



Peabody Fellows Program

PEABODY MUSEUM OF NATURAL HISTORY • YALE UNIVERSITY

Biodiversity Curriculum Unit Excerpts "Hide and Seek: Be an Animal Track Detective"

Lesson Titles:	Leaps and Bounds (Lesson 1)
	Making Animal Tracks (Lesson 2)
	Putting It All Together: Animal Chart (Lesson 3)
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Grade:	3
Program Year:	2000

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Science Standards

Students will develop, practice and understand the abilities necessary to conduct scientific inquiry as they investigate and research animal tracks and their makers, observe and describe specimens, use data to formulate questions and hypotheses, and present their research to their classmates (1.0, 1.1, 1.2).

NHPS Science Standards 1.0, 1.1, 1.2

Content Standard 1.0

SCIENTIFIC INQUIRY

Students will develop abilities necessary to conduct scientific inquiry, including posing a question, stating an hypothesis, developing an investigation, observing and documenting the process, and recording and determining the results.

Performance Standard 1.1

Students will acquire and practice the ability to do scientific inquiry.

- a. Students will ask questions about objects, organisms and events in the environment.
- b. Students will plan and conduct simple investigations.
- c. Students will use simple equipment and tools to gather data and extend their senses.
- d. Students will use data to develop reasonable explanations.
- e. Students will communicate their investigations and explanations verbally and in writing.
- f. Students will learn and practice a standard format for investigating, recording, presenting and communicating about their inquiry.

Performance Standard 1.2

Students will understand the process of scientific inquiry.

- a. Students will conduct scientific investigations that ask and seek to answer questions, and then they will compare those answers with what they have learned previously.
- b. Students will use different kinds of investigation, including observation and description, experimentation, and theorizing to achieve broad understandings in science.
- c. Students will learn to present their investigations publicly.

In this unit, students will develop an understanding of the properties of objects as they observe, describe and classify types of animals, tracks, patterns of movement and attributes. As the students create and interpret pictures and stories of tracks, signs and patterns of movement, they will understand that position and placement of tracks and clues can tell a story about an animal's or person's activity and purpose (2.1, 2.2).

NHPS Science Standards 2.1, 2.2

Performance Standard 2.1

Students will identify objects and materials with rich verbal description.

- a. Students will classify common objects by form and function.
- b. Students will describe the characteristics of objects and materials by observable properties.
- c. Students will identify similarities and differences in common objects.
- d. Students will represent these objects with visual sketches.
- e. Students will group and sort solid objects and materials.
- f. Students will sort objects by opposing characteristics, such as long vs. short and hard vs. soft.
- g. Students will understand how materials exist in different states, such as solids, liquids and gases.
- h. Students will understand that materials can change states by heating and cooling.

Performance Standard 2.2

Students will understand that objects have position and motion and that forces can effect change over these objects.

- a. Students will describe the location of an object relative to another object or the background.
- b. Students will describe an object's motion by tracing and measuring its position over time.
- c. Students will understand that the position of objects can be changed by pushing or pulling and that the size of the change is related to the force of the push or pull.
- d. Students will learn that sound is produced by vibrating objects.
- e. Students will understand how pitch can be varied by changing the rate of the vibration.

Through observation of specific details in an animal's tracks, such as webbed feet or opposable toes, students will develop an understanding of the characteristics of animals and their significance and relationship to their environment and their needs (3.0, 3.1, 3.3).

NHPS Science Standards 3.0, 3.1, 3.3

Content Standard 3.0

LIFE SCIENCE

Students will develop an understanding of the characteristics of organisms; life cycles of organisms; reproduction and heredity; populations and ecosystems; organisms and their environment; and the diversity, interaction and interdependence of organisms.

Performance Standard 3.1

Students will identify the fundamental characteristics of living organisms.

- a. Students will identify and describe the basic needs of living organisms, such as air, food, water, nutrients and light.
- b. Students will identify the characteristics of living organisms.
- c. Students will understand that organisms can survive only in the environment in which their needs can be met.
- d. Students will identify and describe the different structures of plants and animals and how these help their growth and survival.
- e. Students will demonstrate some familiarity with the diversity of environments of the world and the biological diversity of these regions.
- f. Students will compare and contrast the similarities and differences of plants and animals.
- g. Students will recognize that plants and animals are influenced by internal and external cues that guide their behavior and survival.

Performance Standard 3.3

Students will identify fundamental connections between organisms and their environments.

- a. Students will observe ways in which humans depend on the natural and constructed environment.
- b. Students will explore the ways in which humans alter their natural environment beneficially or harmfully.

While observing their environment for a variety of animal and human tracks, the students will distinguish between natural and human-made objects (5.3).

NHPS Science Standard 5.3

Performance Standard 5.3

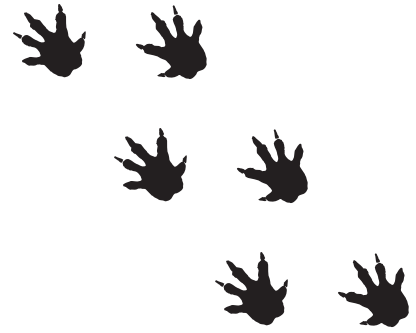
Students will develop abilities to distinguish between natural objects and objects made by humans.

- a. Students will identify basic characteristics of objects that occur in nature.
- b. Students will identify objects made by people, including those that help solve human problems and enhance the quality of life.
- c. Students will categorize objects as those of natural origin or of human design.

Leaps and Bounds

(Lesson 1)

Sue Matican Grade 3
Edgewood Magnet School



Objectives

Students will:

- Recognize that we can learn about an animal's behavior and habits by observing its tracks. (Examples include the animal's size, type, habitat, type of movement and feeding patterns.)
- Use the resources in the BioAction Lab to identify four patterns of movement as shown in charts, pictures and books: galloping, bounding, waddling, and walking/trotting.
- Use this information about patterns of movement to help identify a given set of animal tracks.
- Categorize a list of animals by their pattern of movement.

Materials

3x5 cards
BioAction Lab
Pre-labeled graph to create a bar graph
Chart paper
Markers
Pencils
Animal pictures (or list of animals)

Vocabulary

Walking/Trotting Moving on foot at a normal rate where one foot is always on the ground; the movement or gait of a four-legged animal where one front leg and the opposite hind leg are moving forward almost at the same time, then the other two, and so on.

Galloping The fastest gait of a four-legged animal where once in each stride all four feet are off the ground at the same time.

Bounding Moving by a series of leaps.

Waddling Swaying from side to side when walking.

Set up

- Prepare a graph by labeling the x-axis with "patterns of movement" and walking, galloping, bounding, and waddling and the y-axis with "number of animals" and the numerals.
- Pull out all materials relating to the patterns of movement for easy accessibility.

- Prepare a list of animals, or generate a list with the students, for research and categorizing by pattern of movement. (Alternatively, have students find pictures of animals they are interested in investigating as to their pattern of movement, and then use these pictures to create a pictograph.)

Background

We can learn a great deal about the habits and behaviors of animals by observing their tracks. Tracks are evidence of where an animal has been, where it's going and what it has been doing. Measurement and examination of the tracks for size, number of toes, presence of toenail marks, and size and shape of pads can help identify the track-maker. Examination and measurement of the pattern of tracks can determine the pattern of movement and further aid in the identification of the track-maker. Most animals can be categorized as walkers/trotters, gallopers, bounders, or waddlers.

Lesson procedure

- Discuss and brainstorm with the students the kinds of information we can learn from observing animal tracks.
- Read *Animal Tracking* by Jim Arnosky.
- Ask the following questions: *Do all animals move in the same way? How do the movements of a squirrel differ from those of a dog? Can you demonstrate these movements? Who can give some other examples of how different animals move?*
- Compare patterns of human movement with those of other animals and discuss how we can use these to gather data about habits and behavior.
- Ask the following questions: *Do people always move in the same way? If you just got up in the morning and you were going to the bathroom to brush your teeth, how would you move? (Demonstrate walking slowly.) If you are on your way to the bus stop and you see your bus coming down the street, how would you move? (Demonstrate running or trotting.) If you were carrying something very heavy, so heavy that it is hard to manage it, how would you move? (Demonstrate waddling.)*
- Like people, animals move in different ways or patterns. We are going to be animal detectives again and investigate different patterns of movement in animals, and then use this information to identify what animal has made a particular track. Instruct the students that they are going to work with a partner and choose an animal either from specimens or photos found in the BioAction Lab. They will then use the books, charts and posters to determine the animal's pattern of movement.
- Partners are to write on a 3x5 card the name of their animal and its pattern of movement. Draw a picture of the animal's tracks on the bottom of the card.
- When the students have completed their cards, collect them. List the 4 patterns of movement on a chart or chalkboard. Tally the different patterns the group found.
- Graph the findings by gluing the 3x5 cards onto appropriately labeled chart paper to create a bar graph or pictograph.

- Discuss the findings and ask questions the students can answer by using the graph, such as, *which pattern of movement did we find more of, less of, etc.*

Closure

Students will graph their findings to show identification and categorization of animals by their pattern of movement. Students will assemble their own field guides including the four patterns of movement and a list of the animals that fall in each category. They will take these field guides on visits to Edgewood Park for field investigations of actual animal tracks.

Inter-disciplinary activities

- Literature is integrated into the lesson in the use of the trade book *Animal Tracking* by Jim Arnosky.
- The creation of the field guide involves researching, writing and drawing.
- Math is integrated into the lesson as the students gather and tally data to create a bar graph.

Assessment

Each student's participation in the graphing activity and completion of his/her field guide will be evidence of understanding.

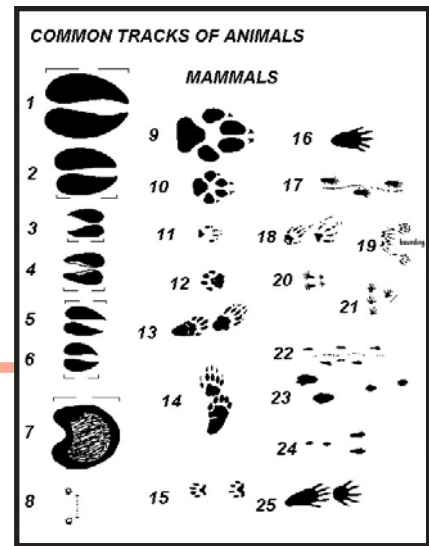
Extension activities

- "Track Detectives": Have the children investigate outside their homes for animal tracks. Follow the tracks and try to determine the pattern of movement of the track-maker. Draw a picture of the tracks. Write a paragraph telling who you think the track-maker is and what clues you used to determine this.
- "Snow Detectives": After a snowfall, go outside and look for tracks—animal, human and vehicular. What story does the pattern of tracks tell? Who has been there?
- Have several students bring in their pets (such as rabbits, gerbils, hamsters and turtles) for a day so the class can observe their movements. Film their movements with a video camera to determine their patterns of movement. If possible, get stop-action photos of their movements.
- Take a field trip to a horse stable to observe the various movements of horses, such as walking, trotting, and galloping.

Making Animal Tracks

(Lesson 2)

Sue Matican Grade 3
Edgewood Magnet School



Part One: First Day

Objective

The students will make their own set of animal-track stamps.

Materials

Sponges
Insoles
Glue
Cardboard
Plaster
Animal-track molds
Chart paper
Markers

Staffing needs

Classroom teacher
Museum educator
Very helpful: additional adults to assist at each station.

Set up

The students will choose an animal from the BioAction Lab and reproduce its tracks. They will select a method to reproduce their own set of animal tracks from the choices given. Prior to the lesson, materials should be set up at stations. Students will bring an animal-track picture to a station and create their own animal-track stamps or models. Allow drying time overnight. The classroom teacher and BioAction Lab staff person will assist students with the materials as needed.

Background

Through their experiences in the previous lesson, the students should be developing an understanding and recognition of some animal tracks. This activity will reinforce their new knowledge.

Lesson procedure

- Review with the students some of the places on the BioAction Lab where they can find animal tracks [for example, posters, books, plaster models (casts) and animal track scarves].
- Instruct the students to browse through the BioAction Lab and select an animal whose tracks they would like to reproduce.
- Demonstrate the different use of materials at each station:
 - **Station 1:**
 - Draw or trace the animal track on a piece of sponge
 - Cut with scissors
 - Glue onto corrugated cardboard
 - **Station 2:**
 - Draw or trace animal tracks on an insole
 - Cut with scissors
 - Glue onto corrugated cardboard
 - **Station 3:**
 - Mix plaster according to posted instructions (see package).
 - Pour into chosen mold and allow to dry.
- Students choose a method for making their animal track and move to the appropriate station (#1 or #2).
- Students label their tracks with their names and the animals' names.
- Designate a safe drying place for the students to place their labeled tracks.

Closure

List on chart paper which students made which tracks. Discuss similarities and differences the students may have noticed in the different animal tracks they made (for example, size, pads, presence of toe nails, presence of tail drag).

Part Two: Second Day

Objective

The students will use the animal tracks, stamps or casts they made to create a book and a set of animal-track matching cards.

Materials

Pre-cut construction paper pages
Ink pads
3x5 cards (5x8 cards)
Book binding machine
Plastic rings for binding
Magazines for clipping animal pictures
Computer access to search and print animal pictures

Set up

Prior to the lesson, set up materials at different stations with space for several students to work.

Staffing needs

Classroom teacher
Very helpful: additional adults to assist at each station.

Lesson procedure

- Review with the students the variety of animal tracks made during the last lesson.
- Discuss today's activity choices, telling the students that they will use the animal-track stamps they made to create both their own book and their own animal-track matching cards. They will work in teams, sharing their stamps so that they will each be able to create a book and a set of cards with a variety of animal tracks, not just the ones that they made themselves.
- Demonstrate how to use the ink pads and animal-track stamps to create a print.
- Divide students into groups and move them to their workspace with the necessary materials.
- Each child will make a print of their own stamp on a page for their book and another print on an index card to create a matching card game. They will then pass their stamp to a team member and repeat the process using each other's stamps.
- Upon completion of all of the pages, the animal-track books can be assembled on the bookbinding machine. Students can design their own covers.
- Students can then find pictures that correspond to the animal tracks on their matching cards and glue the pictures on another card to create a matching card game. The matching cards can be used to play "Concentration," or "Go Fish."

Closure

Students can share their books and play their matching games in small groups or with the entire class.

Assessment

Completion of the project will serve as a measure of success.

Inter-disciplinary activities

- This lesson integrates science and visual arts.
- The students can create a mural on burlap of their own footprints and trace their own patterns of movement. Each student can then use a different color paint to print his/her foot and create a map keynoting who made which color footprint. Each student can measure the length and/or width of their footprint and add this measurement to the map key.
- Individually, or in pairs, the students can create a story that explains the pattern of movement on the mural.

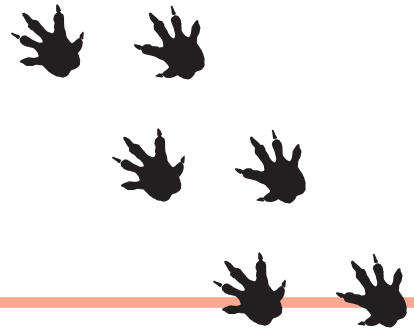
Extension activities

- The students can use the plaster casts they made and create animal tracks by "walking" through a pan of sand or mud. Stories can be created or acted out depicting how and why these tracks were made. Discussion questions might include:
 - How do you think these tracks compare to the actual tracks made by the animal? Explain.* (Possible answers might be that the animal's weight, stride, and speed would affect the appearance of the tracks.)
 - Do these tracks show the actual way the animal moves? Explain.*
- The students can make their own animal-track T-shirts using the stamps they made and permanent ink or fabric paint.

Putting It All Together: Animal Chart

(Lesson 3)

Sue Matican Grade 3
Edgewood Magnet School



Objectives

Students will:

- Create a chart showing each animal's sounds, movements, appearance, size and tracks.
- Give an oral presentation about the animal they have researched and add it to the chart.

Materials

Poster board
Pencils
Markers
BioAction Lab resources
Books
Posters
Magazine and internet pictures
Index cards

Set up

The students will need access to the BioAction Lab materials.

Staffing needs

Classroom teacher
Very helpful: additional staff to help students locate appropriate materials

Background

Using the information learned from the previous lessons, students will choose a final animal on which to report. With information and strategies for looking at clues, the students will compile a complete description of their chosen animal.

Lesson procedure

- The students will work in pairs. Each team will choose an animal about which they will compile data.

- The students will use the resources on the BioAction Lab to locate specific information about their animal. They will make notes on index cards about their animal's sounds, movements, appearance, size and tracks.
- Each pair of students will either draw or find a picture of their chosen animal and put it on an index card.
- The pictures and data will be displayed on a class chart, with headings for each type of information the students discovered.

Closure

Each pair of students will give a brief oral presentation of their findings for their chosen animal.

Assessment

Successful completion of the fact cards and the oral presentation from each student team will serve as the assessment tool.

Inter-disciplinary activities

- The activities in this lesson integrate scientific research, artistic representation and oral expression.
- The extension activities provide additional interdisciplinary options.

Extension activities

- The students can act out their animals by demonstrating their patterns of movement and imitating their calls.
- The final research information and pictures the students gather can be displayed on posters rather than on a class chart, or compiled into a class book. This would allow for more detailed reporting.
- Each student team can draw their animal's footprints to scale, cut them out, label them and compare them to those prepared by the other students. Comparisons can be related to the actual size of each animal, its relation to other animals, and its place in the food chain and in the environment. Students can apply these findings to understand biodiversity and the interrelationship of plants, animals, people and the environment.
- The teacher may choose to perform the Candy scat and Riddle-writing lessons below.

Candy scat

The students will use resources from the BioAction Lab (for example, models of scat) to identify candy replicas of scat and the animals that made them. They will make a list of their findings.

Examples:

M&Ms (rabbit)

Tootsie Rolls (opossum)
Peanut Clusters (turtle)
Raisinettes (squirrel)
Yodels (raccoon)
Smarties (skunk)
Peanut M&Ms (deer)
Jimmies (mouse)
Bread (fox)
Bunch of Crunch (frog)

Riddle writing

The students can use the information they gathered about their chosen animals to write riddles and then challenge their classmates to solve them.

For example:

"I have paws that look like human hands. I look like I'm wearing a mask. I am nocturnal. I can open your trash cans using my opposable thumb and eat the garbage you have thrown away. My scat looks like Yodels. Who am I?"

Lesson 3 Putting It All Together (student worksheet)

Scientist: _____ Date: _____

You are going to choose an animal from the BioAction Lab to research. You will then make a poster about this animal. Use this form to record your research information before you plan your poster. Make sure you include the following:

Animal name: _____

Name of babies: _____

Usual number of babies born: _____

Type of habitat: _____

Where it lives: _____

Size: _____

Description: _____

Pattern of movement: _____

Food eaten: _____

Predators (other animals that eat this animal):

Tracks:

Picture:

Annotated Bibliography

Resources for Teachers

Cornell, Joseph. 1998. *Sharing Nature with Children*. Dawn Publications, Nevada City, CA.

Hands-on activities motivate children to learn about their natural environment.

DeVane, Margaret, et al. 1990. *New Haven Outdoors: A Guide to the City's Parks*. Citizens Park Council of Greater New Haven, CT. This guide provides a description and the location of the city's parks and what they offer.

Hale, Janet. 1994. *Hands-on Minds-on Science Animals*. Teacher Created Materials, Inc., CA.

Children learn about animals through hands-on activities.

Hickman, Pamela, and Pat Stephens. 1998. *Animal Senses: How Animals See, Hear, Taste, Smell, and Feel*. Kids Can Press, Toronto, ON.

This book reveals the unique ways that animals sense their environment.

Experiments and activities explain how these senses help animals survive and show children how to compare animal senses to their own.

Lang, Elliott, and Marie Read. 1998. *Common Birds and Their Songs*. Houghton Mifflin Company, Boston.

This guide to North American birds includes descriptions of characteristics, markings, and habits, along with photographs. Editions with compact disks include audio bird calls.

Lingelback, Jenepher. 1989. *Hands On Nature Activities*. Vermont Institute of National Science.

Creative hands-on activities involve students in a wide variety of activities that teach about nature.

Miller, Dorcas. 1981. *Track Finder*. Nature Study Guide, Rochester, NY.

This nature study guide helps identify the track-makers through pictures and descriptions.

Russell, Helen Ross. 1998. *Ten-Minute Field Trips*. National Science Teachers Association, Arlington, VA.

This field trip guide provides a variety of quick and creative activities for field trips.

Resources for Students

Arnosky, Jim. *Crinkleroot's Book of Animal Tracking*. G.P. Putnam's Sons, New York.

Crinkleroot, a folksy nature guide, leads readers through the woods as they learn to track animals.

Arnosky, Jim. 1979. *Crinkleroot's Book of Animal Tracks and Wildlife Signs*. G.P. Putnam's Sons, New York.

Crinkleroot, a folksy nature guide, teaches about animal tracks and signs.

Arnosky, Jim. 1990. *Crinkleroot's Guide to Walking in Wild Places*. Bradbury Press, New York.

Crinkleroot, a knowledgeable guide to the outdoors, eagerly shares the joys of nature. He encourages the reader to listen to a stream, find a tiny forest in a boulder crack, and recognize the paths animals have made through the woods.

Behler, John L. 1999. *Reptiles: National Audubon Society First Field Guide*. Scholastic Inc., New York.

This extensive guide provides pictures and descriptions of reptiles.

Benjamin, Cynthia. 1999. *Footprints in the Sand*. Scholastic Inc., New York.

Children love seeing the tracks of a woodpecker, a lizard, a spider—even a young girl—all leading to their homes.

Benjamin, Cynthia. 1994. *Footprints in the Snow*. Scholastic Inc., New York.

This book introduces young children to the tracks that different animals—deer, owl, squirrel, bear, and even a little girl—leave in the snow as they hurry to their homes.

Dendy, Leslie. 1998. *Tracks, Scats and Signs (Take-Along Guide)*. Northword Press.

This helpful book guides young readers to the clues left behind that can help identify the track-makers.

Dewey, Jennifer Owings. 1991. *Animal Architecture*. Orchard Books, New York.

This engaging book shows the variety of creative and unusual homes built by animals.

Dewey, Jennifer. 1989. *Can You Find Me? A Book About Animal Camouflage*. Scholastic Inc., New York.

In this unique picture book, youngsters will journey into the world of mammals, sea animals, insects, and reptiles, and discover their camouflaging techniques.

Donnelly, Marlene Hill. 1999. *Big Tracks, Little Tracks: Following Animal Prints (Let's-Read-Find-Out Science, Stage 1)*. HarperCollins Juvenile Books, New York.

Forrest, Louise Richardson. 1988. *Field Guide to Tracking Animals in Snow*. Stackpole Books, Mechanicsburg, PA.

Through detailed pictures and descriptions, the reader learns to identify animals by the tracks they leave behind in the snow.

George, Lindsay Barrett. 1995. *In the Snow: Who's Been Here?* HarperCollins, New York.

The sharply focused art captures both the crisp cold of winter and the happy warmth of family as William, Cammy, and their dog find animal tracks and signs while following a snowy trail to the sledding hills.

Grassy, John, and Chuck Keene. 1998. *Mammals: National Audubon Society First Field Guide*. Scholastic Inc., New York.

This detailed guide provides information on the behaviors, habitats, and characteristics of the many species of mammals, as well as pictures and tracks to help identify them.

Landry, Sarah B. 1994. *Urban Wildlife: Peterson First Guides*. Houghton Mifflin Co., New York.

This descriptive guide provides descriptions and pictures of city animals.

Levine, Lynn and Martha Mitchell. *Mammal Tracks: Life-Size Tracking Guide*. Heartwood Press, East Dummerston, VT.

This wonderful guide provides life-size pictures of animal tracks, categorizing animals by their patterns of movement.

National Audubon Society. 1993. *Familiar Animal Tracks (The Audubon Society Pocket Guides)*. Knopf Publishing, New York.

This helpful guide provides pictures and descriptions to help the reader identify animals and the tracks they make.

Paul, Tessa. 1997. *By Lakes & Rivers (Animal Trackers Series)*. Crabtree Publishers. Young naturalists are provided with the clues they need to identify and track animals that make their homes along waterways. Included are descriptions of the sights and sounds of animals, their behavior and their homes.

Reiser, Lynn. 1996. *Beach Feet*. Greenwillow Books, New York.

A fabulous, fact-filled book that helps the readers find out about the feet of a sand dollar, crab, seagull, sand fly, octopus, sea star, and many others through its charming illustrations and footnotes.

Ryan, Pam Munoz. 1997. *A Pinky Is a Baby Mouse and Other Baby Animal Names*. Hyperion Books for Children, New York.

Children learn the names of a variety of baby animals through this beautifully illustrated book.

Wolff, Ashley. 1999. *Stella and Roy Go Camping*. Dutton Children's Books, New York.

Stella and Roy investigate animal tracks, hoping to find bear tracks, as they go on a camping adventure with their mother.

World Book Encyclopedia. 1988. World Book, Inc., Chicago, London, Sydney, Toronto.

This is a wonderfully helpful resource for background information on animals, providing many pictures of animal tracks.

Yolen, Jane. *Owl Moon*. 1987. Philomel Books, New York.

On a cold winter's night, a young girl and her father walk through the woods hoping to see a great horned owl. After a long, cold night, Sarah's patience is rewarded.

Internet Resources

EEK! - Follow that footprint, paw print, hoof print...

www.dnr.state.wi.us/org/caer/ce/eeek/nature/track.htm

Outdoor Action Guide to Animal Tracking.

www.princeton.edu/~oa/nature/tracking.shtml