

explore



# Brooks River Brown Bears: Inheritance and Variation of Traits

Grades 3-5



Students experience the excitement of watching live-streaming video of wild bears on Brooks River in Katmai National Park, Alaska, in order to explore science concepts in the real world. These three lessons, designed for grades 3–5, offer students the opportunity to engage in activities that focus in particular on the inheritance and variation of brown bear traits.



### ANCHORING PHENOMENON

Every summer, the brown bears of Katmai National Park in Alaska converge along the Brooks River to fish for sockeye salmon.



### GUIDING QUESTION

*Why are there differences between the ways individual brown bears look and act?*

## OBJECTIVES

- **Lesson 1:** Understand the difference between inherited and acquired traits.
- **Lesson 2:** Recognize that bears' fishing techniques are learned, acquired behaviors that can be used as distinguishing traits.
- **Lesson 3:** Identify brown bears based on their inherited and acquired traits.

## STANDARDS

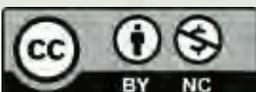
Next Generation Science Standards	
<b>3-LS3-1 Heredity: Inheritance and Variation of Traits</b>	<ul style="list-style-type: none"> <li>• Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.</li> </ul>
<b>3-LS3-2 Heredity: Inheritance and Variation of Traits</b>	<ul style="list-style-type: none"> <li>• Use evidence to support the explanation that traits can be influenced by the environment.</li> </ul>
<b>Science and Engineering Practice 1</b>	<b>Asking Questions and Defining Problems</b> <ul style="list-style-type: none"> <li>• Identify scientific (testable) and non-scientific (non-testable) questions.</li> <li>• Ask questions that can be investigated and predict reasonable outcomes based on patterns.</li> </ul>
<b>Science and Engineering Practice 4</b>	<b>Analyzing and Interpreting Data</b> <ul style="list-style-type: none"> <li>• Represent data in tables to reveal patterns that indicate relationships.</li> <li>• Analyze and interpret data to make sense of phenomena.</li> </ul>
<b>Science and Engineering Practice 8</b>	<b>Obtaining, Evaluating, and Communicating Information</b> <ul style="list-style-type: none"> <li>• Obtain and combine information from reliable media to explain phenomena.</li> </ul>
<b>Disciplinary Core Idea LS3.A</b>	<b>Inheritance of Traits</b> <ul style="list-style-type: none"> <li>• Many characteristics of organisms are inherited from their parents.</li> <li>• Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.</li> </ul>
<b>Disciplinary Core Idea LS3.B</b>	<b>Variation of Traits</b> <ul style="list-style-type: none"> <li>• Different organisms vary in how they look and function because they have different inherited information.</li> <li>• The environment also affects the traits that an organism develops</li> </ul>
<b>Crosscutting Concept 1</b>	<b>Patterns</b> <ul style="list-style-type: none"> <li>• Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.</li> </ul>

### Texas Essential Knowledge and Skills

<b>Grade 3, Science, 3.4</b>	<p><b>Scientific Investigation and Reasoning</b></p> <ul style="list-style-type: none"> <li>The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to collect, record, and analyze information using tools, including cameras, computers [...] and materials to support observation of habitats of organisms such as terrariums and aquariums.</li> </ul>
<b>Grade 4, Science, 4.4</b>	<p><b>Scientific Investigation and Reasoning</b></p> <ul style="list-style-type: none"> <li>The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to collect, record, and analyze information using tools, including [...] cameras, computers, [...] and materials to support observation of habitats of organisms such as terrariums and aquariums.</li> </ul>
<b>Grade 4, Science, 4.10.B</b>	<p><b>Organisms and Environments</b></p> <ul style="list-style-type: none"> <li>The student is expected to explore and describe examples of traits that are inherited from parents to offspring such as eye color and shapes of leaves and behaviors that are learned such as reading a book and a wolf pack teaching their pups to hunt effectively.</li> </ul>
<b>Grade 5, Science, 5.10.B</b>	<p><b>Organisms and Environments</b></p> <ul style="list-style-type: none"> <li>The student is expected to differentiate between inherited traits of plants and animals such as spines on a cactus or shape of a beak and learned behaviors such as an animal learning tricks or a child riding a bicycle.</li> </ul>

### Florida Next Generation Sunshine State Standards for Science

<b>Grade 4, SC.4.L.16.2</b>	Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment.
<b>Grade 4, SC.4.L.16.3</b>	Recognize that animal behaviors may be shaped by heredity and learning.



## THE 5Es

Lesson 1 gives students an opportunity to express what they know about bears. They **engage** with the Guiding Question, “Why are there differences between the ways individual brown bears look and act?”, and make connections between what they know and new ideas about inherited and acquired traits. Lesson 2 allows students to **explore** the phenomenon of brown bears converging at the Brooks River to fish for salmon. Students discover differences between bears’ fishing techniques; they turn and talk to **explain** to each other why the techniques are learned and not inherited traits. Lessons 2 and 3 provide students with opportunities to **elaborate**: They ask their own questions about bears on the live cams, discuss and compare their ideas, and develop a deeper understanding of individual differences between the inherited and acquired traits of brown bears. As **evaluation** at the end of Lesson 3, students review and reflect on their own learning and new understandings.



## RESOURCES

### Websites

[explore.org](https://explore.org)

hosts the live-streaming bear cams. The web page provides the link to a “Fan Made Bear Guide” (see the PARTNER section) and also hosts live web chats with Katmai National Park rangers (see the CALENDAR section).

### [Katmai National Park & Preserve](#)

provides online reference materials. One particularly useful resource is the ebook [Bears of Brooks River](#), which is updated annually. (Enter the search terms “NPS Katmai ebook” with the current year.)

### Books

#### *Brown Bear Summer*

by Thomas Bledsoe; Plume, 1990.

More than any other, this book provides the most detailed and accurate explanations of brown bear fishing behavior at a waterfall. It is out of print, but inexpensive copies can often be found online.

#### *Into Brown Bear Country*

by Will Troyer; University of Alaska Press, 2005.

Will Troyer’s introduction to the natural history of Alaska’s brown bears—told with the objectivity of a biologist, the resonant voice of an outdoorsman who has spent decades in bear society, and breathtaking photography—is both enchanting and informative. Troyer offers a holistic description of bear biology and behavior, an account of bear–human interactions, and practical advice for viewing and photographing bears.

#### *Alaska’s Bears: Grizzlies, Black Bears, and Polar Bears*

(*Alaska Pocket Guide*) by Bill Sherwonit (Author), Tom Walker (Photographer); Alaska Northwest Books, 2016.

Alaska is truly bear country. It is the only one of America’s 50 states to be inhabited by all three of North America’s ursine species: black bear, polar bear, and brown bear. Learn about their appearances, behaviors, yearly cycles, ecological niches, and relationships with humans.





1

## Brooks River Brown Bears: Inheritance and Variation of Traits

● Introducing the Brown Bears

explore

Learning  
IN MOTION

## 1

## Introducing the Brown Bears



Students find out about the brown bears that fish for salmon along the Brooks River in Katmai National Park, Alaska, and are introduced to the Guiding Question. The class watches a video clip, views photographs, and observes the physical and behavioral differences between bears at different life stages. After learning definitions of traits, students work in pairs to categorize brown bears' specific traits as being either inherited or acquired.

**GUIDING QUESTION**

*Why are there differences between the ways individual brown bears look and act?*



## Lesson 1: Introducing the Brown Bears

### MATERIALS

#### Teacher Materials

- **Introducing the Brown Bears** visuals:
  - Katmai National Park and Preserve Map
  - Spring Cubs photograph
  - Older Cubs photograph
  - Subadult photograph
  - Adults photograph
  - Brooks River Highlight 1 video

#### Student Materials

- **Katmai Brown Bear Identification** handout (1 per student)
- Optional: **Katmai Junior Ranger Bear Years** handout (for Extension)

### LESSON PREPARATION

- Work with your school network administrator to make possible the viewing of videos and live bear cams from the Internet site [explore.org](http://explore.org).
- Prepare to project (or print one large classroom display copy of) the **Katmai National Park and Preserve Map** and the four photographs of bears in different life stages.
- Set up a means for students to view the **Brooks River Highlight 1** video.
- Print one copy of the **Katmai Brown Bear Identification** handout for each student.
- Optional: Print one copy of the **Katmai Junior Ranger Bear Years** handout for each student.



## Lesson 1: Introducing the Brown Bears

### OPENING

#### Introduce the Brooks River Brown Bear

1. Capture student interest by asking what they know about bears, such as the different kinds (species), where they live, how they behave, what they eat, and so on.
2. Let the class know they will be watching video of brown bears that have come to fish for migrating salmon along the Brooks River in Katmai National Park, Alaska.

3.  Display the **Katmai National Park and Preserve Map**.

- Point to the inset that shows the state of Alaska, and explain the state's location relative to the continental United States.
  - Point to the inset that shows Brooks Camp Vicinity, and trace the short length of the Brooks River.
4. Explain to students:
    - During the summer, the bears are super hungry because they haven't eaten during hibernation through the winter and spring. They must eat an entire year's worth of food in six months or less!
    - Bears gather at Brooks River because it's the first place salmon become available to bears in Katmai.
    - The waterfall on Brooks River makes a barrier the salmon have to jump over in order to continue swimming upriver to spawn. Brooks Falls is a kind of bottleneck where bears count on finding fish in the first half of the summer.



[Katmai National Park and Preserve map](#)

5. Tell the class that many of the same bears return year after year, and wildlife biologists know how to recognize them. Ask:
  - Can you think of ways the biologists might do that?

#### Introduce the Guiding Question

1. Write the Guiding Question on the board:



*Why are there differences between the ways individual brown bears look and act?*

2. Tell students that their goal is to observe bears' physical characteristics and behaviors and try to tell individual bears apart. They will practice by watching some video highlights of bears from past years.

## Lesson 1: Introducing the Brown Bears

### ACTIVITY

#### Watch Brown Bears

1. Give the class two questions to focus on as they observe the bears:
  - What differences in **physical appearance** do you notice between one bear and another?
  - What differences in **behavior** do you notice between one bear and another?

2.  Show the **Brooks Falls Highlight 1** video clip.

3. Have students turn and talk with a partner about their observations. Expect to hear students comment on the cubs' small size and darker color as compared to their mother and the cubs copying their mother by standing on hind legs.



Brooks Falls Highlight 1

#### Observe Physical and Behavioral Traits

1. Tell the class that wildlife biologists use a combination of physical and behavioral traits to identify individual bears. **Traits** are the thousands of characteristics that make someone an individual. For example, everyone in the class has physical traits of eye color and hair color; part of what makes each person unique are the differences between their hair and eye color and someone else's.
2. Ask the class:
  - How could you tell which bear(s) in the video were adults and which bear(s) were younger?
  - Did you use their physical traits, their behavioral traits, or both?



## Lesson 1: Introducing the Brown Bears

3.  Show the four photographs of bears at different life stages (**Spring Cubs**, **Older Cubs**, **Subadult**, and **Adults**). Encourage students to describe the differences they see between them. As a result of discussion, work with students to recognize that:

- Cubs in their first summer (spring cubs) are very small compared to their mothers. They usually have dark fur and can sometimes have a band of lighter fur around their neck.
- Cubs in their second and third summers are taller than spring cubs and usually have lighter fur than spring cubs do. They are still dependent on their mother and follow her where she goes.
- Subadult bears are generally small to medium-sized. They have lanky bodies, which can make them appear to have a big head and ears. A bear's coat generally darkens as it grows from a cub into an adult bear.
- Adult male bears grow twice (two times) as large as adult females.



a. Spring Cubs



b. Older Cubs



c. Subadult



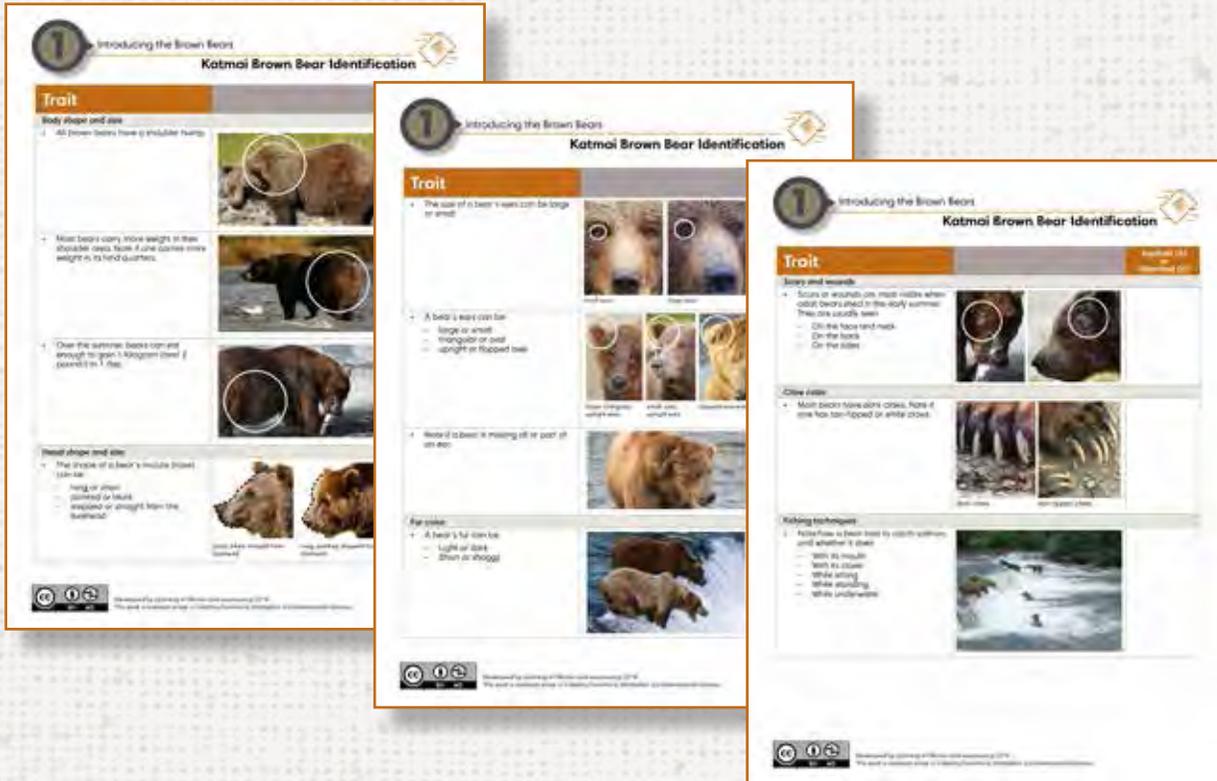
d. Adults

# Lesson 1: Introducing the Brown Bears

4. Explain that for any living thing, some of its traits are inherited and some are acquired through its life stages.
  - **Inherited traits** are the characteristics passed from biological parents to their offspring.
    - Inherited **physical** traits include eye color, ear shape, the hump on the back.
    - Inherited **behavioral** traits include instincts (such as salmon migrating up Brooks River or bears' eating food).
  - **Acquired traits** are the characteristics an individual develops during their life.
    - Acquired **physical** traits include things that happen to someone (such as getting a scar, gaining or losing weight).
    - Acquired **behavioral** traits include things someone learns (how the bears fish for food—diving in the water, catching salmon in the air).

## Identify Inherited and Acquired Traits

1.  Give each student the **Katmai Brown Bear Identification** handout, which describes observable physical and behavioral traits.



Katmai Brown Bear Identification



## Lesson 1: Introducing the Brown Bears

- Have students work in pairs to read aloud and discuss each trait and mark the right-hand column with one of the following:
  - “I” if they think the trait was inherited
  - “A” if they think the trait was acquired
- Once a pair has completed the sheet, have them meet with another pair to compare and discuss their answers. Let them know that the class will review the answers in the next lesson.

### REFLECTION

- Give the class a cloze activity to evaluate their understanding of the difference between acquired and inherited traits. Write on the board:
  - An inherited trait means it is \_\_\_\_\_. An example of an inherited trait is \_\_\_\_\_.
  - An acquired trait means it is \_\_\_\_\_. An example of an acquired trait is \_\_\_\_\_.
- Have students write the sentences and fill them in.
- Read students' written responses to help you decide how deep a review to give in the next lesson.

### EXTENSIONS

#### Bear Years

- Have students calculate their age in bear years.
  -  Print a copy of the **Katmai Junior Ranger Bear Years** handout for each student and have them fill it in. Or, write this equation on the board:  

$$(\text{student age}) / 4 = \text{Bear Years}$$
- Have students decide what bear life stage they would be in:
  - Cubs (younger than 2½ years old): They are still dependent on their mother.
  - Subadults (between 2½ and 6 years old): They stay with their mother, but are not fully dependent.
  - Adults (older than 6 years): They usually don't reach full size until they are 10–12 years old and live to be about 20 years old.



The handout is titled "Introducing the Brown Bears" and "Katmai Junior Ranger Bear Years". It features a large image of a brown bear in a mountainous landscape. The text explains that a life span of a Katmai bear averages 20 years and that people in the United States usually live to be around 80 years old. It lists three life stages: Subadult (ages 2.5 to 6), Adult (ages 6 to 12), and Cub (ages 0 to 2.5). A "Calculate Your Bear Age" section provides the formula:  $(\text{Your Age}) \div 4 = \text{Bear Years}$ . At the bottom, there are Creative Commons Attribution-NonCommercial 4.0 International License icons and a URL: <https://www.nps.gov/katmai/learn/activities/katmai-jr-ranger-bear-years.cfm>.

Katmai Junior Ranger Bear Years

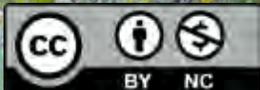
## Lesson 1: Introducing the Brown Bears

### Stream the Live Cam

1.  If online streaming is available in your school (and the month is right), link to one of the live cams hosted by explore.org:
  - [The Falls](#) (most active in July)
  - [The Riffles](#) (most active in September)
  - [The Lower River](#) (most active in September and October)
2. Allow it to play during the class's free time. Alternatively, give the link to students, so they can watch from home.

### Clues to a Bear's Sex

1. Determine which sex characteristics to share with your class.
2. Identify the ways students might distinguish between male and female bears:
  - If it is an adult bear with cubs, it is a female.
  - If it has visible genitalia, it is a male.
  - If a stream of urine goes in back of its hind legs, it is a female.
  - If a stream of urine goes straight down between its hind legs, it is a male.





## Spring Cubs



## Older Cubs



# Subadult



# Adults



# 1



## Katmai Brown Bear Identification

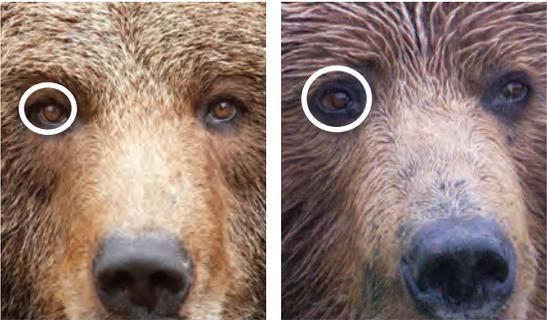
Trait		Acquired (A) or Inherited (I)?
<b>Body shape and size</b>		
<ul style="list-style-type: none"> <li>All brown bears have a shoulder hump.</li> </ul>		
<ul style="list-style-type: none"> <li>Most bears carry more weight in their shoulder area. Note if one carries more weight in its hind quarters.</li> </ul>		
<ul style="list-style-type: none"> <li>Over the summer, bears can eat enough to gain 1 kilogram (over 2 pounds) in 1 day.</li> </ul>		
<b>Head shape and size</b>		
<ul style="list-style-type: none"> <li>The shape of a bear's muzzle (nose) can be               <ul style="list-style-type: none"> <li>long or short</li> <li>pointed or blunt</li> <li>stepped or straight from the forehead</li> </ul> </li> </ul>	<div style="display: flex; justify-content: space-around;"> <div data-bbox="704 1533 971 1793">  <p data-bbox="704 1801 971 1856">short, blunt, straight from forehead</p> </div> <div data-bbox="977 1533 1260 1793">  <p data-bbox="977 1801 1260 1856">long, pointed, stepped from forehead</p> </div> </div>	



# 1



## Katmai Brown Bear Identification

Trait		Aquired (A) or Inherited (I)?
<ul style="list-style-type: none"> <li>The size of a bear's eyes can be large or small</li> </ul>	 <p>small eyes                      large eyes</p>	
<ul style="list-style-type: none"> <li>A bear's ears can be               <ul style="list-style-type: none"> <li>large or small</li> <li>triangular or oval</li> <li>upright or flopped over</li> </ul> </li> </ul>	 <p>large, triangular, upright eyes      small, oval, upright ears      flopped over eart</p>	
<ul style="list-style-type: none"> <li>Note if a bear is missing all or part of an ear.</li> </ul>		
Fur color		
<ul style="list-style-type: none"> <li>A bear's fur can be               <ul style="list-style-type: none"> <li>Light or dark</li> <li>Short or shaggy</li> </ul> </li> </ul>		



# 1



Trait		Aquired (A) or Inherited (I)?
<p><b>Scars and wounds</b></p> <ul style="list-style-type: none"> <li>Scars or wounds are most visible when adult bears shed in the early summer. They are usually seen               <ul style="list-style-type: none"> <li>On the face and neck</li> <li>On the back</li> <li>On the sides</li> </ul> </li> </ul>		
<p><b>Claw color</b></p> <ul style="list-style-type: none"> <li>Most bears have dark claws. Note if one has tan-tipped or white claws.</li> </ul>		
<p><b>Fishing techniques</b></p> <ul style="list-style-type: none"> <li>Note how a bear tries to catch salmon, and whether it does               <ul style="list-style-type: none"> <li>With its mouth</li> <li>With its claws</li> <li>While sitting</li> <li>While standing</li> <li>While underwater</li> </ul> </li> </ul>		

# 1



## Katmai Junior Ranger Bear Years

### Bear Years

A life span of a Katmai bear averages 20 years. People in the United States usually live to be around 80 years old. Bears, just like us, go through many amazing changes as they mature. In this activity, read about the different life stages of brown bears. Then, find your bear age and life stage.

#### Subadult

These are bears between 2.5 and 6 years old. They no longer stay with their mother, but aren't fully mature. Subadult bears face a lot of competition from older, larger bears.

#### Adult

These are bears older than 6 years. They are the biggest of all bears, but they usually don't reach their full size until they are 10-12 years old.

#### Cubs

Cubs are young bears dependent on their mother. They are usually younger than 2.5 years old. When cubs are born, they weigh less than one pound, are blind, and are completely hairless and toothless.

### Calculate Your Bear Age

$(\text{Your Age}) \div 4 = \text{Bear Years}$

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Are you a cub, subadult, or adult?

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<https://www.nps.gov/katm/learn/upload/Katmai-Junior-Ranger.pdf>





# 2

## Brooks River Brown Bears: Inheritance and Variation of Traits

### ● Observing the Brown Bears

## 2

## Observing the Brown Bears



Students begin by reviewing and discussing their categorizations of brown bears' specific traits as being either inherited or acquired. After observing a photograph and video clip, students find out that bears learn (acquire) their fishing techniques. Students observe individual bears on the live bear cam and record their observations on a data sheet. When they are done, the class watches a video clip of bears using different fishing techniques. The lesson concludes with students using what they have learned about bears' fishing techniques in order to come up with a question they might answer while watching a live cam.



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**GUIDING QUESTION**

*Why are there differences between the ways individual brown bears look and act?*



## Lesson 2: Observing the Brown Bears

### MATERIALS

#### Teacher Materials

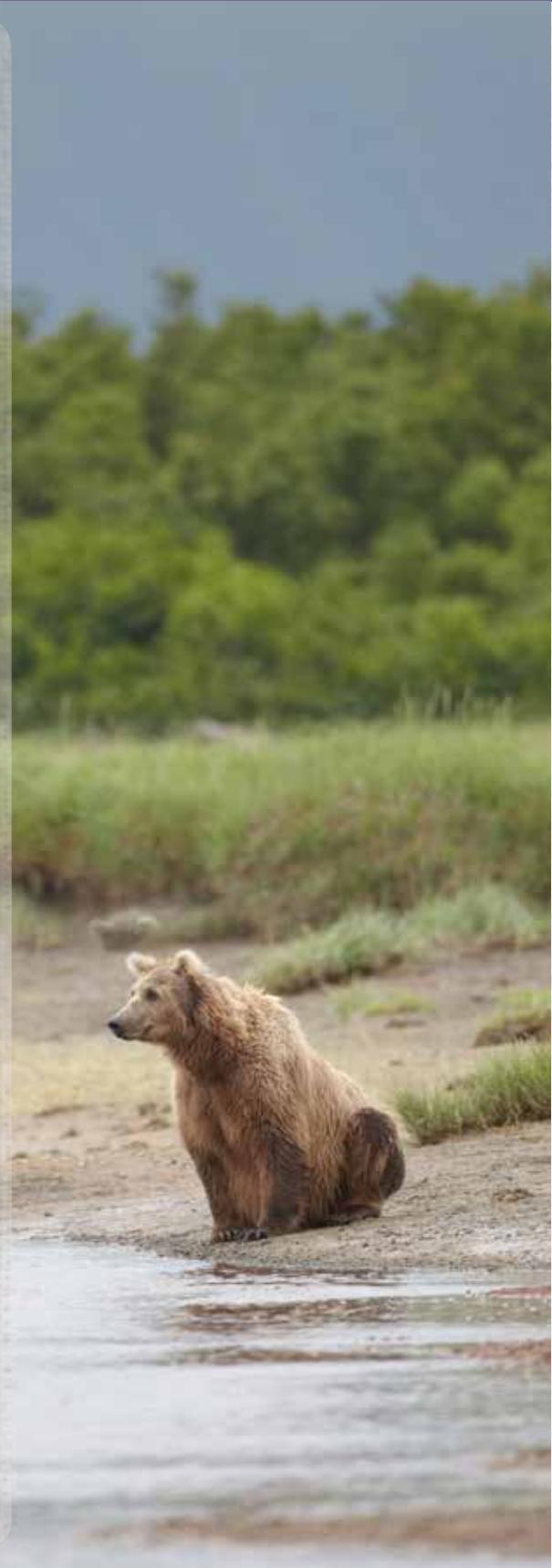
- **Key to Katmai Brown Bear Identification** handout
- **Observing the Brown Bears** visuals:
  - **Brown Bears Fishing at Brooks Falls** photograph
  - **Brooks Falls Highlight 2** video
  - Optional: **Brooks Falls Highlight 3** video
  - **Brooks Falls Highlight 4** video

#### Student Materials

- **Katmai Brown Bear Identification** handout (from Lesson 1)
- **Brooks River Brown Bear Data Sheet** handout (1 per student)
- Optional: **Katmai Junior Ranger Bear Behavior Bingo** handout

### LESSON PREPARATION

- Set up a means for students to view a digital photograph, video clips, and a live cam from explore.org. Options include:
  - Whole-class viewing a large computer monitor or projector
  - Pairs viewing multiple computer monitors simultaneously
  - Pairs taking turns viewing a single computer monitor (appropriate for live cam viewing only)
- If online streaming is available in your school (and the month is right), preview the explore.org live cams from Brooks River, Katmai National Park and determine which area of the river currently has the most bears:
  - The [Falls](#) (most active in July)
  - The [Riffles](#) (most active in September)
  - The [Lower River](#) (most active in September and October)
- If none of the live cams are currently live-streaming, plan to have students watch the **Brooks Falls Highlight 3** video clip.
- Print two copies of the **Brooks River Brown Bear Data Sheet** handout for each student. (Students will use the data sheet as they watch the live cams in this lesson and the next.)





## Lesson 2: Observing the Brown Bears

2.  Display and discuss the **Brown Bears Fishing at Brooks Falls** photograph.

- Zoom in on the two bears standing at the top of the falls. Ask students to identify physical differences between them and decide whether the traits are inherited or acquired. Students may notice:
  - One bear is lighter in color than the other— inherited.
  - One bear has a steeper brow ridge above its muzzle (nose)—inherited.
  - The bears have scars in different places— acquired.
- Broaden the focus to the two bears sitting in white water below the falls. Ask students to identify acquired behavioral differences between the four bears. Students may observe and infer:
  - They fish in different places and by standing or sitting, so they might have learned different fishing techniques.
  - Some fishing spots might be better, so the bears there might be bigger and stronger than others (dominant).



**Brown Bears Fishing at Brooks Falls**

3.  Show the **Brooks Falls Highlight 2** video clip, which shows two bears standing and “wrestling” in the river.

4. When the video is done, ask students to describe what they saw. Confirm that it is difficult to know whether the bears were playing or fighting, but that they were definitely testing each other’s strength. In general, the strongest, largest bears are the most dominant, “top” bears. That means they get the first choice of fishing spots or anything else that other bears might want.



**Brooks Falls Highlight 2**

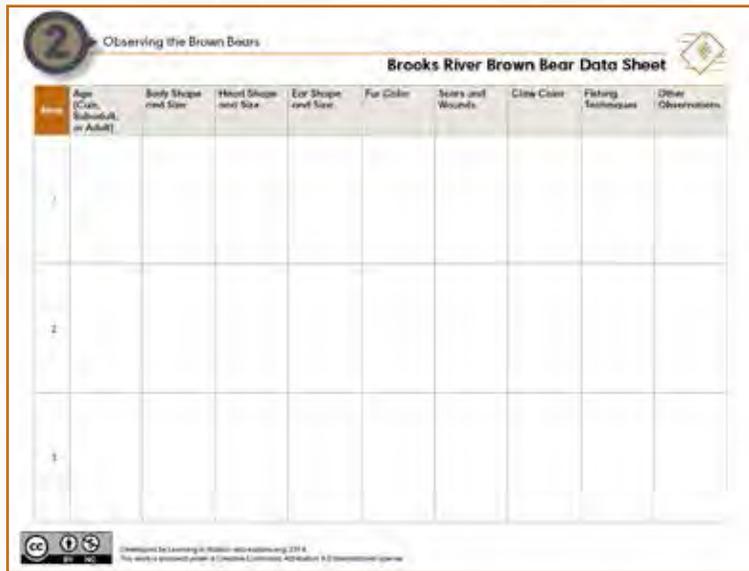
### Introduce the Activity

1. Let the class know that today they will observe and collect data about the brown bears from live-streaming video at Brooks River. Explain:
  - Multiple cameras are installed along the river every summer and early fall. Two are mounted near the falls.
  - The cameras are being operated remotely. The operator will pan or zoom in when it looks like something interesting is happening.
  - The bears are wild animals, so people do not approach them.

## Lesson 2: Observing the Brown Bears

2.  Give each student a **Brooks River Brown Bear Data Sheet** handout, and point out that there are spaces for them to collect data about the traits of three individual bears. They can write or draw their observations. These include:

- Age (cub, subadult, or adult)
- Body shape and size
- Face shape and size
- Ear shape and size
- Fur color
- Scars and wounds
- Claw color
- Fishing techniques
- Other observations



The image shows a data sheet titled "Observing the Brown Bears" and "Brooks River Brown Bear Data Sheet". It features a table with the following columns: Age (Cub, Subadult, or Adult), Body Shape and Size, Head Shape and Size, Ear Shape and Size, Fur Color, Scars and Wounds, Claw Color, Fishing Techniques, and Other Observations. The table has three rows for data entry. At the bottom left, there are Creative Commons icons (CC BY-NC) and a copyright notice: "Developed by Learning in Motion and explore.org 2018. This work is licensed under a Creative Commons Attribution 4.0 International License."

Brooks River Brown Bear Data Sheet

Remind the class that they can refer to their **Katmai Brown Bear Identification** handout for more information about what to look for in each set of traits.

## ACTIVITY

## Watch Brown Bears

1.  Show the live-streaming video you selected (the Falls, the Riffles, or the Lower River). Gauge how long to have students watch by the number of bears on camera and students' attention spans. (If no live cams are streaming, show the **Brooks Falls Highlight 3** video, which shows a mother moving her cubs away from a male.)
2. Call on student volunteers to describe different bears' physical and behavioral traits that they observed and documented from the video. In particular, ask students to describe any fishing behavior they might have seen. Write their observations about fishing techniques on the board.



Brooks Falls Highlight 3



## Lesson 2: Observing the Brown Bears

### Observe the Bears' Fishing Techniques

-  Show the **Brooks Falls Highlight 4** video, which illustrates bears using different fishing techniques. Remind the class that fishing techniques are learned, acquired behaviors. A mother bear needs to teach her cubs how to fish, so the cubs usually fish the way their mother does.
- As students watch, point out some of the bears' techniques:
  - Stand and wait** (Standing on top of Brooks Falls, a bear waits for fish to jump close enough to catch in its mouth.)
  - Sit and wait** (Sitting in the white water below Brooks Falls, a bear simply waits to feel a fish.)
  - Dash and grab** (A bear runs into the shallows at the far side of the river, chases fish, and attempts to pin them to the river bottom with its claws.)
  - Snorkeling** (A bear puts its head underwater to look for fish.)
  - Diving** (A bear goes completely underwater to look for fish.)
  - Stealing** (A bear takes a fish from another bear)
  - Scavenging** (A bear eats fish left behind by another bear)
- Explain that one way to tell apart individual bears is by watching where and how they fish.



Brooks Falls Highlight 4

### Turn and Talk

- Tell students to turn and talk with a partner. They should:
  - Refer to the board and identify any fishing techniques they saw in the live-streaming video (if seen)
  - Explain to each other why bears' fishing techniques are learned and not inherited traits
  - Use what they have learned about bears' fishing techniques in order to come up with a question they might answer while watching a live cam, and write the question down.
- Let them know that in the next lesson, each student pair will share their question with the rest of the class.



## Lesson 2: Observing the Brown Bears

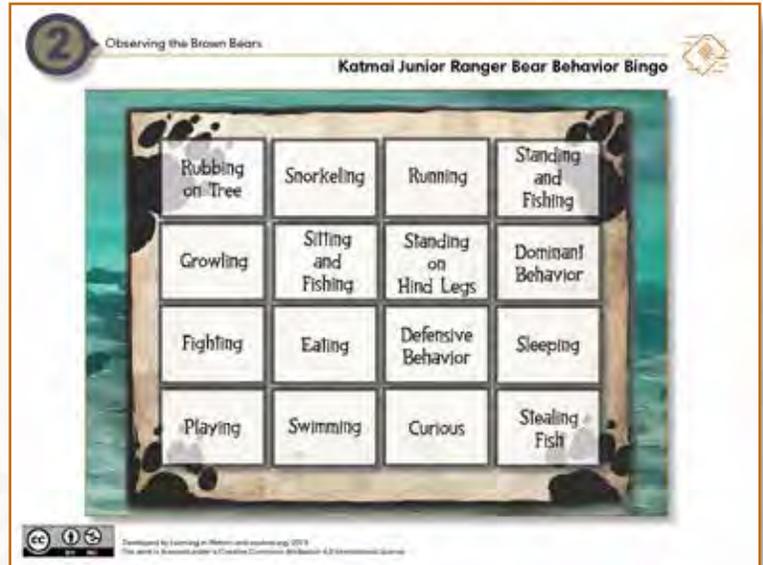
### REFLECTION

- Have students write a brief exit slip describing something they learned about brown bears.

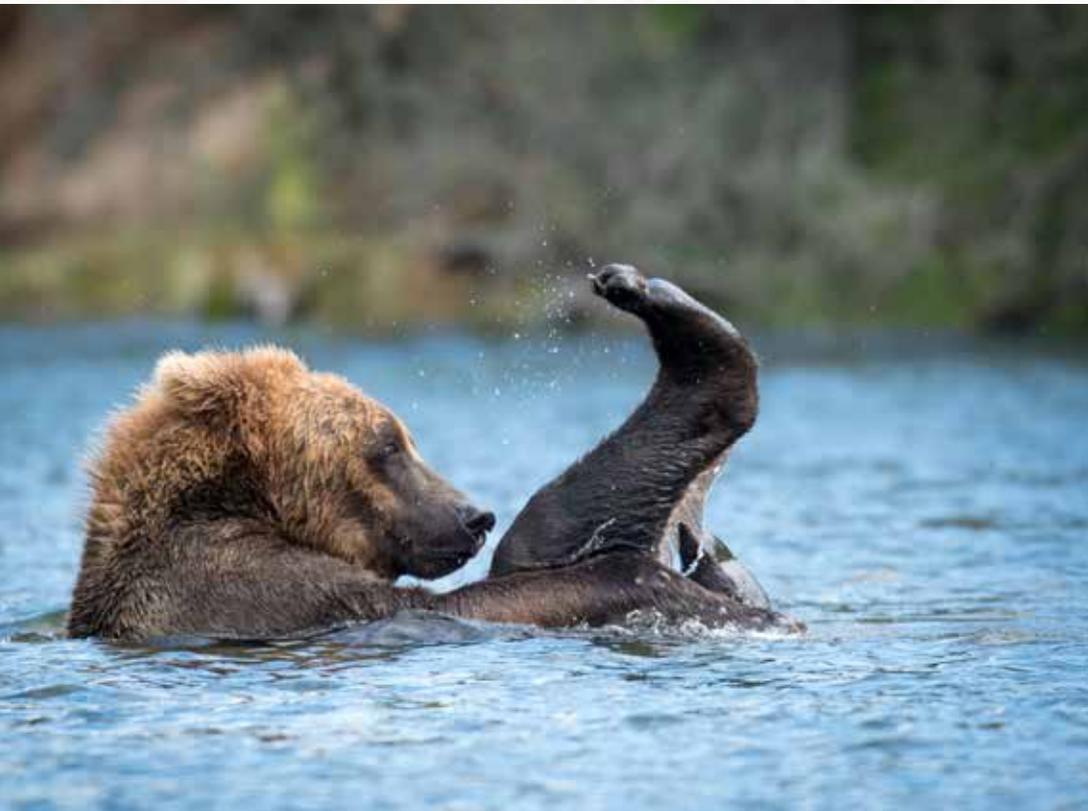
### EXTENSION

#### Bear Behavior Bingo

1.  Print a copy of the **Katmai Junior Ranger Bear Behavior Bingo** handout for each student or student pair.
2. Have students mark the bingo sheet whenever they see one of the bear behaviors and actions on the live cam.
3. Tell them that if they get four in a row (up, down, or diagonal), they've gotten a bingo!



Katmai Junior Ranger Bear Behavior Bingo



# 2



## Key to Brown Bear Identification

Trait		Acquired (A) or Inherited (I)?
<b>Body shape and size</b>		
<ul style="list-style-type: none"> <li>All brown bears have a shoulder hump.</li> </ul>		I
<ul style="list-style-type: none"> <li>Most bears carry more weight in their shoulder area. Note if one carries more weight in its hind quarters.</li> </ul>		I
<ul style="list-style-type: none"> <li>Over the summer, bears can eat enough to gain 1 kilogram (over 2 pounds) in 1 day.</li> </ul>		A
<b>Head shape and size</b>		
<ul style="list-style-type: none"> <li>The shape of a bear's muzzle (nose) can be               <ul style="list-style-type: none"> <li>long or short</li> <li>pointed or blunt</li> <li>stepped or straight from the forehead</li> </ul> </li> </ul>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>short, blunt, straight from forehead</p> </div> <div style="text-align: center;">  <p>long, pointed, stepped from forehead</p> </div> </div>	I



# 2



## Key to Brown Bear Identification

Trait		Aquired (A) or Inherited (I)?
<ul style="list-style-type: none"> <li>The size of a bear's eyes can be large or small</li> </ul>	 <p>small eyes                      large eyes</p>	<p>I</p>
<ul style="list-style-type: none"> <li>A bear's ears can be               <ul style="list-style-type: none"> <li>large or small</li> <li>triangular or oval</li> <li>upright or flopped over</li> </ul> </li> </ul>	 <p>large, triangular, upright eyes      small, oval, upright ears      flopped over eart</p>	<p>I</p>
<ul style="list-style-type: none"> <li>Note if a bear is missing all or part of an ear.</li> </ul>		<p>A</p>
<b>Fur color</b>		
<ul style="list-style-type: none"> <li>A bear's fur can be               <ul style="list-style-type: none"> <li>Light or dark</li> <li>Short or shaggy</li> </ul> </li> </ul>		<p>I</p>



# 2



## Key to Brown Bear Identification

Trait		Aquired (A) or Inherited (I)?
<p><b>Scars and wounds</b></p> <ul style="list-style-type: none"> <li>Scars or wounds are most visible when adult bears shed in the early summer. They are usually seen               <ul style="list-style-type: none"> <li>On the face and neck</li> <li>On the back</li> <li>On the sides</li> </ul> </li> </ul>		<p><b>A</b></p>
<p><b>Claw color</b></p> <ul style="list-style-type: none"> <li>Most bears have dark claws. Note if one has tan-tipped or white claws.</li> </ul>		<p><b>I</b></p>
<p><b>Fishing techniques</b></p> <ul style="list-style-type: none"> <li>Note how a bear tries to catch salmon, and whether it does               <ul style="list-style-type: none"> <li>With its mouth</li> <li>With its claws</li> <li>While sitting</li> <li>While standing</li> <li>While underwater</li> </ul> </li> </ul>		<p><b>A</b></p>



# Brown Bears Fishing at Brooks Falls



# 2

## Observing the Brown Bears



### Brooks River Brown Bear Data Sheet

Bear	Age (Cub, Subadult, or Adult)	Body Shape and Size	Head Shape and Size	Ear Shape and Size	Fur Color	Scars and Wounds	Claw Color	Fishing Techniques	Other Observations
1									
2									
3									



## Katmai Junior Ranger Bear Behavior Bingo

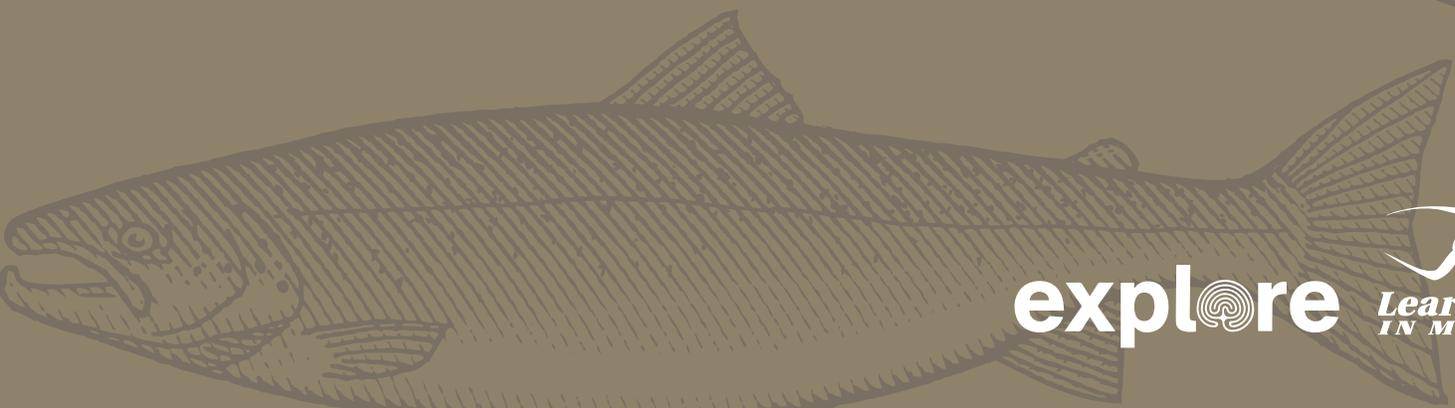




3

## Brooks River Brown Bears: Inheritance and Variation of Traits

● Identifying the Brown Bears



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IN MOTION

## 3

## Identifying the Brown Bears



Students begin this lesson by sharing the question they wrote at the end of Lesson 2. They again use a data sheet to record their observations of individual bears on a live cam from Brooks River. When they are done with the live observations, students view photographs of four bears that belong to the same family. They identify the inherited and acquired traits of each.



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**GUIDING QUESTION**

*Why are there differences between the ways individual brown bears look and act?*



## Lesson 3: Identifying the Brown Bears

### MATERIALS

#### Teacher Materials

- **Identifying the Brown Bears** visuals:
  - Marilyn #216 photograph
  - BB #24 photograph
  - Weevil #790 photograph
  - Divot #854 with Snare photograph
  - Divot #854 with Scar photograph
  - Optional: **Brooks Falls Highlight 5** video

#### Student Materials

- **Brooks River Brown Bear Data Sheet** handout (1 per student)

### LESSON PREPARATION

1. Preview the explore.org live cams from Brooks River, Katmai National Park, and determine whether the class should continue watching the same cam they viewed in Lesson 2.
2. If none of the live cams are currently streaming, plan to have students watch the **Brooks Falls Highlight 5** video clip.
3. Set up a means for students to view digital photographs, video clips, and a live cam from explore.org. Options include:
  - Whole class viewing a large computer monitor or projector
  - Pairs viewing multiple computer monitors simultaneously
  - Pairs taking turns viewing a single computer monitor (appropriate for live cam viewing only)



## Lesson 3: Identifying the Brown Bears

### OPENING

#### Share Questions

1. Remind students that in the last lesson, they used what they learned about bears' fishing techniques in order to come up with a question they might answer while watching the live cams.
2. Call on student pairs to share their question with the rest of the class.
3. Write the questions on the board. Let students know that today they may have a chance to answer one of them.

### ACTIVITY

#### Watch Brown Bears

1.  Give each student a new **Brooks River Brown Bear Data Sheet** handout, and remind them that they can write or draw their observations. Also remind them that they are using the bears' traits to tell individuals apart. Encourage them to see if they can find an answer to any of the questions on the board.
2.  Show the live-streaming video you selected. As in Lesson 2, gauge how long to have students watch by the number of bears on camera and students' attention spans. (If no live cams are streaming, show the **Brooks Falls Highlight 5** video clip.)
3. Ask students whether they think they recognized any of the bears or were able to answer any of the questions.
4. Divide the class into pairs or small groups, and have them discuss and compare their observations and understanding.
  - Circulate around the room. Listen to students as they talk about the difficulty of telling bears apart, and observe their developing skills at identifying traits.
  - Use what you hear to determine whether students might continue watching the live cams as a class or at home.



Identifying the Brown Bears

Brooks River Brown Bear Data Sheet

Year	Age (Cubs, Subadult, or Adult)	Body Shape and Size	Head Shape and Size	Ear Shape and Size	Fur Color	Scars and Wounds	Claw Color	Fishing Techniques	Other Observations
7									
3									
1									

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Brooks River Brown Bear Data Sheet



Brooks Falls Highlight 5

## Lesson 3: Identifying the Brown Bears

5. Explain that the first few times anyone sees the bears, they will find it hard to identify individuals. However, with practice, they will be able to identify the most commonly seen bears along the Brooks River. (Every year, Katmai National Park puts out an updated ebook, [Bears of Brooks River](#), which has photos and descriptions that can be used for reference.)

### Identify Traits in a Family of Bears

1. Tell students that they will apply what they have learned about identifying traits by looking at photographs of bears that belong to the same family.

2.  Display the photograph of **Marilyn #216**. Explain that this is a bear that biologists at Katmai identify as Bear #216 (nicknamed Marilyn).



Marilyn #216

3. Have students identify Marilyn's different physical traits. Write students' ideas on the board. Make sure to include:
  - Prominent shoulder hump
  - Shaggy and dark blond fur
  - Blond ears
  - Straight muzzle

4.  Display the photograph of **BB #24**. Explain that this is a bear that biologists at Katmai identify as #24 (nicknamed BB).



BB #24

5. Have students identify BB's different physical traits. Write students' ideas on the board. Make sure to include:
  - Long legs
  - White claws
  - Narrow, straight "Roman nose"

6.  Display the **Weevil #790** photograph. Let students know that Marilyn and BB are no longer seen at Brooks River, but they had offspring that grew up and returned. This is one of their offspring, identified as #790 (nicknamed Weevil).



Weevil #790

## Lesson 3: Identifying the Brown Bears

7. Tell the class that observers have noticed that Weevil has very long legs. Write the trait on the board. Have students identify Weevil's other physical traits, and write those on the board as well. Make sure to include:
  - Long legs
  - Shaggy and light brown fur
  - Straight muzzle
  - Small ears in proportion to her head
8. Ask the class which of her traits appear to have been inherited from her parents. Students should be able to answer: shaggy and light-colored fur, long legs, straight muzzle.

9.  Display the photograph **Divot #854 with Snare**. Tell the class that this is a bear that biologists at Katmai identify as Bear #854 (nicknamed Divot). Divot is also an offspring of Marilyn and BB, and she is one of Weevil's siblings. She still comes to Brooks River and has had cubs. She is an adult female with distinctive acquired and inherited traits.



Divot #854 with Snare

10. Explain the wire around Divot's neck:
  - In late July 2014, Divot came to Brooks River with one yearling cub and a wire snare (a trap) around her neck.
  - Rangers and park biologists tranquilized her and successfully removed the snare.
  - By October, the bear and her cub were both fat and healthy.

11.  Display the photograph **Divot #854 with Scar**. Describe Divot's distinctive physical traits:



Divot #854 with Scar

- Circular scar around her neck
  - Straight and short muzzle
  - Often has noticeable shed patch on forehead
  - Golden blond fur in July
- a. Have the class identify which of Divot's traits is acquired. Students should know that the scar is an acquired trait.
  - b. Ask the class to identify which of her traits appear to have been inherited from her parents. Students should be able to answer: light coat, straight muzzle.
  - c. Explain that some inherited traits might be from more distant ancestors, such as grandparents. In addition, siblings do not share exactly the same inherited traits.

## Lesson 3: Identifying the Brown Bears

### REFLECTION

1. Tell students to write:
  - 3 things they have learned about inherited and acquired traits
  - 2 personal connections to the topic of traits
  - 1 question they have about brown bears

### EXTENSION

#### Inquiry Science

1. Have students continue to watch the live streaming video of bears along Brooks River. Tell them to write all of their questions and “wonderings” about what they see.
2. Convene the class to have each student state at least one question they would particularly like to know the answer to (and that another student has not already posed). Record questions on the board or chart paper.
3. Work with the class to differentiate between questions that can be answered through three means:
  - More observational study of the live cam
  - Reading reference materials
  - Asking an expert

4.  Provide students with opportunities to find their answers in each of the three ways. For the second and third ways:

- Online reference materials provided on the Katmai National Park website include the ebook [Bears of Brooks River](#), which is updated annually (enter the search terms “NPS Katmai ebook” with the current year). The site also includes a list of [Frequently Asked Questions](#).
- [explore.org](#) hosts live web chats with Katmai National Park rangers (see the CALENDAR section). Students may [submit questions](#) to be answered at that time.
- Several other websites have background information suitable for elementary students:
  - [WWF](#)
  - [PBS Nature](#)
  - [San Diego Zoo](#)



# 3

## Identifying the Brown Bears



### Brooks River Brown Bear Data Sheet

Bear	Age (Cub, Subadult, or Adult)	Body Shape and Size	Head Shape and Size	Ear Shape and Size	Fur Color	Scars and Wounds	Claw Color	Fishing Techniques	Other Observations
1									
2									
3									



Marilyn #216



BB #24



June 2003

Weevil #790



Divot #854 with Snare



Divot #854 with Scar

