SECTION 3

POPULATION DYNAMICS

The lessons in this section are reprinted from:
Alaska Department of Fish and Game. 2001. ***Alaska Wildlife Curriculum***. Anchorage, AK: Alaska Department of Fish and Game
Some modifications may have been made.

Extinction - Distant Thunder

Target Grades: K-3rd

Objectives:
Students will define "extinct" and "extinction" and relate the changes in Alaska habitats to the extinction of animals.

Concept:
Most students, especially younger ones, are able to relate to the concept of extinction by learning about dinosaurs. Since Alaska had many dinosaurs that lived here and are now extinct students will relate what they learn about dinosaurs to what has happened to extinct animal species in Alaska and what could happen to some of the endangered or threatened species.

Materials:
- *Thunderfeet: Alaska's Dinosaurs and other Prehistoric Critters* by Shelley Gill and Shannon Cartwright audiocassette with lyrics by Hobo Jim.

Introduction:
Ask your students if they think dinosaurs ever lived in Alaska. List as many different types of dinosaurs the students come up with. Ask students about the fate of these dinosaurs and discuss different theories behind the dinosaur's extinction. Tell the students that they will be reading a story about all of the different dinosaurs that actually lived in Alaska.

Procedure:
Students will read along or listen to a story about dinosaurs and participate in a group discussion of extinction.

1. Read the book *Thunderfeet* to your class or in reading groups. Be sure to show the students the colorful illustrations.

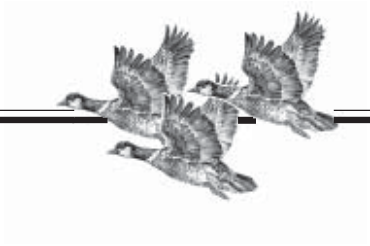
2. Ask the following questions after reading the text on the indicated page.

• ***Page 1*:** What does the author mean by "roam no more?" Can you think of a word that means that the **dinosaurs** are all gone? (**Extinct** - *if they have trouble remembering the word, have them think of "ex" by imagining x-ing something out.*)

• ***Page 5-6***: What did the hadrosaur need to live? (**Water**, *Plants for* **food**, *forest for* **shelter** *and nest materials. Together these make up the hadrosaur's* ***habitat****.)*

• ***Page 7-8***: What did troodon eat? (*hadrosaur eggs*) What did the hadrosaur eat? (*plants*)
Can you describe a prehistoric **food chain**? (*plant-hadrosaur-troodon*) Which animal is a **predator**? (*troodon*) Which animal is the **prey**? (*hadrosaur*)

• [**OPTIONAL**: Play the first song on the tape, then ask what other animal eats hadrosaurs? *(tyrannosaurus)*]



Extinction - Distant Thunder *continued...*

• ***Page 9-10:*** What kind of animal was Tyrannosaurus? *(a predator)*

• ***Page 11****:* What kind of habitat did Ceratops need? *(horsetails for food, water, cypress forest for shelter)*

• ***Page 13-14****:* What happened to the dinosaurs in Alaska and everywhere else? (*They became* **extinct**, *but scientists don't know exactly how this occurred.*)

• ***Page 15-16****:* Which animals in the picture survived after the dinosaurs? *(mammals)* What familiar animal do you see that lived at the time of the dinosaurs? *(the dragonfly – turn back to pages 5,10, and 11 to help students answer the question)*

• ***Page 19-20****:* Can you see any animals in this picture that you know are not extinct? *(moose)*

• ***Pages 19-24:*** Were there other kinds of animals that once lived in Alaska that no longer live here? *(Yes, mastodons, camels, sloths, short-faced bears, mammoths, yaks, ponies, lions)* What did these animals eat? *(The mastodon, sloth, pony, and camel are shown eating grass; the short-faced bear is shown chasing the camel; the narrative hints that lions eats ponies.)*

• ***Page 25-26****:* Do you see animals here that you know are not extinct? What does it mean that "dragonflies still remember"? (Dragonflies were around at the time of the dinosaurs and they are around today.) If the dragonfly didn't go extinct, what do you think this means about dragonfly habitat? *(Dragonflies have been able to find food, water, and shelter in the right arrangement for all this time.)* What happened to the habitat of dinosaurs? *(It changed so that dinosaurs could no longer survive.)* Do you think there could be dinosaurs again?

3. Play the audiocassette of songs and help students learn the songs and sing along.

EXTENSIONS:

1. **Art of extinction.** Create prehistoric animal art projects. To reinforce the understanding of the word "extinct," students could make buttons with an extinct animal illustration inside a circle with an "X" across it. To relate this lesson to current times, students could put extinct Alaskan animals on their buttons (*the Steller Sea Cow, the Spectacled cormorant and the Eskimo curlew are all extinct*).

2. **Parade of prehistoric animals.** Using the "Let's Have a Parade" song on the *Thunderfeet* tape, have a prehistoric parade with students acting out the animals in the story. Students could make costumes based on the illustrations in *Thunderfeet.*

3. **Write story through dragonfly eyes.** Write a story that illustrates what a dragonfly would have seen living among the dinosaurs.

4. **Fossil field trip or guest speaker.** Contact local experts to find out if there is a field trip site in your area where your students could see fossils. Invite experts into your classroom to describe local fossils and their significance. If your class is in Fairbanks or can visit Fairbanks, take a field trip to the University of Alaska Museum to see the Blue Babe and mastodon exhibits.

5. **Dinosaur film time.** Watch videos and/or filmstrips about dinosaurs.

Reprinted from : *Alaska Wildlife Curriculum*, Alaska Dept. of Fish and Game.

Extinction - The Last Curlew

Target Grades: 4th - 6th

Objectives:

Students will be able to explain and describe the process of extinction, the causes of extinction or endangerment and the characteristics of extinct species.

Materials:

- Endangered and Extinct Species Fact Sheets
- Other resource materials (*see Resources*).

Introduction:

To introduce the concept of geological time and extinction - go for a geology hike through time in the classroom. See the activity on page ? in the Aleutian Shield Fern section.

Procedure:

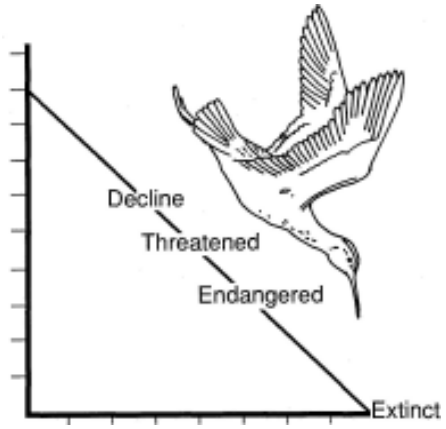
Explain to students that they will write a story in the first person as if they are the last individual of a species. They need to incorporate all they know about geological time and extinction as they portray the plight of their chosen plant or animal.

1. Introduce the terms **extinct**, **extinction** , **endangered**, and **threatened** from the species cards.

2. Tell students that in Alaska several kinds of wildlife became extinct after the Age of Dinosaurs 65 million years ago and at the end of the Ice Age (Pleistocene Epoch 10,000 years ago). Some others became extinct less than 300 years ago.

3. Students choose which species card they would like to read. Students reading the same species cards meet in groups of 2 - 3 to study them.

4. Each group develops a graphic concept-map illustrating the important events and factors that caused the species to become endangered or extinct.



5. Each student writes a story from the point of view of the last surviving member of the species. The story will describe the struggles of the animal to survive and the obstacles that stand in its way.

6. Students meet in groups of 2 - 4 for a writers' workshop in which the group reacts and comments on each story. Students then rewrite their stories based on the feedback from the writers' workshop.

7. Compile a class list of the different causes of extinction described on the species cards or other research. Make a second list of the characteristics of each species that made it vulnerable to becoming endangered or extinct. *(The sea cow, for example, needed a habitat that was only found in a small area. Also, the sea cow moved very slowly making it easy to kill by humans.)*

VARIATION: Students do the ***Search for Answers Activity*** prior to this writing activity.

Extensions:

A. **Script good human behavior.** Students view the Star Trek movie "The Final Frontier" about the extinction of humpback whales. Rewrite the plot with human behavioral changes that allow the whales to survive.

B. **Poetry for survival.** Students write poems about the survival of an endangered species.

Extinction - Gone Forever

Target Grades: 5th - 8th

Objectives:

Students will be able to define *extinction* and give examples of extinctions from both natural and human causes. Students will relate causes of extinction to extinct species and determine the extent to which humans have accelerated the rate of extinction.

Concept:

Students will create a time-line of extinct species which will allow them to make connections between increased human activity in an area and extinction of plants and animals.

Materials:

- *For each student:*
  - Extinction Time-line Worksheet
  - Woolly Mammoth Fact Sheet
- *For each group:*
- Fact Sheets:
  - Spectacled Cormorant
  - Steller's Sea Cow

Introduction:

Explain to students that they will be creating a time-line of extinct species in cooperative groups. Do the Geological Hike to refresh students' understanding of the geological time-line. See the section on the Aleutian Shield Fern.

Procedure:

Discuss the concepts of **species** and **extinction**. *Scientists estimate that globally we now lose anywhere from 100 to 1,000 species each year.*

Ask students to list as many extinct species as they can. Brainstorm a list of factors that might cause a species to become extinct.

Assign each group a historical time period (1750-1800, 1800-1850, 1850-1900, and 1900-1950). Have them work cooperatively *(sharing materials, assigning jobs or roles, etc.)* Give each group a fact sheet for the species that became extinct during its time period *(save the "Woolly Mammoth" Fact Sheet for later use)*.

Group members read their fact sheets to learn why their species became extinct and discuss the factors leading to extinction.

Use the "Extinction Time-line Worksheet" to develop a time-line of extinctions on paper or computers showing the numbers of mammals and birds that became extinct in seven time periods *(see example)*. Then, students identify the time period for their species and label their graph.

Each group shares the information it learned about why their species became extinct with the rest of the class. Place the names of the species the groups studied on the graph with an arrow to indicate the time period in which each became extinct.

Distribute copies of the *"Woolly Mammoth" Fact Sheet* and give students time to read it. Discuss the different causes of extinction the students have learned from all of the fact sheets. Compare the potential causes of the prehistoric extinction of the woolly mammoth with the potential causes of extinctions during historic times.

Ask students whether the numbers of bird and mammal extinctions are increasing or decreasing and why this might be happening. *(Increasing — the current rate far exceeds that of the last 65 million years.)*

Show the class the graph of the growth of the world's human population and relate it to the graph of bird and mammal extinctions. *The accelerated rate of*

Extinction - Gone Forever continued...

extinction has been directly linked to the exploding human population and to the high rate of natural resource consumption by the industrialized world.

Generate a list of characteristics of species that would make them vulnerable to extinction *(examples: demand by humans, unable to adapt rapidly to environmental changes, migratory habits, small populations, low birth rates).*

Extensions:

B. **Current extinctions.** Students research the last 50 years, identifying what species have gone extinct including hypotheses or why extinction occurred.

C. **Tropical forest extinctions.** Many people are concerned about the rate at which the tropical rainforest is being logged and cleared for timber products, farming, ranching, mining, and other development. This is occurring at a rapid rate in Central and South America and in South Pacific and Asian countries such as Indonesia. Have your students research the tropical rain forest ecosystem and the issues of deforestation and wildlife loss.

D. **Math problems: extinction.** *E. O. Wilson, an expert on biodiversity, has estimated the extinction of species in tropical forests as high as 17,500 species each year at the current rate of deforestation. (Of 10 million species worldwide, 5 million species occur in these rainforests.)*

- Using the above information, calculate the annual rate of extinction in the rainforest resulting from this type of habitat loss each year *(Answer: approximately 1 species per 1,000 species per year).*

- Compare this rate to past global extinction rates of 1 species per 1 million species per year or 1 species per 10 million species per year *(1,000 to 10,000 times higher).*

- If the current rate of deforestation continues, the tropical rain forests will be eliminated by 2135. Ask students to calculate their age in 2135, when the rainforests are predicted to disappear.

Make a poster with the facts. Make a poster about one of the species which answers all the following questions about its extinction: who, what, where, when, why, and how?

Extinction Timeline Worksheet

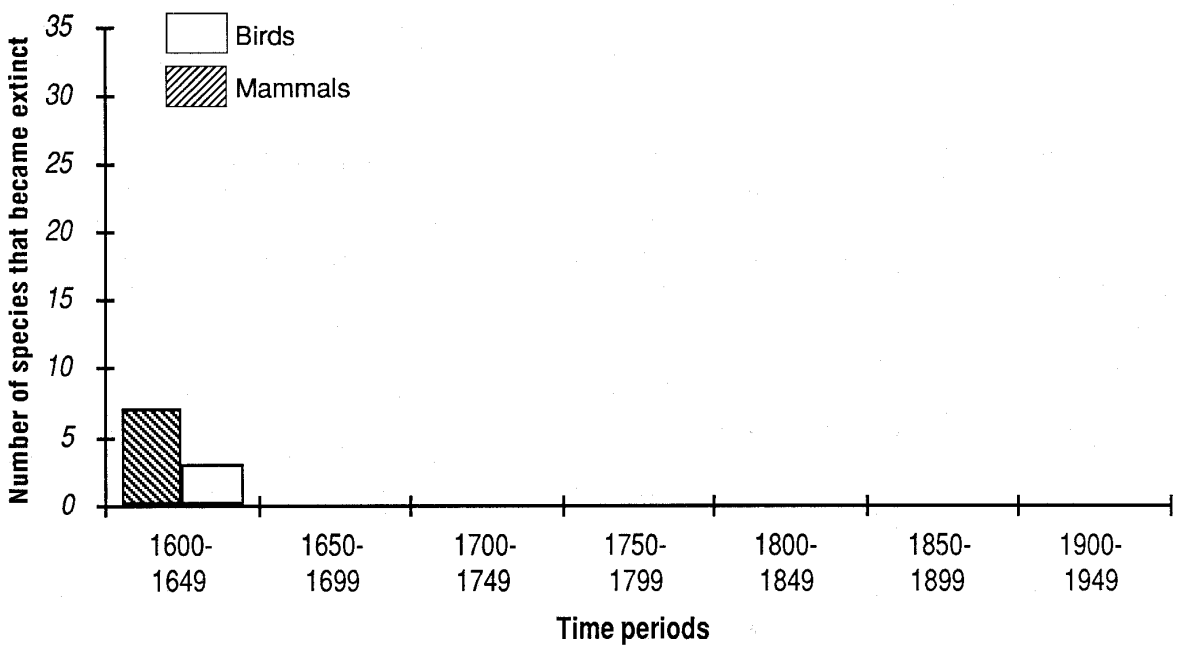
DATA:

Number of species of birds that became extinct:

Between 1600 and 1649: 3
Between 1650 and 1699: 9
Between 1700 and 1749: 5
Between 1750 and 1799: 9
Between 1800 and 1849: 12
Between 1850 and 1899: 29
Between 1900 and 1949: 35

Number of species of mammals that became extinct:

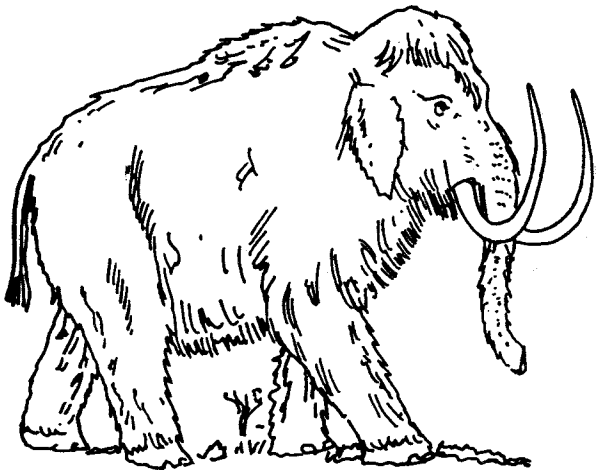
Between 1600 and 1649: 7
Between 1650 and 1699: 3
Between 1700 and 1749: 2
Between 1750 and 1799: 7
Between 1800 and 1849: 2
Between 1850 and 1899: 15
Between 1900 and 1949: 22



Woolly Mammoth

Mammuthus primigenius

TIME PERIOD: 11,000 - 14, 000 YEARS AGO



SPECIES STATUS: EXTINCT

The woolly mammoth was Alaska's member of the elephant family. Like today's elephants, mammoths were large animals that traveled in herds and had two white tusks and a trunk. Unlike elephants of today, the mammoths were covered with long, dark hair.

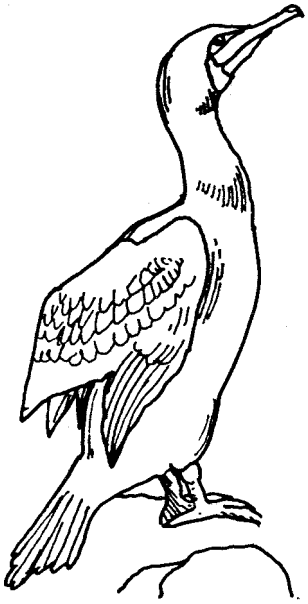
Mammoths lived in Alaska when much of the world's northern areas were covered by glaciers and ice sheets, but much of Interior Alaska was ice-free. Many scientists believe Interior Alaska was part of a huge grass-covered area that stretched into Asia across a land bridge in the area that is now the Bering Sea. Woolly mammoths fed on grasses in these areas. The mammoth and many other animals that lived on the grassy plain all became extinct about the same time.

What caused the extinction of the mammoth and the other animals? The answer remains a mystery. Scientists have two theories. One is that the climate changed quickly as the ice sheets began to melt. Winters became colder and more snow fell, making it difficult for animals with short legs like the mammoth to move about and find food. As the climate continued to change, the grasslands became forests. Animals that were adapted to life in the grassland could not adapt to life in the forest and they perished. Scientists who favor the theory of changing climate study the ancient remains of plants, but it is difficult to date these remains exactly.

The second theory is that humans crossed a land bridge between Asia and Alaska. Some scientists believe that these people hunted the animals until they were extinct. These scientists believe the mammoths and other animals could not adapt to these new predators. Fossils show that during the Ice Ages in Asia, people hunted mammoths. They ate mammoth meat, used the skins for clothing, and used the skins and bones to construct shelters.

Spectacled Cormorant

Phalacrocrax perspicaillatus



SPECIES STATUS: EXTINCT

A large, nearly flightless seabird, the spectacled cormorant lived on a few remote islands of the western Aleutian Islands. Scientists believe they were once abundant because Georg Wilhelm Steller reported the birds as existing in "most copious" numbers. Steller was a naturalist who traveled with the 1741 Russian expedition lead by Vitus Bering to determine what land lay east of Siberia.

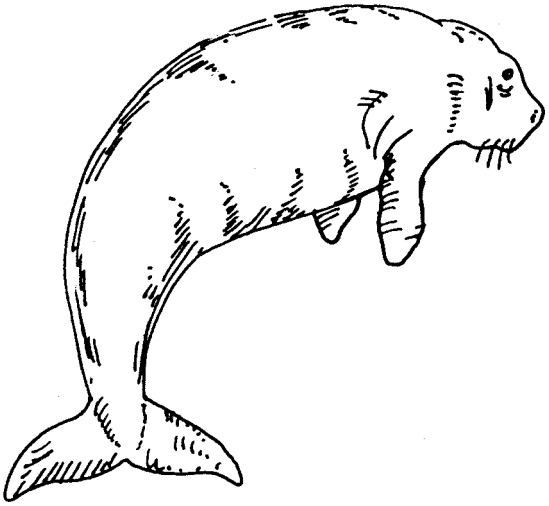
Steller wrote about this large black bird while shipwrecked on a tiny island near the western end of the Aleutians, later named Bering Island. In midwinter, he and the other stranded sailors killed the slow moving and unwary cormorants for food. Steller wrote, "They weighed 12 - 14 pounds, so that one single bird was sufficient for three starving men."

Almost nothing is known about the life of this bird except that it fed on fish, similar to other cormorants. Steller was the only naturalist to see the bird alive. Other scientists learned of the species through Steller's writings and from specimens brought to museums in 1837.

The population of spectacled cormorants declined quickly as whalers, fur traders, and Aleuts (brought to Bering Island by the Russian-American Company) killed the birds for food and clothing. By 1850, less than 100 years after Steller first saw these seabirds, the spectacled cormorant became extinct. Steller's records, six specimens, and two skeletons in museums are the only evidence that this species existed.

Steller's Sea Cow

Hydrodamalis gigas



POPULATION STATUS: EXTINCT

Georg Wilhelm Steller was a naturalist who traveled to Alaska with the Russian expedition lead by Vitus Bering in 1741. He was the first and only Western scientist to see a live Steller's sea cow. Steller sighted this unique marine mammal when Bering's ship, the *St. Peter*, ran aground on a small island near the western end of the Aleutian Islands. A small population of sea cows lived in the waters around this island and a nearby island. These islands were later named Bering and Copper. This area apparently was the only place in the world where Steller's sea cows lived.

Far larger than the largest male walrus, a Steller's sea cow measured up to 25 feet long. A single animal probably weighed up to 8,800 pounds. Steller and the Russians saw sea cows clustered in herds along the shore of the island. "These animals," he wrote, "are busy with nothing but their food. The back and belly are constantly seen outside the water, and they munch along just like land animals with slow, steady movement forward."

The population of sea cows was small when Steller first described the giant creature. Some scientists think that the entire population included less than 2,000 individuals. The sea cow's habitat was restricted to a small area of the ocean where the temperature of the water was suitable.

The slow-moving animals were an easily hunted source of food for the Russians exploring the Alaska coast. The crew on Steller's ship were the first Russians to hunt and eat the sea cow. By 1768, only 27 years after Steller first sighted them, the entire population had been killed by sailors, seal hunters, and fur traders. The sea cows were killed for food and skins to make boats. This amazing animal, which lived in the Bering Sea just over 200 years ago, now exists as a few intact skeletons and pieces of skin in museums.

Carrying Capacity - Hermit Crab Game

Target Grades K-3rd

Objectives:

Students will demonstrate how a habitat need can limit the size of a population.

Concept:

Plant and animal species with very specific habitat needs are susceptible to population decline or limits to their population size. Students can make connections between plants and animals that have fewer habitat restriction and are more adaptable and those that have greater limiting factors and are less adaptable.

Materials:

♦ *A House for a Hermit Crab* by Eric Carle

Introduction:

Tell students they will be simulating hermit crabs searching for a limited number of shells. Read *A House for Hermit Crab* to the class. Alert the students to watch for what the hermit crab needs for shelter and think about the various stages of growth it goes through. Tell them they will be playing a game after the story to reenact the plight of the hermit crab as it searches for a home.

Procedure:

Following the reading of the story, discuss the life of a hermit crab. Teach the class the poem about the hermit crab. Write it on the board. Tell the students that it will be used for a game.

I'm a little hermit crab,
looking for a shell.
I see one. There it is.
This will suit me very well

Play the Hermit Crab Game

See next page for instructions. Replay the game as many times as possible altering the limiting factors and discussing the impact son the population.

Conclusion:

Discuss the results again and point out to students that the number of successful hermit crabs depends upon the number of shells available. The number of shells is the **limiting factor**.

Let the "shell" players be hermit crabs and play the game again.

Turn three "shells" into "crabs" and play the game again. This time the number of hermit crabs that find shells will be smaller. Ask the students what factor limited the size of the population *(the number of shells).*

Extensions:

Write hermit crab poems. Have students write their own poems about hermit crabs.
Observe crabs in tide pools or aquarium. Observe hermit crabs in tide pools. Discuss what might happen to the hermit crab population if too many people collected empty shells at the beach or if the snail population declined.
Create a new game. Create a similar game choosing a different animal and a different limiting factor.

Carrying Capacity - Hermit Crab Game *continued...*

Hermit Crab Game

OBJECT OF THE GAME: for each hermit crab to find a shell. Some of the students will be shells; some will be hermit crabs.

TO BEGIN: divide the class into "shells" and "crabs" with one less "shell" than "crabs." After the class repeats the poem, the "hermit crabs" quickly try to reach a "shell" by crab-walking and crawling under it.

SHELL RULES: "shells" stand with arms spread outward, bending over. This position represents a shell.

CRAB RULES: tell the class all the hermit crabs are considered one **population**. Have the "crabs" practice crab-walking by moving on their hands and feet, knees bent, with their back toward the floor. To be safe, each "crab" must find a "shell" and get on the floor under the arch formed by the "shell's" arms.

After all but one "crab" find a shell; discuss what the "crab" without a shell might do. *(It might move to a new area or a **predator** might eat it.)*

PLAY AGAIN: at the start of each round, have the "crabs" with shells leave their shells so that all hermit crabs are looking for new shells.

I'm a little hermit crab,
looking for a shell.
I see one. There it is.
This will suit me very
well.

Population Posters

Target Grades: K-2nd

Objective:

Students will be able to categorize wildlife into populations and count wildlife populations.

Materials:

- Poster paper
- colored construction paper
- drawing materials
- glue
- ***Optional:*** *Alaska Ecology Cards* or other sources with pictures of animals.

Introductions:

Tell your students that the class is going to make a mural showing representative populations of five common species living in their area. Brainstorm kinds of wildlife species common in your area. Write wildlife names on a large piece of poster paper.

Procedure:

Have the class choose five favorite animals. Divide the class into five groups and assign one of the animals to each group.

Distribute construction paper to each group *(for example, brown for bears and moose, white for mountain goats)*. Have students draw their special animal to create a **population** of their animal. Let students determine the size of their population. For younger students, you may want to provide models of the animals for them to draw and afterward make photocopies to multiply their "populations."

Students work in groups on a class mural. Using a large sheet of poster paper, students draw a landscape similar to the local landscape. Students glue their animal populations onto the mural in appropriate places.

Hang the finished product *(which represents several animal populations in the local landscape)*.

Ask the class to count the number of individuals in each animal population on the mural. Tally the results on the chalkboard.

Using the mural, discuss the term "population." A wildlife **population** includes all the animals of a single species that live and raise their young in a specific area.

Ask the students to describe their population. Write what the students say onto strips of paper. Encourage students to use "population" in their answer. Attach sentence strips like labels to the mural. *Example: You would ask, "How many bald eagles are in the bald eagle population?" and write the answer "25 bald eagles are in the bald eagle population."*

Extensions:

Add habitat needs to mural. Discuss the habitat needs of the animals on the mural. Students then will include the habitat requirements in their drawings for the mural.

Add plant examples to mural. Collect plant materials on a field trip or photocopy pictures of local plants and glue them onto the mural.

Spin off into water cycle. Use construction paper to make ponds, clouds, etc. Discuss and draw the water cycle.

Count animals in photographs. Students count wildlife from aerial photographs, posters, or magazine photos. Request aerial photographs from Alaska Department of Fish and Game or US Fish and Wildlife Service.

Count human populations. What is the human population of your classroom, school, community?

How Many Animals Live Here?

Target Grades: 3rd - 8th

Objectives:

Students will count the population of animals in a small area and estimate the size of the population over a larger area.

Concept:

A habitat's ability to provide food, water and shelter dictates an animal's population size. If one or more of these factors are depleted, the size of the population is affected. Inversely, if an animal population gets too large for the capacity of the habitat, the destruction to the habitat will reduce the population size.

Materials:

Indoors:

- Beans, Popsicle sticks, popcorn, or other objects that are easy to see, count, and clean up;
- measuring sticks
- paper and pencils
- poster paper

Outdoors: *for each group* –

- collecting equipment appropriate for the area you wish to census (bottom scraper for ponds or lakes, net strainer *[old nylon stockings or panty hose are suitable]*
- collecting trays or containers *[white works best for visibility of organisms]*)
- four marker sticks at least 1 /2 meter long
- clipboard
- paper and pencils
- poster paper.

Procedure:

This activity can be done in the classroom with objects such as beans or popcorn, or outdoors with observations or collections of organisms. It is a good activity to help students gain an understanding of the challenges scientist face when trying to count a population of plants or animals. It will also reinforce common terminology used by scientists and researchers when sampling populations. It is best to do the activity in the classroom first, then go outside and practice the sampling procedures in a familiar area nearby.

CLASSROOM ACTIVITY

Create a population in the classroom or gymnasium using beans, Popsicle sticks, popcorn, or similar items. Spread one of the items around the room. If you have a large class, you can have different groups of students sampling different populations and then compare results and methodology.

Tell the students that they will become wildlife managers today who need to know size of an animal's **population** this year, in order to know if it is increasing, decreasing, or stable.

Explain that each group will count the animals in a small area to get an idea of how many might be in the entire area. In other words, students will conduct a **census** in a small area, which is a **sample** of the entire area. Then they will **estimate** the population in the larger area, using the procedure outlined in the Outdoor Activity section below.

How Many Animals Live Here? *continued...*

OUTDOOR ACTIVITY

IN ADVANCE, select a field trip site

• Determine the collecting equipment you will need to collect animals. During the winter, it is possible to census the number of animal tracks made by individual animals in an area.

• Mark a half-meter length with a marking pen on one of the four marker sticks for each group.
Identify the boundaries of the study site (pond, lake, rock outcrop, meadow, etc.). Ask the students to guess how many animals of different types are in the area. Name several animals they are likely to encounter in a census.

Students brainstorm how they could count all of the animals. Animals may be hard to see or find. Counting each one may be very time-consuming and difficult. Help them think about the challenges of being sure they have really caught or counted all the animals.

Students should discuss why they would not want to change animal **habitat** *(such as draining the pond to count the fish, digging up an anthill to count the ants)* just to get a count.

Divide the class into small groups. Explain that each group will count the animals in a small area to learn how many might be in the entire area. In other words, students will conduct a **census** in a small area, which is a **sample** of the entire area.

Give each group paper, pencils, and a clipboard to record their census data. Demonstrate how to use the marker sticks to outline a square sample area. Use the stick with the half-meter mark on it to measure each side of the square. Mention that each team's sample area should be at least a meter away from any other team's sample area.

Teams begin their census. If they are working in a pond, stream, or area of soil, students scoop bottom sediment inside the sample area to a depth of approximately 1 inch. They should rake the scoop in straight rows until the entire area is uncovered to a depth of 1 inch. The scooped sediment is emptied into a strainer and rinsed to strain out mud. The leftover scrapings are then placed in observation trays.

Students will draw a picture of each type of animal they observe. Students should write the number found next to the picture.

Reunite the groups. Give the teams a few minutes to share their discoveries. Ask them whether they would change their guess about how many animals of a certain type lived in the area.

For older students: Ask them to guess how many samples would be needed in order to count all of the ____ *(name of an animal)* in the population. Would it be 10 times or 100 times or 1,000 times? To estimate the size of the population, students multiply the number of a species they found *(for example: 6 water striders)* by the number of samples they would need to cover the population's area *(for example: an area of 4 square meters would require 64 1 /2 meter square samples).* The population would be 6 x 64, or 384 water striders.

Return collected organisms to their habitat.

How Many Animals Live Here? *continued...*

BACK IN THE CLASSROOM

Use poster paper to list the species and census numbers

Encourage a discussion. How many species of animals were found? Which species were most numerous? Which were least numerous? Why did each team catch different kinds and numbers of species? *(Some possible explanations are differences in sample areas, unevenness of distribution of organisms, differences in counting and scooping techniques).*

Write **population** on the chart and arrive at a class definition. Emphasize that a population includes only one type of animal or species.

Extensions:

Research endangered species populations. Do the Become an Expert research activity to learn more about an endangered species population. Older students can include researching sampling methods used to estimate the populations and critique the decision making process for recommending these species for listing under by the state species or federal government.

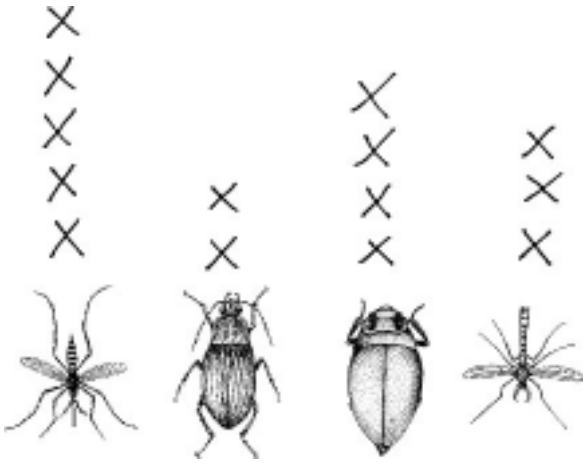
Research local wildlife populations. Students will research local wildlife populations. Contact the Alaska Department of Fish and Game office in your area for population data on a species of interest to students. Invite wildlife biologists, local experts, or long-term residents and Native elders into the classroom to share their knowledge. They may be willing to lead or assist on a field trip.

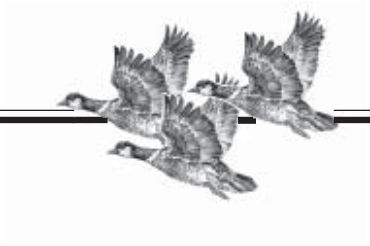
Census things in schoolyard. Students brainstorm ways to census or estimate highly visible organisms in the schoolyard (types of plants, insects, spiders, animals that leave tracks, birds that come to a feeder, etc.). As you discuss these, be sure to emphasize the difference between a census and an estimate (see background information).

Compare in another season. Students can conduct the activity during a different seasons of the year. They should compare census numbers and estimated populations and try to explain the differences.

Credits:

Adapted from "*How Many Organisms Live Here*?" OBIS, Lawrence Hall of Science, University of California, Berkeley, CA. Distributed by Delta Education, Inc., Box M, Nashua, NH 03061-6012.





Don't Put All Your Eggs in One Basket

Target Grades: K - 4th

Objectives:

Students will learn that animal populations grow through births and observe the relationship between the size of a population and the number of young that are born each year.

Concept:

The clutch size of birds is determined by a number of factors: size of bird, habitat restrictions, longevity, chance of chick survival. Many endangered birds, such as the Short-tailed albatross, lay one egg per breeding season so they are very susceptible to population decline of their breeding season is or success rate is hindered.

Materials:

- Paper cups *(1 per student)*
- photocopies of Goose Pair Silhouettes
- dry grass
- cotton batting
- beans
- poster paper
- glue or tape.

NOTE: The following activity can be adapted for over-population.

Introduction:

Tell students that they will be simulating a population of nesting geese and then analyzing the results of the simulation. Ask them what they know about work that biologists do to estimate population size. Make a list of ways that the students think would be good for getting a good estimate for a local bird population.

Procedure:

Give a paper cup to each student. Place the grass, cotton batting, and beans in a central location. Tell the students that they will each be making a goose nest by gluing the grass and batting in the cup.

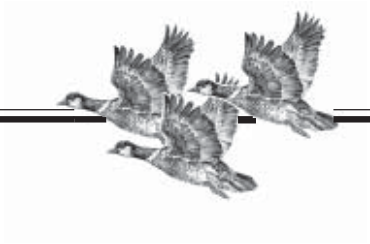
After the students have made the nests, give each student the goose illustrations and have them cut out pairs of geese.

Tell the students that each pair of geese will produce five eggs each year. Students collect five beans each and place them in their nests.

Create a large graph on the poster paper with two columns. Label the left-hand column "Pairs of Geese" and the right-hand column "Number of Eggs" *(see illustration)*. Explain that a goose population will have a certain number of pairs. *(See the activity "Population Posters" in this unit if you have not introduced the term "population" to your class.)*

Begin filling in the chart. Start with "one pair of geese." Ask a student to bring a goose pair silhouette for the chart. The geese can be taped or glued to your chart. Move to "two pairs of geese." Again ask students to bring the pairs. Continue until the population has 20 pairs.

Explain to the students that the number of eggs laid by each pair varies. For the purpose of this activity, however, each goose pair will lay five eggs. Begin with "one pair of geese" and draw a nest (circle) and fill it with five eggs. Ask the class to count the number of eggs in the egg column and write down that number. Continue this process for the increasing number of pairs (Older students can do this by multiplication.)



Don't Put All Your Eggs in One Basket *continued...*

Compare the number of eggs laid by the largest population with those of smaller populations. Encourage students to think of things that could happen to geese so there would be fewer geese in a population *(they could be eaten by predators, harvested by hunters, die from accidents, or starve to death because there was too little food).*

Which population would recover quickest if each population lost 10 geese? *(The smallest population would become extinct; other small populations would take a long time to recover because there would be fewer eggs each year compared to the larger populations. The largest population would recover the quickest.)*

Explain that people are concerned about very small populations of wildlife because they may be in danger of extinction.

Write or draw accompanying story. On poster paper, the students as a class will write a story about what they learned. Place the story next to the graph. Younger students can draw their story or dictate as you write.

Enhance the math problems. The activity assumed that all female geese laid the same number of eggs. Explain to the students that female geese do not always lay the same number of eggs. Each student should choose the number of beans to place in their nest. The number should be between 3 and 7. Hide the nests around the room or on the school grounds and then have the students conduct a nest search and count the total number of eggs. Older students can calculate the average **clutch** size *(number of eggs per nest)* by adding the numbers in each nest and dividing the total by the number of nests.

Extensions:

Use Aleutian Canada goose example. Conduct the same activity, using the Aleutian Canada goose population. Read the Fact Sheet on the Recovery Story for the Aleutian Canada Goose. Watch the video on the recovery process used by Fish and Wildlife Service to bring the population back from being threatened with extinction. Introduce the fox as a predator on goose eggs. Use the information to estimate what future populations will be, based on historic and current growth and decline. *Timely information is available on the website* <www.r7.fws.gov>

Pairs of Geese	Number of Eggs
1 Pair of Geese	5 Eggs
2 Pair of Geese	10 Eggs
3 Pair of Geese	15 Eggs
4 Pair of Geese	20 Eggs