

SECTION 1

BIODIVERSITY AND HABITATS





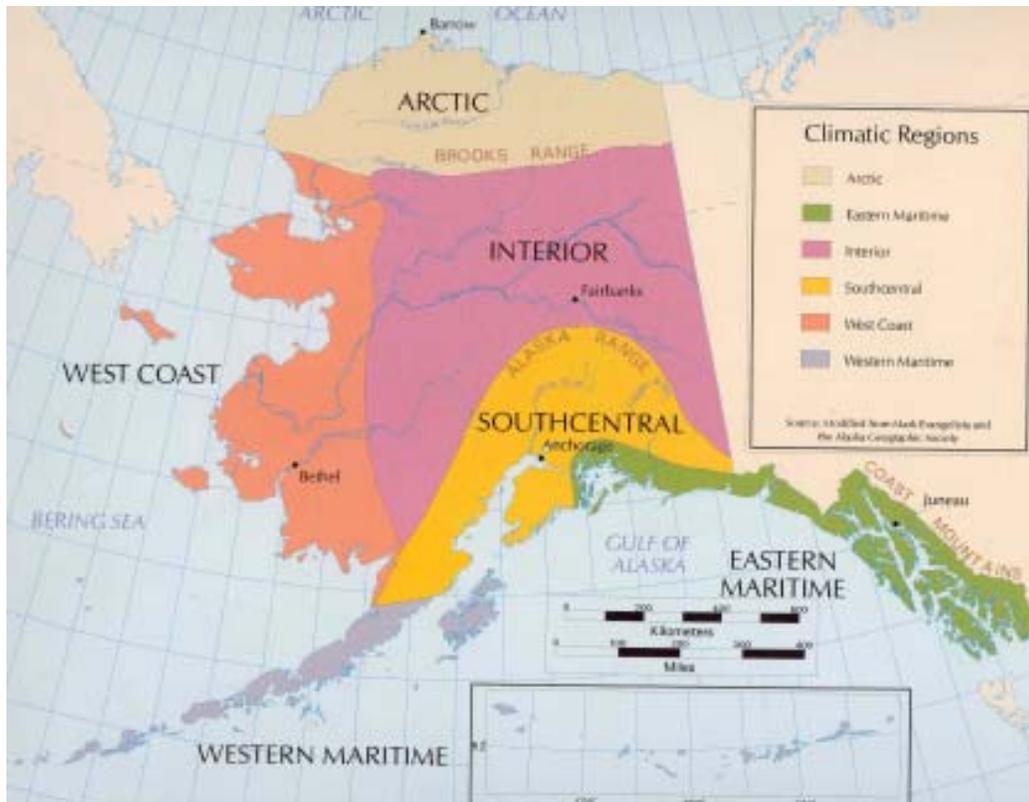
Regions in Alaska

Flannel Story Board

Background:

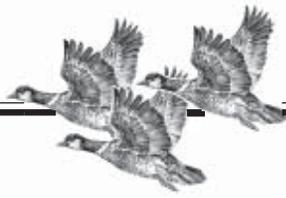
Alaska is a large state with distinct ecosystems separated by geological and geographic boundaries. The habitats within these ecosystems are home to a wide variety of plant and animal species. A large portion of the state is relatively isolated from major human influences while a small portion has had continual and relatively large-scale human development and influence since the early 1700s. This Activity Guide will focus on the area of the state delineated by the Alaska Maritime Wildlife Refuge and the habitat requirements of the plants and animals found there. The Maritime Refuge encompasses most of coastal Alaska and includes the Aleutian and Pribilof Islands. These areas are characterized by relatively mild temperatures (in the southern reaches), a large amount of precipitation, relatively treeless terrain and inaccessibility. The areas have been occupied by Alaska Native populations for centuries, who have subsisted in these areas harvesting from the land and sea.

Alaska can be divided up into 6 climatic regions (Pearson and Hermans, 2000): Arctic, Southeast Region, Interior, Southcentral, Western Coast and Aleutian Region. Various factors influence an areas' climatic



designation. Latitude is one influence and influences daylength on a seasonal basis. Maritime and continental influences are another factor that affects a regions' environmental composition. Fairbanks and Nome are at the same latitude, but Nome faces the Bering Sea. The Bering Sea is cool in the summer and keeps Nome cool as well, whereas Fairbanks is far removed from any large body of water and can be much warmer in the summer. The Alaska Maritime Refuge is in the Aleutian Region climatic region.

From: *Alaska in Maps, A Thematic Atlas*, Edited by Roger W. Pearson and Marjorie Hermans, University of Alaska, Fairbanks, 2000.



Regions in Alaska continued

This region has no continental influences. It is characterized by severe winter storms and cool summer temperatures. The Southeast Region has a similar amount of precipitation and temperature as the Aleutian Region but geographic influences vary enough that they have very different ecosystems. The Southeast Region is less windy, a little warmer and has more sunny days thereby supporting lush forests in Southeast Alaska. The Aleutian Islands, on the other hand, have no forests. The Southcentral climatic region has both continental and maritime influences. Mountain ranges stop moisture from the Gulf of Alaska and are largely glaciated. In the winter, this region is influenced by both the warmer, unfrozen Gulf of Alaska (for example, Homer area) and the frozen continental Interior (for example, Soldotna/Kenai area).

Endangered and Threatened Species or Populations and their Climatic Regions:

Steller's Eider: Arctic, Southcentral, Western Coast, Aleutian Region
 Spectacled Eider: Arctic, Western Coast
 Short-tailed Albatross: Aleutian Region
 Aleutian Shield Fern: Aleutian Region
 Bowhead whale: Arctic, Western Coast
 Humpback whale: Aleutian Region, Southcentral and Southeast Region
 Sperm whale: Southeast Region, Southcentral, Aleutian Region
 Fin whale: Western Coast, Aleutian Region
 Steller Sea Lion (Western population): Southcentral, Aleutian Region
 Sei Whale: Aleutian Region
 North Pacific Right Whale: Aleutian Region
 Blue whale: Aleutian Region
 Leatherback sea turtle: Aleutian Region, Southcentral, Southeast Region

Delisted Species:

Aleutian Canada Goose: Aleutian Region
 Gray whale: Arctic, Western Coast, Aleutian Region, Southcentral, Southeast Region

Candidate Species:

Beluga whale (Cook Inlet population): Southcentral
 Northern Sea Otter (Southwest population): Aleutian Region



Alaska's Many Regions

Alaska is a large state with many different areas. Let's divide the state into 6 different regions and find out what types of plants and animals can be found there and the kind of weather each place has.

The first region is the Arctic - a place where there is very little to no sunlight in the winter and daylight all the time in the summer. The Arctic actually gets very little snow - it is like a desert - but because it remains so cold all winter - the snow that does fall stays for a very long time. Underneath the soil is permafrost - frozen soil - which stays frozen all the time - summer and winter. Plants that grow here are small but plentiful in the summer. There are no trees. It is a rich area for nesting waterfowl, shorebirds and migrating mammals such as caribou. The threatened Spectacled Eider breeds here. The Arctic Peregrine falcon, which was once listed as endangered, breeds here as well. Mammals that live here are arctic fox, polar bear, musk ox. Whales migrate to the arctic ocean to feed in the summer and seals can be found there year round.

The Interior is the next region of the state - since it is so far from the ocean it gets very hot in the summer and very cold in the winter. There is still permafrost on many areas so the trees and plants do not grow very tall, but there are areas where birch, aspen, and spruce trees grow well. Food for animals is scarce so there are fewer animals found here - moose browse on willows, bald eagles nest in the forest and many ducks migrate through on their way to nesting grounds. Other animals include the wolf, grizzly bear, lynx and snowshoe hare.

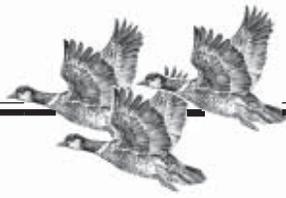
The next region is the Western Coast which is full of small lakes and ponds and is generally very flat. Two major rivers (the Yukon and Kuskokwim) end here and create big delta areas that are rich in plants and insects - just right for nesting waterfowl and shorebirds. The Bering Sea keeps the temperatures cool in both summer and winter. It is an area of rich salmon runs returning to the rivers and many bears. It is a very important nesting area for many of the geese, tundra swans and sandhill cranes.

The Aleutian region is made up of the Aleutian Islands and the end of the Alaska Peninsula. This is an area of active volcanoes, cloudy, rainy and windy weather and cool temperatures. There are no trees on the islands and plants are very small. This is the home of the Aleutian Shield Fern which is found only on the island of Adak and is listed as endangered. The Aleutian Canada goose nests only on these islands and many sea ducks and other waterfowl winter around these islands. The mammals that live here have been introduced by humans. Marine mammal life, such as sea otters, seals, sea lions and migrating whales are plentiful.

Southcentral Alaska is where most of the people live. There are big mountains and lots of glaciers in this area. The weather is both cold and dry like the interior and cool and wet like the other coastal areas. Many plants and animals live in this area. It is rich for salmon, brown and black bears, mountain goats and moose. There are big spruce trees and many deciduous trees like birch and cottonwood as well. Prince William Sound and Kachemak Bay are very rich with intertidal life, waterfowl and marine mammals.

Southeast Alaska is known for it's rainy weather and big spruce and hemlock trees. Here the temperature stays about the same all year round. The land is very mountainous and there are many small rivers and glaciers. Sealife and marine mammals are more common than land mammals. Bald eagles love this area because of all of the salmon that return to the rivers.

Let's see where the animals on our Endangered Species list can be found and place them in the region they either migrate to or live in. As you can see, each area of the state is unique and special for the plants and animals that live there. Many of these plants and animals could not live in the other areas of the state. Alaska is very big indeed!



Biodiversity Grab Bag

Target Grades: K-8th

Objectives:

Students will be introduced to the concept of biodiversity through metaphors that can be related to the meaning and benefits of biodiversity.

Concept:

Biodiversity is the survival of a variety of species on earth. There are many benefits to maintaining biodiversity on our planet.

What You Need:

- ◆ Grab Bag
- ◆ Stethoscope
- ◆ Tools
- ◆ Binoculars
- ◆ Felt Earth
- ◆ Plastic Food
- ◆ Protest Sign
- ◆ Doll

Background:

In this activity, students are introduced to the concept of biodiversity and given the opportunity to make connections between the meaning and benefits of biodiversity and common everyday items they know. This activity involves exploring metaphors. A brief review or explanation of metaphors may be necessary if you have not covered this as a class.

Procedure:

Introduce the term biodiversity to your students. Write the word "**Biodiversity**" on the board and ask for possible definitions. Break the word down into two parts and review the meanings of "**bio**" (life) and "**diversity**" (variety) as keys to understanding the meaning of the word. Engage students in a brief discussion about the definition of biodiversity, the numbers of species on the earth and some open ended discussions about the importance of having all of these species.

Tell your students that you have a special bag filled with symbolic items that represent the different reasons for preserving biodiversity and what biodiversity can mean to us. Ask them to brainstorm different ways biodiversity might be important to their lives.

Next hold the bag up in the front of the room and have students come up one by one to pull an item from the grab bag. Have the student try to guess the metaphor and discuss it's meaning.



Grab bag for biodiversity:

Protest Sign:

Biodiversity Belongs

Plants and animals have a right to exist whether or not they are useful to humans

Stethoscope:

Biodiversity helps us heal ourselves

Many plants provide valuable medicines to the world

Tools:

Biodiversity keeps natural areas together

Every time we lose a species we change the way an ecosystem works - all of the parts are intertwined

Binoculars:

Biodiversity attracts tourists

People like to go to places to see nature and ecosystems - tourism is a rapidly growing industry. Ecotourism can be done in a sustainable manner, especially in protected areas.

Felt Earth:

Biodiversity help life continue on earth

Biodiversity helps to keep the gene pool strong and the more species there are, the more adaptability there will be to changing conditions like global climate change.

Plastic Food:

Biodiversity gives us food

Humans depend on a variety of plants and animals to breed crops and animals suitable for use on farms. Twenty species of plants give us 80% of what we eat - if something happens to these crops, the more resistant wild varieties might help.

Doll:

Biodiversity helps us preserve OUR diversity

Human cultures are dependent on local ecosystems and the diversity of plant and animal life to sustain them - cultures that live close to the land are more susceptible to being threatened when there is a loss of biodiversity in their area.



Biodiversity Field Trip

Target Grades: 5th - 7th

Objectives:

Students will form a definition of species while observing biological diversity in the form of species diversity. They will compare species diversity in two different habitat types.

Concept:

By comparing different habitats students will gain an understanding of the adaptations necessary for organisms to survive and gain an understanding of the diversity found in various habitats.

What You Need:

- ◆ a circular item to identify a plot (hula-hoop, stakes and string, for example)
- ◆ hand lens
- ◆ small ruler
- ◆ a field notebook
- ◆ clipboard
- ◆ pencils
- ◆ plant field guides and Alaska Ecology Cards

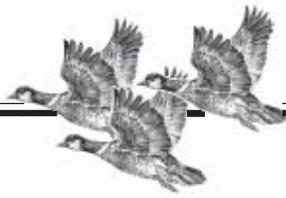
Background:

In this activity, students measure species diversity in much the same manner as scientists. A species is a population of organisms that are alike, and that are able to produce offspring that can breed again. Scientists often compare small areas in order to draw conclusions about the biodiversity of a larger area. Selecting sample sites that represent a larger area and classifying species are tools to measure

biodiversity. When your students use the results of their survey to predict the effects of habitat changes, they are facing the same questions that wildlife managers encounter. Managers try to predict and monitor changes in species diversity after forest fires, beetle outbreaks, drought or floods, human development, or as one animal high on the food chain becomes more abundant or scarce. Questions that scientists ask and try to answer include the following.

- ◆ How do changes in a plant community (forest, wetland, tundra, etc.) affect wildlife that depend on that community for some or all of their habitat needs?
- ◆ Who eats whom?
- ◆ What other species may be impacted because of the interrelationships of living things in an ecosystem?
- ◆ How many individual animals might be affected if the habitat is lost?
- ◆ How significant will the loss of individuals be to the continuance and abundance of the population?
- ◆ Will the elimination of one population or species from an area result in the loss of other populations or species?
- ◆ What is the carrying capacity for a population (How much habitat is needed to support a population)?
- ◆ How can impacts to wildlife be balanced against human needs and desires that lead to land use changes?





Biodiversity Field Trip *continued*

Procedure:

IN ADVANCE, select two outdoor areas that are distinct “habitat types” for your sampling unit (for example, a pond and a paved playground, a forest and a lawn, a wet tundra site and a pingo). If you can find an area with two habitat types in close proximity, you can split the class and complete data-gathering in one day; otherwise, it will require two field trips.

IN CLASS,

1. Define or review the definition of species (*a population of organisms that are alike and are able to produce offspring that can breed again.*)
2. Describe the habitats you have chosen and ask them to predict what types of living things/species (or evidence of living things) they might find in each one.
3. Make a chart with two columns, one for Site 1 and one for Site 2. For each type of habitat, record student predictions under the heading “Species Predictions.” Under each heading, make two columns, one for “Plants,” and one for “Animals.” Leave room to list “Species Found” after the field trip.
4. Divide the class into groups. Give each team a clipboard, small ruler, and hand lens. Each team will keep a field notebook. Explain that they will be making detailed notes and sketches of each species, not collecting plants and animals.

OUTDOORS (or in class)

1. Teams set up study areas at the site by creating circular plots of equal size.

2. Tell students that the goal is to find the greatest number of different plant and animal species within their sampling unit. Students will need to look closely to determine whether the plants and animals they observe are different species. For example, a young plant, a dead plant, and a mature plant of the same species may look different, but they should count as one species.

3. If students don’t know a name for each plant or animal, they should make notes or sketches and give it a descriptive name (for example, “white flowered plant”). Allow 20 or more minutes for them to make their lists.

4. Repeat steps 1-3 in the second sampling unit which should be a different habitat type.

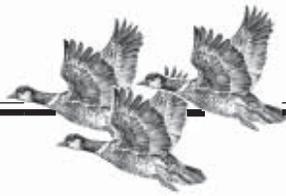
5. After completing the activity in both sampling units, ask the teams to count the number of species they found in each plot.

BACK IN CLASS

1. Add the heading “Species Found” to the charts you made and list the different species found. Total the number of different organisms found in each sampling unit.

2. Define the term biodiversity (*the variety of living things*). Explain that one measure of biodiversity is the number of species in a particular area. Lead a discussion by asking the following questions:

- ❖ What site had the highest diversity of species?



Biodiversity Field Trip *continued*

- ❖ Why might one habitat type have more or less species diversity than another?
 - ❖ What positive and negative effects can people have on the biodiversity of an area? If you visited an area that people had disturbed or developed as one of your sites, use that as the example
 - ❖ Of the organisms that live in this areas, which ones did you find?
 - ❖ Would you find more or different species at a different season?
 - ❖ If you were to spend more time doing this study, what other species do you think we would see?
 - ❖ What are the nonliving things that might affect these living things (for example, soil, rain, sunshine)?
- B. Focus on local animals. Discuss whether common local animals have specialized habitat requirements. Discuss their abilities to travel, or disperse to other areas of similar habitat. Can they travel centimeters? Meters? Kilometers?
- C. Learn local plant knowledge. Invite a bilingual teacher, elder or knowledgeable community member to teach plant names and traditional uses in different languages and cultures.
- D. Turn drawings into guide book. Make drawings of species found in the plot. Then compile a classroom guide book.
- E. Study life in soil samples. Take samples of soil to search for organisms in the soil.
- F. Expand on local habitat types. Discuss how different habitat types could meet the habitat requirements of different animals, using local examples.
- G. Compare diversity at other seasons. Return to the sites at a different season and compare the data.

Extensions:

A. Compare habitats along a line. Stretch a 30 meter-long rope "line transect" so that it crosses two habitats. Students walk along the transect and list all the species they see within 10 centimeters of the line (students can use a small ruler to check the distance). Use field guides to identify unknown species or make descriptive notes to research species back in the classroom. Review the transect data to determine which plants and animals are found in both habitats and which are only found in one or the other.

Reprinted from:
Alaska Department of Fish and Game. 2001. *Alaska Wildlife Curriculum*. Anchorage, AK: Alaska Department of Fish and Game





Scavenge for Biodiversity

Target Grades: K-4th

Objectives:

Students will investigate biological diversity, make comparisons and observe aspects of biodiversity.

Concept:

Students discover, explore, and observe the diversity of life outdoors.

What You Need:

For each student:

- ◆ Five “Biodiversity Cards” selected for your area or season (laminated or copied on waterproof paper for a rainy climate).

Procedure:

IN ADVANCE, select an area for the scavenger hunt

1. *IN CLASS*, distribute the cards. Use them on the school grounds or on a field trip. *For younger students, read the directions on the cards.*
2. Ask students to report back on what they found or didn't find.

Conclusions:

When the class is back at school, have each student portray a living thing he or she observed.

Extensions:

A. Customize the scavenger cards. Make your own cards for your area or for different seasons. Illustrate cards for students who cannot read.

B. Gather biodiversity evidence. Students bring back evidence (drawings or descriptions) of different living things for use on a “Biodiversity on Display” bulletin board.

C. Bird feeder diversity study. Make a class bird feeder(s) with different kinds of food (*sunflower, suet, peanuts, for example*) and observe how many and what kinds of birds come to the feeder. Students observe which birds eat what kind of food. Discuss how a variety of seeds may increase the variety of birds.

Credit:

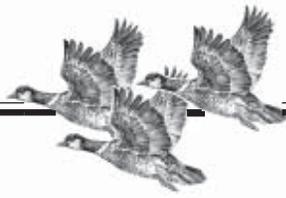
Adapted from “Biodiversity: the spice of life,” *Biological Diversity Makes a World of Difference*, National Park Service and National Parks and Conservation Association, Washington, DC, 1990 and the Alaska Wildlife Curriculum, 2001, ADF&G

Biodiversity Cards

Find a biodiverse place (a place with many living things).	Find a place with nothing living in or on it.	Find a tree or bush with smooth bark.	Find a rock with a living thing on it.
Find a place with more than one type of animal track.	Find an animal with six legs. <i>Treat it with care.</i>	Find a plant.	Pick a plant to stand and count how many different plants you can see.
Find two flowers that look the same but smell different.	Find different seeds.	Find a leaf that is hairy and one that is smooth.	Find an animal home. <i>Watch without touching.</i>

Biodiversity Cards

<p>Watch a plant for five minutes and count the different insects that visit it.</p>	<p>Find a plant that grows in a sunny spot and one that grows in a shady spot.</p>	<p>Turn over a rock. How many different living things did you find? <i>Put rock back when done.</i> <i>This habitat is someone's home.</i></p>	<p>Find a plant or an animal in the shape of a triangle, circle, oval, or square.</p>
<p>Listen. What sounds of living things do you hear?</p>	<p>Find as many different kinds of leaves as you can.</p>	<p>What wild plants do you see that can be used for food?</p>	<p>Find animals living in the soil.</p>
<p>Find animals living in the snow.</p>	<p>Find three different animals. What words describe their shapes?</p>	<p>Find the largest and the smallest leaves on a shrub or tree.</p>	<p>How many different colors of flowers can you find?</p>



Musical Habitats

Target Grades: K-4th

Objective:

Students will demonstrate how habitat loss affects wildlife populations.

Concept:

Students create habitat for one pair of Bald Eagles and simulate the effects of habitat loss on populations.

What You Need:

- ◆ Recorded music
- ◆ paper or cardboard
- ◆ crayons or marking pens
- ◆ scissors, glue
- ◆ colored construction paper
- ◆ OPTIONAL: *To illustrate the story for young students, pictures of Bald Eagles, their nest tree, nest, and main food.*

Procedure:

1. Explain that during the time a pair of Bald Eagles is raising their young, they live in an area called a nesting **territory** where they can find all their **habitat** needs – *food, water, shelter, and space in a suitable arrangement.*

2. Each nesting territory can only support one pair of Bald Eagles and their young. When the young eagles get bigger and are able to fly, they fly away and find their own territory. The adult eagle will often **migrate** somewhere else during winter; but next summer they will return to the same nesting territory to nest again.

3. Read and write on the board (or use pictures) the following description of Bald Eagle habitat requirements:

"Bald Eagles eat salmon, other fish, and refuse. They build their nests in large trees."

4. Tell students they will be using art supplies to make a territory that will meet all the habitat needs of a pair of eagles (you may want to write "*food, water, shelter, and space*" on the board as a reminder). They can draw or cut the construction paper and glue it onto the paper or cardboard.

5. Distribute art supplies. Each student will make a habitat for one pair of Bald Eagles. After the students complete their territories, have them share what they did in small groups.

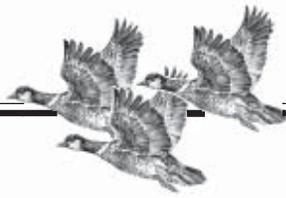
6. Ask the class if they can think of ways Bald Eagle habitat could be changed or lost (*not enough salmon return, mud slides or stream deterioration, polluted oceans, for example*). Explain that if the eagles cannot meet all of their habitat needs, they can no longer live in that territory. Tell them they will be playing a game to find out what happens to an albatross population when habitat is lost.

7. Tell each student to place his or her habitat under a desk or a chair.

8. Students will be a pair of Bald Eagles. They must find a place to live. Remind them that each habitat is enough for only one pair of Bald Eagles. The student must sit in the chair above the habitat when the music stops.

9. Play rounds of "musical chairs," removing one or more territories from beneath the chairs or desks each round. Let the students know what is happening to the habitat. *For example, say "a nesting tree was cut*





Musical Habitats *continued...*

down, one habitat is destroyed" or "a lake was polluted, habitat for two eagles was destroyed" as you remove the habitat). Do this in such a way that the students need to move farther to get to the remaining territories.

10. If a student sits in a chair or desk with no territory, that student is out of the game and can help you remove habitat. Continue the game until only one territory remains.

11. Ask the following questions:

- ❖ What would happen to Bald Eagles that cannot find a territory with all of their habitat needs? (*They would have to find a territory somewhere else or die.*)
- ❖ What happened to the population of eagles as habitat was removed? (*It got smaller.*)
- ❖ What would happen to eagles if the last eagle died? (*They would be **extinct**.*)

EXTENSIONS:

Add "endangered" status to the game. Define the term **endangered** – *in danger of becoming extinct*. Play the game again and ask the students to decide when the eagle population should be considered **threatened** and when it should be considered endangered. (*There is no set population size that triggers the listing so the students can discuss what they consider a small population.*) When is the population extinct? (*When the population drops to zero or drops below the minimum threshold that can sustain the population.*)

After the students choose a population level that will

trigger an endangered label, play the game a third time. When the population reaches the low level set by the students and becomes endangered, have the students who are no longer living albatross help repair the habitat to stabilize the population. Students could also make rules about what people should not be allowed to do that would affect the eagles' habitat.



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Alaska Department of Fish and Game. 2001. *Alaska Wildlife Curriculum*. Anchorage, AK: Alaska Department of Fish and Game

