

Alaska's Wood Bison

A Teacher's Guide

Place-based lessons for rural Alaska

Correlated to the Next Generation Science Standards



Background information, illustrations, resources,
hands-on student activities and investigations.



ALASKA DEPARTMENT OF FISH AND GAME, 2018

Text, activities, layout: Heather McFarland

Primary review and content contributors: Tom Seaton, Mike Taras, Brenda Duty, Kristen Romanoff

Illustrations: Sarah DeGennaro, Heather McFarland, Wes Olson, Teal Rogers

Special thanks to: Wes Olson provided invaluable insight regarding wood bison ecosystem benefits. University of Alaska Fairbanks employees provided input about starting ecotourism businesses in rural Alaska.

We also appreciate all the teachers who participated in wood bison teacher trainings and shared their insights.

Place-based and STEM learning

We all know that when the subject is something students can relate to, the learning is often deeper and more meaningful. Wood bison are the perfect topic for place-based learning for Alaskan students, particularly in areas where wood bison have recently been restored. This unit places an emphasis on place-based learning, as well as STEM (science, technology, engineering and math) lessons. We hope you enjoy learning and teaching about wood bison.

Discover more wildlife teaching resources by visiting www.adfg.alaska.gov and clicking on the “Education” tab.



**Alaska Department of Fish and Game
Division of Wildlife Conservation**

© 2018

CONTENTS

Wood bison background information	2
Lesson 1: Stepping into the hooves of a wood bison	3–4
My life as a wood bison – Example story	5–6
Lesson 2: What questions can I investigate?	7–9
Types of field investigations	10
Questions for sorting	11–12
Lesson 3: Tracking wood bison	13–15
Research questions	16
Google Earth instructions	17–18
Wood bison life cycle diagram	19
Scientific method	20–22
Wood bison habitat diagram	23
Wood bison tracking data log	25–26
Lesson 4: Wood bison ecosystem benefits	28–29
Bison ecosystem cards	31–40
Lesson 5: Wood bison habitat diorama	42–44
Wood bison cut-out	45
Lesson 6: Walking in wood bison habitat	46–48
Lesson 7: Wood bison habitat relay	50–51
Wood bison habitat/behavior table	52
Habitat relay illustrations	53
Lesson 8: Wood bison and friends	56–57
Wood bison/muskox ID guide	58
Lesson 9: Wood bison jeopardy	60–61
Lesson 10: Your living community	62–63
Community role cards	65–70
Lesson 11: A wood bison economy	72–73
Wood bison business ideas	74
My wood bison business plan	75–78
Lesson 12: Wood bison business game	80–81
Game rules	82

Wood bison background information

Wood bison, a relative of the plains bison, are North America's largest land mammal. They are specially adapted for northern climates and historically filled an important ecological niche in the boreal forest of Alaska and Canada. Rich oral history accounts suggest that the Native people in these lands used wood bison for food, clothing, and shelter. Wood bison bones abound in Alaska and experts estimate that about 160,000 wood bison once roamed Alaska and northwest Canada.

By the turn of the 20th century this once abundant resource disappeared from the landscape. Thought to be victims of unregulated hunting, ecological change, and later mixing with plains bison, wood bison were presumed to be extinct by the 1940s. Then in 1957 a small herd (about 200 animals) was discovered in a remote corner of Wood Buffalo National Park, Canada. That discovery set in motion one of the world's greatest conservation efforts. Contributing to both wildlife conservation and ecosystem restoration, the return of wood bison cultivated unprecedented support and cooperation across international borders. Diverse interest groups worked side by side to develop wood bison release and management plans and find creative solutions to ensure the success of this magnificent animal.

Alaska joined this conservation effort more than 20 years ago. Over an eight-year period 66 wood bison were brought to the state from a disease-free herd in Canada. These animals were cared for in captivity at the Alaska Wildlife Conservation Center in Portage, Alaska. As the captive population grew, biologists and managers worked tirelessly to prepare for the future wood bison release. Approval was granted in 2014 and it was time for action. Wood bison could now be transported to their new home in the lower Innoko/Yukon River area, near the remote community of Shageluk, Alaska. In a monumental effort involving biologists, veterinarians, engineers, pilots, heavy equipment operators, community members, and countless volunteers, 130 wood bison were successfully released into the wild in spring–summer 2015.



A cow and bull wood bison. Photo by Doug Lindstrand

The wild wood bison thrived in the Alaska wilderness following release. They produced wild bred, wild born calves, learned to locate food on their own, avoided predators, and gained the support of people across western Alaska and around the world. Alaska's wood bison population adds to the six disease-free, wild herds already established in Canada. Worldwide there were about 4,500 wild, disease-free wood bison in 2017.

To learn more about Alaskan wood bison restoration project visit <http://www.adfg.alaska.gov/index.cfm?adfg=woodbison.main>.



LESSON I

Stepping into the hooves of a wood bison

Standards: Next Generation Science Standards MS-LS1-5, Alaska English Language Arts Standards for reading grade 6-8: 9, and writing grade 6-8: 3

Subjects: Science, language arts

Skills: Writing, story telling, reading

Setting: Indoors

Vocabulary: Wood bison

LESSON OVERVIEW

Students write a short story exploring what it would be like to be a wood bison transitioning from captivity to the wild.

MATERIALS Example story, paper, and pencil.

GUIDING QUESTIONS What was it like for wood bison when they were released into the wild? How is a wood bison’s life in the wild different from life in captivity? What was it like to search for food for the first time?

BACKGROUND

According to Athabascan oral histories and evidence from skeletal remains, wood bison were present in much of Alaska for thousands of years. During the last 200 years the species disappeared, likely from a combination of habitat change and unregulated hunting. Wood bison were thought to be extinct in North America until a small herd was discovered in Canada in 1957.

In 2015, during an effort to restore wood bison in Alaska, 130 bison were released back into the wild in the lower Innoko and Yukon River area. Although students in western Alaska may have little experience or knowledge of bison, they play an important role in the future conservation of the herd.

PROCEDURE

1. Show a photo of a wood bison. Ask students if they have ever seen or heard of a bison. Review the history of wood bison in Alaska. Explain that the success of this herd relies on support from local communities. (Optional) Watch the video **Wood bison relocation highlights** at <http://www.adfg.alaska.gov/index.cfm?adfg=woodbisonrestoration.videos>.
2. Ask students to imagine what it would be like to be a wood bison released into the wild for the first time. How do they think the wood bison felt exploring their new habitat?

PROCEDURE CONT.

3. Read *My life as a wild wood bison– example story* (page 5–6).
4. Ask students to write a story from the perspective of a wood bison. Describe what it was like for wood bison when they were first released into the wild. What was it like to search for food for the first time? How was the landscape different from their home in captivity? Include descriptions of the four senses: taste (what did plants taste like?), smell (how did the land smell?), sight (what did the landscape look like?), and sound (what did the wild sound like?).
5. Once students complete their stories, write the four senses on the board (taste, smell, sight, and sound). Have each student read their story aloud. Whenever a story describes one of the senses, list the description on the board.
6. Alaska Native oral traditions preserve a record of the past through oral material passed down from Elders. Similarly, wood bison pass knowledge of their surroundings from generation to generation. Older bison teach younger animals where to find food and how to escape predators. Discuss oral traditions, ask students to describe knowledge they learned from their Elders. Can they imagine what it would be like if everyone in their community had no previous knowledge of how to survive?

EXTENSION

Want to share your story? Wood bison biologists at the Alaska Department of Fish and Game would like to hear what you wrote. Email your story to dfg.dwc.woodbison@alaska.gov.

ADDITIONAL RESOURCES

www.wildlife.alaska.gov > Animals > Mammals > Wood bison

<https://beartrust.org/wood-bison>

My life as a wild wood bison – Example story

Lush. Green. Abundant. These are the first things I noticed as I scanned the vast meadows and networks of lakes that surrounded me. My new habitat was clearly very productive. The meadows looked like they had not been grazed for hundreds of years. Could it be possible that no large animals feed among the meadows? I broke away from these thoughts to take my first bite. Just as I hoped, the taste was rich and fresh. Like a potluck I sampled different plants. At the very center of the meadows I discover a green, tender plant, which humans call sedge. It satisfied me and I knew this plant would help me grow strong.

My herd moved among several meadows over the next few weeks. Eventually we made our way back toward the first meadow. I discovered something magical. Everywhere I had originally grazed was now covered by young, tender shoots. These growing plants were even tastier and richer than the plants I originally grazed. Could it be? Does my grazing help new plants grow? Other animals must have discovered the same thing. Among the young plants I saw tiny shrews and heard the quacking of ducks. My presence helped these animals.

Shortly after our arrival, several members of the herd grew restless. They desired adventure. What lives beyond these meadows? On their own, they headed into the unknown. At first I was saddened by their departure, but I soon discovered that their wanderings helped the herd. Each time an adventurer returned home they brought back new information. We learned that there were meadows in all directions. Sometimes they even lead us to new areas with better forage. This information is valuable to our herd. In captivity food, water, and shelter were easy to find. In this new land, old and young animals must learn together. We look forward to the day when old bison can teach the younger generations how to survive the wild.

The adventurers also brought news of our two-legged friends. We had not seen many humans since our release into the wild. The adventurers told us that there were several groups of humans living along the river. The adventurers did not get too close, and the two-legged friends did not bother them.

Throughout the weeks I noticed other animals grazing near my herd. One was about the size of a bison, but with shorter hair and a much longer neck, nose, and legs. Some of them had large antlers too. At first I worried that this new creature would compete with me for food. After feeding for several hours together, I discovered that we preferred very different things. I stuck to the sedge meadows and he browsed on willows along the brushy edges. I knew we would live in harmony.

Shortly after I met my long-legged friend, I came across another animal. Stocky like me, but no horns and big teeth and claws. My herd instinctively tightened together forming a protective barrier around our young. We moved nervously. This strange beast awakened an instinct we had not known. Fear. We stood our ground, making ourselves look large and not easy to take down. It worked, the beast left the area. But we knew, this creature was not our friend.

During the summer we moved and fed with ease. We swam effortlessly across even the swiftest waters and waded deep into ponds. When winter came easy travel ceased. Moving through the deep snow was difficult. We saved our energy by traveling in single file. Although we sometimes saw other trails, we made our own and developed a trail system between our favorite meadows.

Example story continued

One day while crossing a frozen lake a member of the herd rested on an open patch covered in mud and sticks (humans call them beaver houses). We were shocked when the bison fell through the ice. Although we tried to help our companion out of the water, he was lost. We learned the hard way that the ice near these mounds is thin and cannot be trusted.

Snow and ice also made finding food difficult. Many of us became exhausted trying to dig through the snow. But after several weeks, our neck muscles grew stronger. We found our natural rhythm and easily swept our heads across the ground exposing nutritious food. Again our favorite foods were the sedges. These plants provided the most energy and helped us move our heavy bodies across the wintry landscape.

Over time we grew accustomed to the life in the wild. What was once difficult and scary was now easy and routine. Our bodies grew strong, stronger than they had ever been in captivity. We are happy. We are free.

LESSON 2

What questions can I investigate?

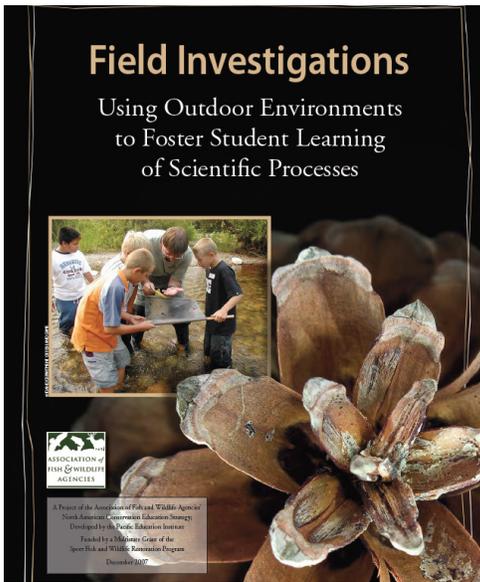
Standards: Next Generation Science Standards MS-LS2-2

Subjects: Science, language arts

Skills: Critical thinking, asking questions, comparing/contrasting, classifying

Setting: Indoors

Vocabulary: Descriptive, comparative, and correlative questions



LESSON OVERVIEW

Students sort investigative questions into three categories (descriptive questions, comparative questions, and correlative questions).

MATERIALS Questions for sorting (page 11–12), types of field investigations (page 10)

GUIDING QUESTIONS What kinds of questions do scientists ask about wildlife and the environment? Are all questions the same?

BACKGROUND

What defines my environment? What is a healthy environment? What is humans' relationship to the environment? How can our community sustain our environment? What is my role in the preservation and use of environmental resources? These essential questions about the relationships between humans and the environment cannot be answered with one field investigation.

Asking a testable question is central to scientific inquiry. The following lesson is geared to help students think about the ways questions are asked and the types of questions field investigators research. There are three types of field investigations—descriptive, comparative, and correlative.

Descriptive field investigations involve describing parts of a natural system. Scientists might try to answer descriptive questions such as, “Where do cougars go when their habitat gives way to a new housing development?” or “What areas do cougars select for den locations?”

In comparative field investigations, data is collected on different populations, or under different conditions (e.g., times of year, locations), to make a comparison. A researcher might ask a comparative question such as, “Is there a difference in lichen growth in areas of high pollution and areas of low pollution?”

BACKGROUND CONT.

Correlative field investigations involve measuring or observing two variables and searching for a pattern. These types of investigations are typically not explored until high school. Correlative questions focus on two variables to be measured together and tested for a relationship: “Do wood bison tracks increase with greater distance from the forest?”

There are many types of questions. In addition to the three types of investigative questions, students may ask essential questions, why questions and book/Internet research questions.

PROCEDURE

* This lesson is part of *Field investigations: using outdoor environments to foster student learning of scientific processes*.

1. Review the essential questions. These big picture questions are why we conduct field investigations. What defines my environment? What is a healthy environment? What is humans' relationship to the environment? How can our community sustain our environment? What is my role in the preservation and use of environmental resources?
2. Distribute the handout, **types of field investigations**, and discuss the three types of questions. You might ask students questions to help them notice differences in the three types of questions.
 - What patterns do you notice in each type of question?
 - What words are important to look for when identifying each type of question?
3. Divide the class into teams of three. Hand each team an envelope set of investigative questions, and ask them to sort the questions into three categories—descriptive, comparative, and correlative.
4. Give the teams time to think about each question and agree on the categories. You can facilitate this process by asking the questions below as you circulate the room.
 - Did you all agree to this category? Explain how you came to this decision.
 - Can each one of you come up with a justification as to why these questions fall into the categories they do?
 - Do you have an uncertainty pile...if so, why? What more do you need to know?
 - What questions do you have about your categories?
 - Can you write your own examples of each type of question?
5. After about 10 minutes, have the class share their categories by asking about a sample of the questions you handed out. With a chart at the front of the class, have students from various groups place a question in the category they selected and have them say why they chose that category.
6. Discuss why scientists need to think about the questions they pose before working in the field.

ASSESSMENT

As students categorize the questions ask them to justify how they classified each question, and ask them to identify the patterns they notice in each type of question (e.g., descriptive questions often begin with “how many,” “when,” or “where”).

Some questions may fit more than one category; what is important is that students can justify their thinking for each category. For example, students may identify the question, “What is the air temperature at your school throughout the year?” as descriptive, because they would be documenting the temperature of a specific location. Other students may call it a comparative question, because they could use the collected temperature data to compare two different times of year.

ADDITIONAL RESOURCES

<http://www.fishwildlife.org/files/ConEd-Field-Investigations-Guide.pdf>

DESCRIPTIVE QUESTIONS

Descriptive field investigations involve describing parts of a natural system. Descriptive questions focus on measurable or observable variables that can be represented spatially in maps or as written descriptions, estimations, averages, medians, or ranges.

- How many _____ are there in a given area?
- How frequently does _____ happen in a given period?
- What is the [temperature, speed, height, mass, density, force, distance, pH, dissolved oxygen, light density, depth, etc.] of _____?
- When does _____ happen during the year? (flowering, fruit, babies born)
- Where does _____ travel over time? (What is an animal's range?)

COMPARATIVE QUESTIONS

In comparative field investigations data is collected on different groups to make a comparison. Comparative questions focus on one measured variable in at least two different (manipulated variable) locations, times, organisms, or populations.

- Is there a difference in _____ between group (or condition) A and group B?
- Is there a difference in _____ between (or among) different locations?
- Is there a difference in _____ at different times?

CORRELATIVE QUESTIONS

Correlative field investigations involve measuring or observing two variables and searching for a pattern. Correlative questions focus on two variables to be measured and tested for a relationship.

- What is the relationship between variable #1 and variable #2?
- Does _____ go up when _____ goes down?
- How does _____ change as _____ changes?

- Are daily distances moved greater for bull or cow wood bison in March?
- Are more insects found in meadows in August, September, or October?
- Which habitat (in the forest, in a field, or by a stream) has the greatest percentage of sand in the soil?
- Are soil temperatures the coolest at a depth of 5 cm, 10 cm or 15 cm?
- In April, which twigs grow faster: those on alder trees or on willows?
- How many songbirds live in the area around your school?
- How many moose live in the Kuskokwim drainage?
- How many calves does a wood bison produce each year?
- What is the depth of snow in a meadow near your school in November?
- What is the air temperature at your school throughout the school year?
- What kinds of plants grow in the boreal forest?
- What is the home range of lower Innoko/Yukon wood bison?
- Do tree species, tree density, tree diameter, or tree height differ between north and south facing slopes in the Alaska Range?

What is the number wood bison in the lower Innoko/Yukon area?

What is the range wood bison in the lower Innoko/Yukon area?

Is there a difference in range size of wood bison or muskox?

Are mature (greater than 30 cm diameter) black spruce trees taller than mature deciduous trees in the boreal forest?

Which location (under shrubs, grass, sedges, or on open dirt) has the highest temperature at 8:00 a.m. at a meadow near your school?

Are there more moose per mile along the Tanana or Yukon river in July?

Are there more blueberry bushes near streams or away from streams along the Yukon river?

Are hares more active during the dawn or the dusk in the Yukon drainage?

Do temperatures differ between forested and non-forested streams in the Yukon drainage?

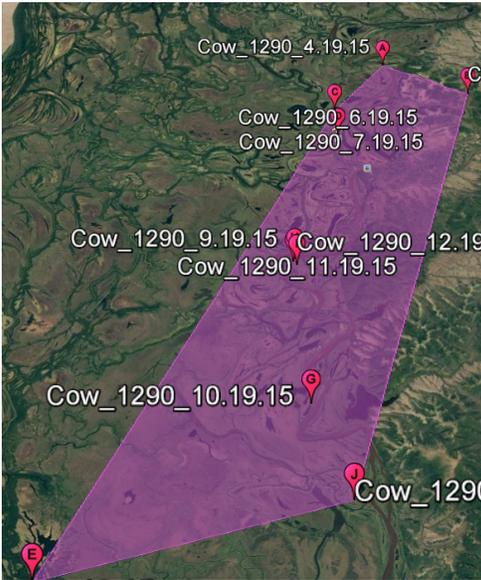
Do birds sing more from 8:00-8:30 a.m. or from 3:00-3:30 p.m.?

Does sedge seed production time change as elevation changes?

Is there a relationship between cow bison movements and calving season?

LESSON 3

Tracking wood bison



Standards: Next Generation Science Standards HS-LS2-1, 2-6, 2-8, 3LS1-1, and 3LS4-4, Alaska Mathematics standards 7.SP.3, 6.G.3, 6.SP.2, 5.G.2, 4.MD.2

Subjects: Science, math

Skills: Mapping, measuring, teamwork, application, hypothesize, analyze and synthesize data.

Setting: Indoors

Vocabulary: Wood bison, home range, habitat, satellite and radiotelemetry, movement, scientific method, hypothesis

LESSON OVERVIEW

Students examine actual wood bison locations in Google Earth, using the imagery to identify movement patterns and habitat associations.

MATERIALS Access to Google Earth; wood bison data packet (Includes: GPS coordinates and aerial photos); wood bison tracking data log, wood bison habitat and life cycle diagrams (one per student).

GUIDING QUESTIONS How do biologists track animal movements? What do biologists learn by tracking animal movements? How might movement patterns change throughout the year? What is home range?

BACKGROUND

The wood bison is the largest land mammal in North and South America. The 1,200–2,250 pound herbivore once roamed wild across much of Interior and Southcentral Alaska. Now that they are back, the Alaska Department of Fish and Game (ADF&G) closely monitors the herd to see how they will respond to their new habitat.

Radio and satellite transmitters deployed on many of the animals allow biologists to track daily movements. These data are used to answer questions about births, deaths, behavior, home range size, and habitat use. Periodically, ADF&G biologists use an airplane equipped with radiotelemetry to locate and check the status of the wood bison. The photos help biologists identify the habitat type that the herd was using during that time of year. Sometimes photos can

Lower Yukon and Innoko river grasslands!

Much of Interior Alaska is covered by boreal forest with moss and shrub understory, but sedge and grassland habitat abounds along many river valleys and in recently burned areas. Sedge meadows are perfect for grazing wood bison.



Technology for tracking wood bison!

The collars that biologists fit on wood bison can carry both radio and satellite transmitters. Radio transmitters enable scientists to track wood bison at close range, for example, by airplane. While satellite transmitters periodically send coordinates to ADF&G offices where the locations are examined in programs like Google Earth.

BACKGROUND CONT.

also provide information on herd dynamics such as when bulls and cows join together for the rut or when cows have their calves.

Note: This is a flexible lesson, adjustable for most grade levels. Students may examine a single wood bison or multiple wood bison over varying lengths of time. See **Research questions** (page 16) for suggestions.

PROCEDURE

In advance, visit www.adfg.alaska.gov > Education > For Educators > Curricula Home > Alaska Wood Bison Curriculum. Download and sign the **Data release form**. Once the form is returned to dfg.dwc.woodbison@alaska.gov you will then be given access to the **Wood bison data packets**.

Contact dfg.dwc.woodbison@alaska.gov with any questions about this lesson or suggestions for incorporating it into your classroom.

1. Ask students what information scientists learn by studying animal movement (i.e., home range size and habitat use). Discuss what kinds of technology biologists use to track animals (i.e., radiocollars, satellite transmitters, ear tags, and bird bands).
2. Examine the **Wood bison data packets!** They contain actual data collected by ADF&G biologists. Included in each packet are photos of the wood bison herd throughout the year, background information about your wood bison and GPS coordinates showing each wood bison's daily locations for a year.
3. Choose the timescale best for your students. You can track daily, weekly, or monthly movements.
4. Select an appropriate **Research question** (see suggestions on page 16). Use the **scientific method** to investigate your research question (see pages 20–22). Record students' hypotheses about what they will find during their tracking effort.
5. Each day, students use Google Earth to input their wood bison location GPS coordinates (See step-by-step **Google Earth instructions** on page 17–18).
6. Students examine the habitat around each wood bison location using Google Earth imagery. Can they classify the vegetation type as water, semi-aquatic vegetation, sedge, grass, shrub, birch/aspens/poplar, or spruce tree? (use the **Google Earth habitat classification** on page 18 to help).

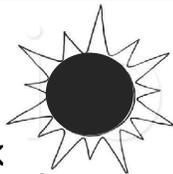
Each data packet contains a year of wood bison locations (one every few days). Data are not "real-time," it is illegal to provide current location data of wildlife.

PROCEDURE CONT.

7. Each student records his or her data and observations in their wood bison data log.
8. Ask students to predict the wood bison(s) behavior based on the time of year and habitat type (use the **Life cycle diagram** on page 19 and the **Habitat diagram** on page 23 to help).
 - Is the wood bison on the shore of a lake in early spring? If so, the wood bison could be foraging on semi-aquatic vegetation that is thawing out of the ice, but still green from the previous year.
 - Is the wood bison in the forest? If so, the wood bison could be traveling between meadow foraging areas. Or, if it is a warm day, the wood bison could be cooling off in the shade.
9. After students input multiple wood bison locations, use the “path” or “ruler” tool in Google Earth to measure the distance that the wood bison moved.
10. Distribute the aerial photos from the **Wood bison data packets**. Using these photos, students identify the habitat type that the herd was using during that time of year. Also record the number of animals in the group and if calves were present.
11. Once the tracking period is complete, students print or draw a map showing the total distance moved by their wood bison. Discuss how this map could help managers identify how natural elements and manmade structures impact wood bison.

Wood bison have great insulation!

Wood bison are extremely cold tolerant and are adapted for long periods of intense cold and wind. They have excellent winter insulation with thick skin and woolly underfur, long guard hairs, and large body mass. The wood bison’s heavy hide can weigh up to 300 pounds! With all this insulation, wood bison sometimes seek shade in forested or shrubby areas during hot days.



EVALUATION

Younger grade levels use the **Wood bison tracking data log** (page 25–26) to summarize their findings. Older students write a lab report describing their research question, hypothesis, data, results, and conclusions. See **Example graphs** (page 16) for suggestions.

EXTENSION

If other classes within your school also tracked a wood bison’s movement (or your class tracked two wood bison), plan a wood bison sharing day. Students from each class conduct presentations about wood bison movement and behavior. Compare and contrast wood bison habitat use, distances moved, and behavior.

ADDITIONAL RESOURCES

http://serc.carleton.edu/sp/library/google_earth/UserGuide.html

Alaska’s Wild Wonders issue 7 “Counting Wildlife” <http://www.adfg.alaska.gov/index.cfm?adfg=educators.wildwonders>

RESEARCH QUESTIONS

The tracking wood bison lesson is flexible and can be adjusted to fit the timescale best for your class. Below are suggested research questions for both short- and long-term tracking efforts.

Remember that this is real data that ADF&G biologists are currently using to answer these same questions. Take some time to discuss each question with your class. Make hypotheses according to the research questions you select. To answer gender and age questions, split the class in half with each group tracking a different wood bison.

Short-term tracking questions:

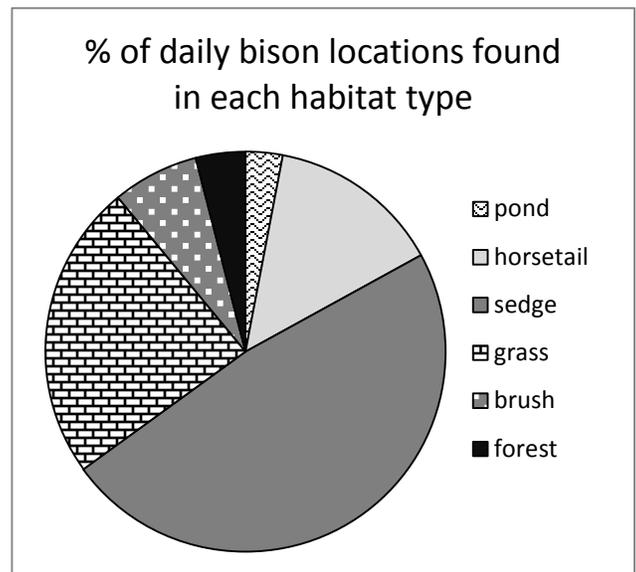
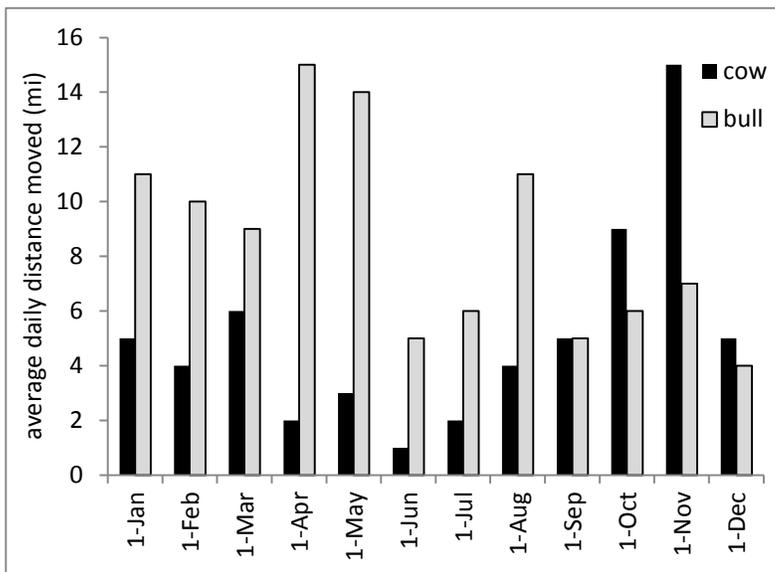
- What is the average distance that your wood bison travels each day?
- In which habitat type does your wood bison spend the most time?
- If your class tracked multiple wood bison, compare and contrast the daily distances moved. How does gender and age influence daily movement patterns?
- By tracking bison for only a short time, are you missing any information?

Long-term tracking questions:

- If your class tracked a wood bison for a year, what is its home range?
- How are your wood bison's movement patterns influenced by the seasons?
- In which habitat type does your wood bison spend the most time? How does habitat preference change with time of year?
- If your class tracked multiple wood bison, compare and contrast the daily distances moved. How does gender, age, and the time of year influence daily movement patterns?

EXAMPLE GRAPHS

Students can create many descriptive graphs using the data they collect. Include variables such as date, gender, age, distance moved, and habitat type. Bar graphs are useful for examining movement patterns over extended periods. They are also ideal for comparing patterns between multiple animals. Pie charts are useful for examining habitat use, particularly when data are presented as a percentage adding up to one hundred.



Note: This is example data and does not represent actual wood bison findings.

GOOGLE EARTH INSTRUCTIONS

Watch the video tutorial at www.adfg.alaska.gov > Education > For Educators > Curricula Home > Alaska Wood Bison Curriculum.

Follow these detailed instructions when using Google Earth to view wood bison movement data:

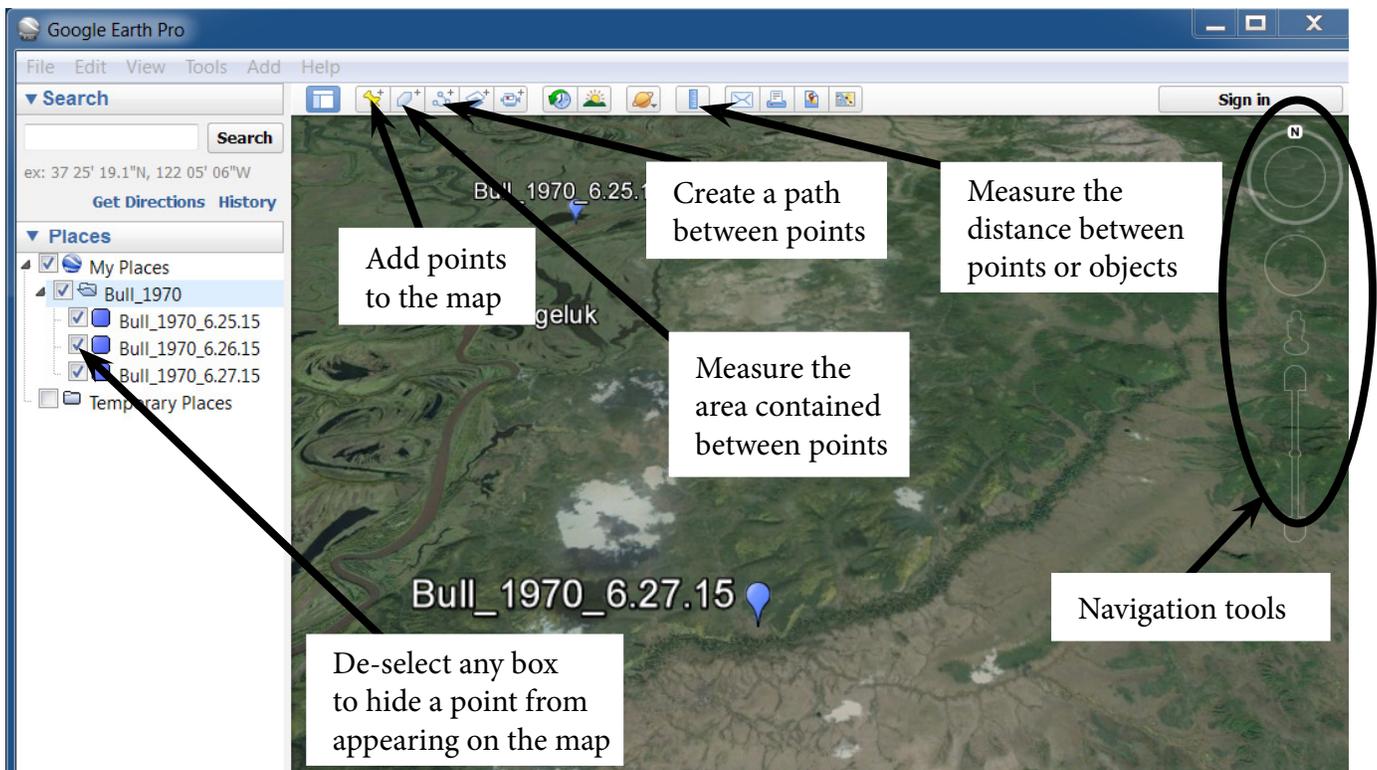
1. Open Google Earth or download it for free at <https://www.google.com/earth/download/>. **Note:** the online version of Google Earth does not work for this lesson, students must download the program onto their computers.

FORMAT & CLARITY

2. Your Google Earth may show the latitude and longitude in a different format than the data we provide. To change the lat/long format go to Tools > Options > 3D View and select "Decimal Degrees" under the "Show Lat/Long" section.
3. While in the options window you can also increase the image clarity of your map, making it easier to determine the wood bison habitat type. Select the "Use high quality terrain" box (deselect this option if your Internet is slow).

INPUTTING LOCATIONS

4. Use the "Add Placemark"  icon to create a wood bison location data point. A new window will open prompting you to rename the waypoint and enter the GPS coordinates (copy and paste coordinates from the wood bison packet to avoid errors).
 - Naming convention for cows: Cow_ID#_mm/dd/yy
 - Naming convention for bulls: Bull_ID#_mm/dd/yy
5. You can change the color and shape of your placemaker by clicking the square tab to the right of "Name: Untitled Placemark."

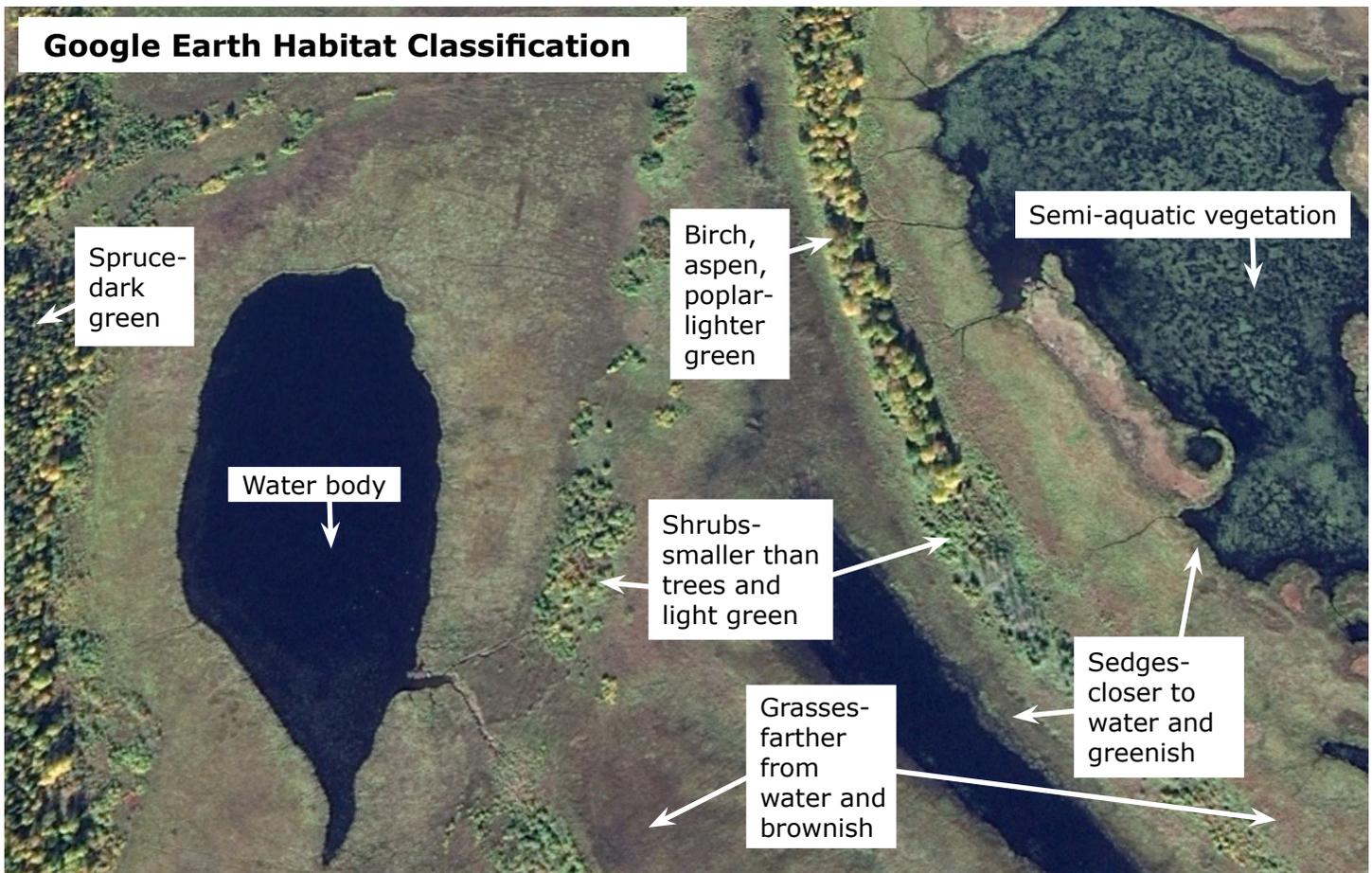


INPUTTING LOCATIONS CONT.

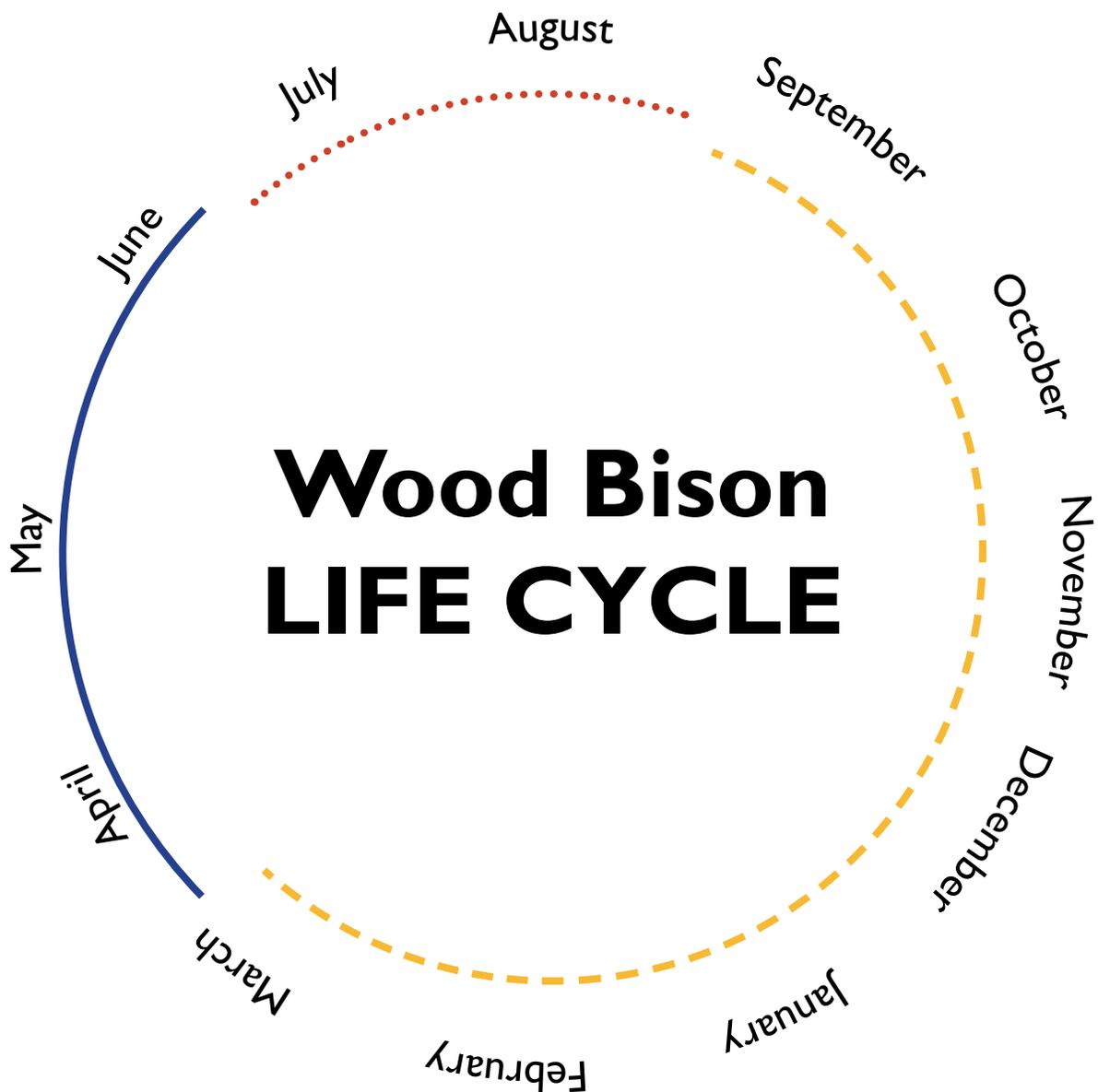
- Once you have created a waypoint, move it into a new folder by going to the "Add" drop down menu at the top of the screen. Select "Folder." A new window will appear prompting you to rename the folder (the naming convention should be either Cow_ID# or Bull_ID#). Drag the waypoint you just created, and any future waypoints, into the folder.
- Students can save their data points and folder by right clicking on the folder and clicking "Save Place As..." from the drop down menu.

MEASURING DISTANCES

- Once students have placed multiple waypoints in their folder, measure the distance between any two objects using the "Ruler"  icon.
- The distance between two or more locations can also be measured using the "Add Path"  icon.
- If you use the "Add Path" icon, a new window will appear prompting you to rename the path (use the same naming convention as before). Next, use the cursor to click on each of the points you want to draw a path between.
- To determine the length of the path, right click on the path and select "Properties" from the drop down menu, then go to the "Measurements" tab.
- To determine the area within multiple points, use the "Add Polygon"  icon. Follow steps 10–11 (Use this icon to determine wood bison home range).



- **BIRTH** From April until June cows give birth. New calves are usually red colored for the first 2–3 months.
- **RUT** In June, bulls commonly join cows in preparation for breeding (known as the rut) which usually takes place in late July or early August. Rutting groups often contain several bulls as well as cows, calves, and young nonbreeding animals. Larger, more dominant bulls usually breed first and with more, and better quality cows. Younger bulls can sometimes breed later in the season when the more dominant bulls are preoccupied with other cows. Some bulls that are not powerful enough to compete for cows avoid the rutting groups entirely and instead feed in secluded meadows.
- - - **WINTER** After the rut, groups disperse. Adult bulls often stay away from cow groups for long periods of time. Calves and young animals of both genders remain with cow groups throughout the year. When bulls reach sexual maturity at about three years old they often leave the cow groups and join bull groups.



SCIENTIFIC METHOD

The reason science is so important is that it provides an objective way to understand the world. As humans we can be influenced by our prejudices. Without a set process, science would be subject to our interests, opinions, and past life experiences. The scientific method is a process for asking and answering questions using a specific set of procedures. It provides a logical and standardized approach for examining a process. The scientific method minimizes the influence of bias, reducing personal influence and helping us stick to facts. This is the process that all scientists, no matter their discipline, use to study the world around them.

The scientific method works best when a hypothesis is tested through repeated experimental tests. If you only test a question once, you may measure an anomaly. Therefore it is recommended to use a large sample size (20-30 generally). Your experiment should also be designed so that someone else can conduct the exact same study, this means it must be repeatable.

One way to teach the scientific method is through S.H.I.P.S. S stands for "start with a question." H stands for "hypothesize," this is the only time when past experiences can be used to make an educated guess about the outcome of your question. I stands for "investigate" using a standardized study method. P stands for "prepare your data" using tables, maps, graphs, or statistics. S stands for "summarize" your conclusions so that you can communicate your findings to the rest of the world. See pages 21–22 for a student worksheet using this approach to the scientific method.

Scientific Method

START WITH A QUESTION

HYPOTHESIZE

INVESTIGATE

PREPARE YOUR DATA

SUMMARIZE

Start with your question: _____

_____?
_____?

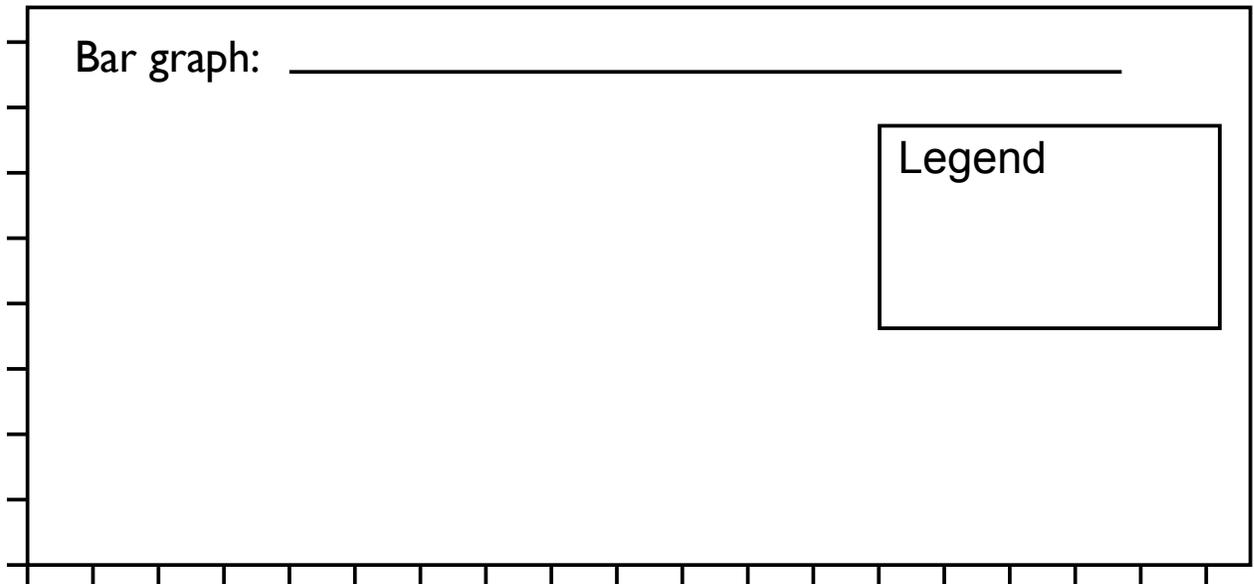
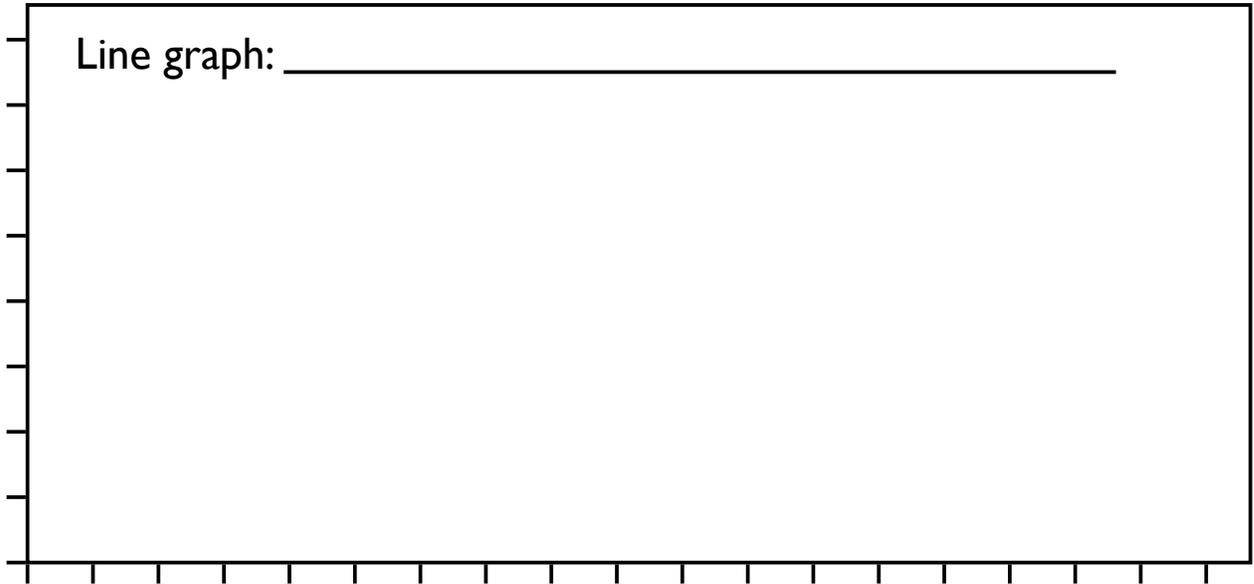
I **H**ypothesize that _____

Independent variable- the things you change
Dependent variable- the thing you are measuring
Control variable- the things you keep constant

Investigate
(here's where you put your data)

Observations: _____

Prepare your data using a graph (don't forget to label the axes):



Summarize your findings: _____

WOOD BISON HABITAT

Finding what's green? Throughout the year bison forage on different plants depending on what is available and provides the most nutrients. For example, young plants are much more digestible than mature tough plants. As different plants "green-up" bison feed on them. This diagram shows how bison use different plants throughout the year.

Seasonal changes! As the summer progresses different plants mature at different times related to pond or lake drying, the shifting of river channels, and other disturbances like fire. Across western Alaska, these changes create habitat that is necessary to sustain grazing bison.

SPRING

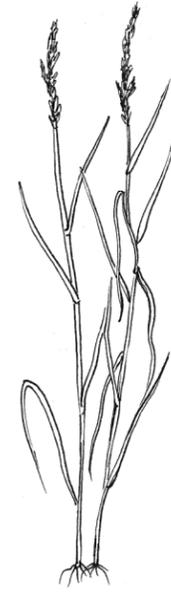
Semi-aquatic vegetation grow in and along lakes. In the spring when lake ice begins to melt these plants can be preserved in the ice and still green from the previous summer. Since other plants have not yet "greened-up," bison wade into lakes in search of rich nutrients from these left-over plants. The waters edge is also the first place of "green-up" during the spring.



Semi-aquatic Vegetation
Equisetum

SUMMER

During the summer bison feed on a variety of plants including grasses, sedges, shrubs and semi-aquatic vegetation. As each vegetation type "greens-up," bison take advantage of the tender young leaves. In this way bison move from forage type to forage type. Bison can also increase grass and sedge production by removing older stems, fertilizing, and mixing the soil with their hooves.



Common Grass
Calamagrostis tenuis

WINTER

During the winter, bison search for food under deep snow by sweeping their nose or head across the ground. Using this technique they search for sedges, one of the only forage items that store nutrients in their stems and leaves during the winter instead of in their roots locked under the frozen ground.

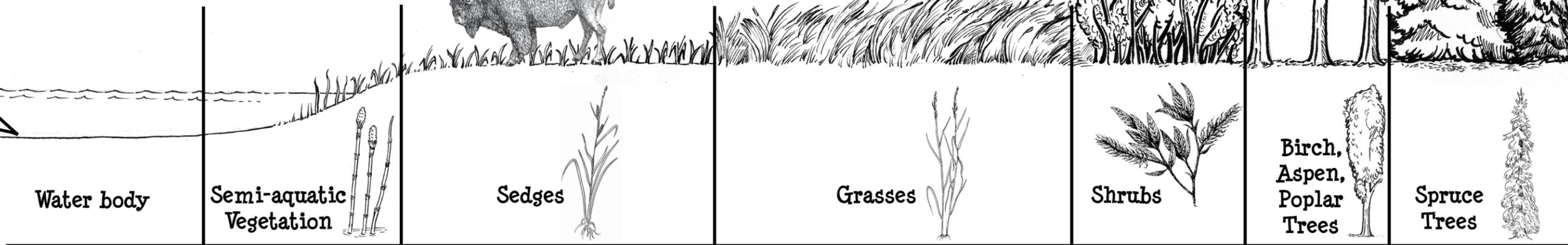
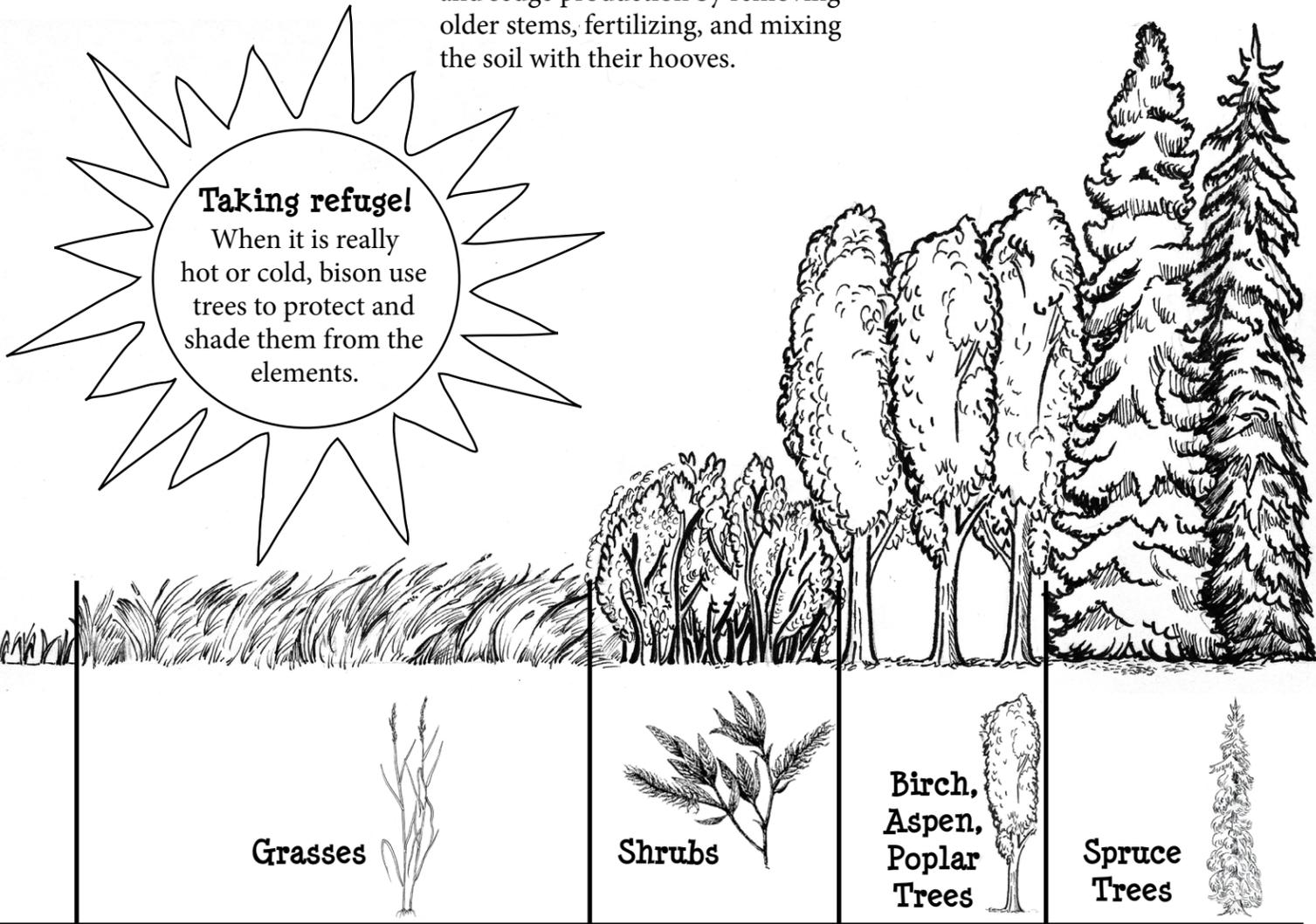


Water Sedge
Carex aquatilis

Lake level changes
Throughout the summer, lake and river levels rise and fall often related to season or weather conditions. As water levels drop they uncover new ground where young vegetation can grow. These young plants provide important forage for bison, particularly late in the summer when other plants have matured and no longer provide a rich source of nutrients.

High water levels
Often after snow and ice melt, lake water levels are high, and young vegetation grows only at the rim.

Low water levels
Throughout the summer, or when there has been little rain, water levels drop and new plants revegetate the receding lake bed.



DISTANCE FROM WATER BODY →

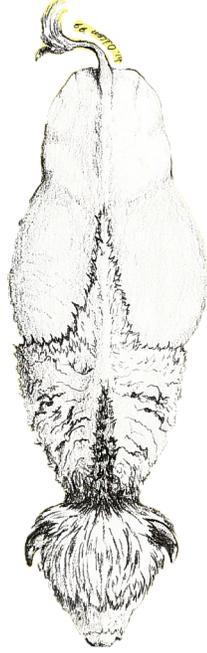
Conclusions

What movement patterns did you observe?

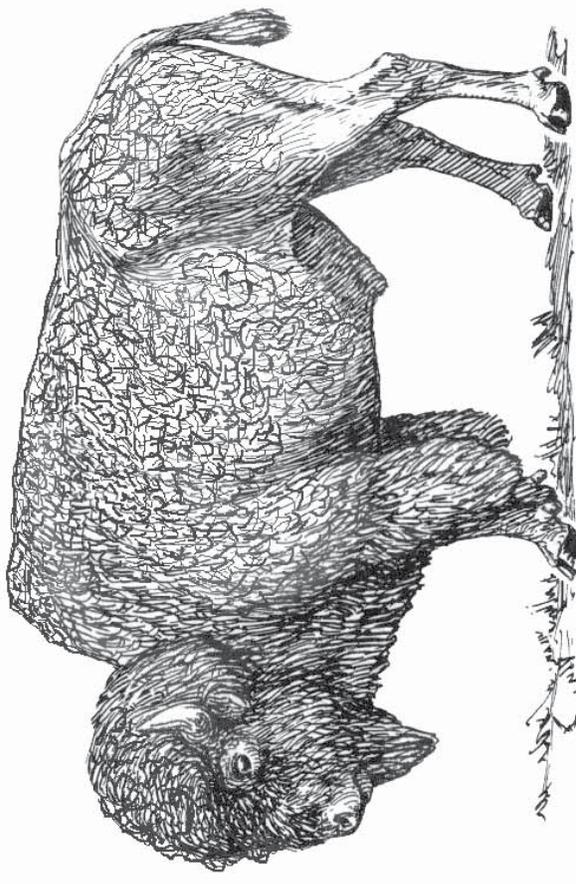
How did these movement patterns relate to habitat use?

Was your hypothesis supported?

What did you find most interesting about tracking wood bison?



BISON TRACKING



Bison ID #:

My bison is a:

Male

Female

This wood bison data log belongs to:

LESSON 4

Wood bison ecosystem benefits



Standards: Next Generation Science Standards 5-LS2-1, MS-LS2-1, MS-LS2-3, MS-LS2-4, MS-LS2-2, MS-LS2-5, MS-LS1-4, and HS-LS2-6

Subjects: Science

Skills: Inference, communication

Setting: Indoors

Vocabulary: Ecosystem, interactions, keystone species

LESSON OVERVIEW

Students play a card game to learn the positive effect wood bison have on other organisms in their environment.

MATERIALS Bison ecosystem cards (one set per five students).

GUIDING QUESTIONS What is an ecosystem? What is a keystone species? How do bison influence their environment?

BACKGROUND

Every organism impacts its environment in some way, whether positively or negatively. A keystone species is a plant or animal that has a disproportionately large effect on its environment relative to its abundance. These species play a critical role in maintaining the structure of the ecological community around them and affect the abundance and productivity of many different organisms.

Wood bison once served as a keystone species in Alaska. In parts of Canada, bison still play an important role in their environment and positively impact many species. They manipulate their physical environment through grazing which affects numerous species including ground squirrels, shrews and grasshoppers. Bison feces, hair, and carcasses are also used by countless plants and animals.

With the return of wood bison to Alaska, biologists expect that they will once again positively contribute to their surrounding environment. However, we do not know exactly how these interactions will play out until wood bison are on the landscape longer. The following lesson provides examples of the wood bison interactions from Canada that biologists expect may also occur in Alaska.

* Information for this game was provided by bison specialist Wes Olson.

PROCEDURE

1. Define keystone species on the board. Ask students if they can think of any keystone species near them (i.e., salmon and beaver are keystone species). Ask students to describe a positive relationship between a keystone species and other organisms in their community (i.e., bears and birds rely on salmon).
2. (Optional) Have students “pre-read” the ***Bison ecosystem cards*** (page 31–40) to become familiar with the vocabulary and the relationships between different organisms.
3. Introduce the card game “Go Bison.” The game is similar to “Go Fish,” but rather than collecting multiple cards of the same rank, players collect sets of cards representing interactions between bison and their environment.
4. Deal five ***Bison ecosystem cards*** to each player. Leave the rest of the cards face down as the draw pile.
5. Starting with the player at dealer’s left, the first player asks another for a card that interacts with one of the cards in their hand. For example: “Kevin, do you have a *songbird*?” In order to ask, you must already have at least one card that interacts with a songbird (interactions are listed in bold at the bottom of each card). For example: **Bison hair** is used by **songbirds** for nesting material, or **songbirds** benefit from the explosion of **insects** near bison. “Kevin” must give you a **songbird** if he has one. Any time that a card changes hands the receiving player must read aloud the interaction described on the front of the card.
6. If a request is filled, it stays your turn. Continue asking any player for cards. If a request cannot be filled the person you requested a card from says “Go Bison.” You must draw a card from the deck. Your turn ends.
7. Play continues in a clockwise fashion. Once a player has three interactions they lay the set down face-up on the table. The player with the complete set must describe to the rest of the players how the cards interact. For example: “**Bison hair** is used by **songbirds** to insulate their nests, **songbirds** are eaten by **peregrine falcons**.” Each set of interactions must include one of the eight bison cards (**bison stomachs**, **bison grazing**, **bison bones**, **bison carcass**, **bison trails**, **bison dung**, **bison wallows**, and **bison hair**).
8. Once a set of interactions is laid down, any player can add to it during subsequent turns. However, the player must describe how the new card contributes to the current set of interactions.
9. Play continues until all the cards are used. The first player to get rid of their cards wins.

EVALUATION

Have students create a diagram listing a bison interactions they learned about. Use captions and drawings to describe the relationship.

EXTENSION

Ask students to think of interactions between the cards that were not listed in the descriptions. Have students write in their own interactions and play again.

Bison Hair

Bison have the second-warmest natural hair of any North American animal, next only to the muskoxen. Bison hair is also water repellent. They shed their entire coat twice a year in the spring and again in the fall. Their hair is used by songbirds during nesting. Their hair often traps vegetation and can help to disperse seeds to new areas.

Bison hair interacts with: seed dispersal and songbirds.

Bison Wallows

Bison roll around (wallow) in wet or dusty areas to coat their hair with dirt and mud to protect themselves from biting insects. Sometimes, bull bison also urinate in the wallow during the rut to enhance their scent. These wallows create an opening in the vegetation that can be up to 15 feet wide and a foot deep. Sharp-tailed grouse use wallows. There is also increased plant growth near wallows.

Bison wallows interact with: sharp-tailed grouse and increased plant growth.

Bison Bones

Although bison are not commonly killed by predators they do occasionally die from other natural causes. After death, bison leave behind massive bones that are used by a many species including rough-legged hawks and porcupines.

Bison bones interact with: rough-legged hawks and porcupines.

Bison Trails

With their heavy bodies bison leave behind tracks and trails wherever they travel. Particularly during the winter, bison expend a lot of energy walking through deep snow. To reduce energy loss, they travel in single file and often create extensive winter trail systems. Foxes and other animals use these trails. As bison move their hooves often push seeds into the soil.

Bison trails interact with foxes and seedling germination.

Bison Carcass

Although bison are not commonly killed by predators they do occasionally die from other natural causes. After death, bison leave behind their ~1,000 pound carcass which enhances soil as it decomposes. The carcass also benefits a whole host of species including scavengers.

Bison carcass interacts with scavengers.

Bison Dung

Bison leave behind up to 50 pounds of dung per day. Bison dung contains many nutrients that can enhance soil and increase plant growth. Bison dung also contains microbes that are consumed by dung beetles. Insects like ants also feed on the dung.

Bison dung interacts with: enhanced soil, increased plant growth, microbes, insects, and ants.

Go Wood Bison!

Bison Grazing

As bison graze, they create "grazing lawns" of short, rapidly re-growing and tender vegetation. Bison leave behind a mosaic of small or large patches of mature grasses and sedges interspersed with closely grazed patches. Voles and lemmings, grasshoppers, ground squirrels, and geese and shorebirds all benefit from his mosaic of grazed and ungrazed habitat.

Bison grazing interacts with: voles and lemmings, grasshoppers, ground squirrels, and geese and shorebirds.

Bison Stomachs

Bison are ruminants which means they have a specialized stomach that allows them to ferment plants in separate chambers prior to digesting them. These separate chambers contain microbes.

Bison stomachs interact with: microbes.

Peregrine Falcons

Peregrine falcons benefit from increased abundance of small mammals such as insectivores, voles and lemmings, and ground squirrels near bison. They also can kill songbirds and sharp-tailed grouse on the wing.

Peregrine falcons interact with: insectivores, voles and lemmings, ground squirrels, songbirds, and sharp-tailed grouse.

Ants

When ant queens establish a new colony that is near bison they often select a bison patty as the foundation for their new anthill. Because bison usually bed down near the forest edge there is usually more bison dung in these areas.

Ants interact with: bison dung.

Northern Flicker

Northern flickers nest in cavities, usually near the forest edge adjacent to meadows. As insects crawl along on the ground, flickers hop along eating them. Ants are one of their most common food items.

Northern flicker interacts with: ants.

Humans

Humans can benefit from wood bison in many ways. Once wood bison hunting becomes legal they will be able to eat bison. Humans can also use bison hair for wool, dried bison dung for fire starter, and bison bones for carving.

Humans also benefit from increased plant growth and more abundant wildlife like foxes, and sharp-tailed grouse.

Humans interact with: increased plant growth, foxes, sharp-tailed grouses, bison hair, bison dung, bison bones.

Go Wood Bison!

Seedling Germination

As bison move along their hooves push seeds resting on the surface of the ground into the soil. This improves the odds that a seed will germinate. Pushing seeds into the ground also helps them escape consumption by seed eating animals.

Seedling germination interacts with: bison trails.

Foxes

The cost of locomotion (movement) through snow is great. Many animals like fox and moose can reduce that cost by following bison trails as they move from place to place.

Foxes prey on ground squirrels and other small mammals.

Foxes interact with: bison trails and ground squirrels.

Songbirds

When migratory songbirds return to Alaska in the spring they start building nests almost immediately. They search for insulated materials to line their nests with. One study showed that nests lined with shed bison hair were 30% more likely to survive.

Songbirds feed on insects around bison dung.

Songbirds interact with: insects and bison hair.

Seed Dispersal

Bison play an important role in seed dispersal. Seeds are trapped by the thick, wavy bison hair on their chaps, beards and manes and transported to new areas.

Seed dispersal interacts with: bison hair.

Increased plant growth

Plants need nitrogen to grow. The nitrogen found in bison urine enhances plant growth in sedge meadows. Vegetation around bison wallows is particularly lush from all the urine.

Nutrients from bison dung helps vegetation surrounding the dung patty grow.

Increased plant growth interacts with: bison wallows and bison dung.

Sharp-tailed grouse

Sharp-tailed grouse depend on openings in the vegetation to conduct their spring mating displays. To attract females, the males conduct an elaborate dance that includes rattling tail feathers, stomping feet, and launching several feet into the air.

Sharp-tailed grouse are known to conduct their mating displays in the openings created by bison wallows.

Sharp-tailed grouse interacts with: bison wallows.

Go Wood Bison!

Porcupine

Porcupines chew on bison bones to gain access to the calcium and minerals they contain. This chewing and gnawing helps to break down skeletons.

Porcupine interacts with: bison bones.

Scavengers

Mammalian and avian scavengers feed on large chunks of meat from bison carcasses. They locate decaying flesh using their strong sense of smell. Scavengers are among the first to dismantle and consume the carcass.

Scavengers interact with: bison carcass.

Ground squirrels

The close-clipped vegetation left behind by bison grazing creates ideal habitat for ground squirrels. In this short vegetation ground squirrels can see predators before they attack.

Ground squirrels eat plants and benefit from increased plant growth near bison. Sometimes they also eat songbird eggs.

Ground squirrels interact with: bison grazing, increased plant growth, and songbirds.

*Although there are no ground squirrels in the Innoko area, they do occur in many areas of Alaska where bison may exist in the future.

Microbes

Tiny organisms called microbes live in the rumen, the first chamber of the bison stomach, and digest plant material that the bison cannot otherwise digest. This relationship benefits both the bison and the microbe. The microbe gets a suitable place to live with a supply of food delivered to its door. The bison gets energy from digesting the broken down plant material that the microbes produce. Bison patties often contain these microbes.

Microbes interact with: bison stomachs, bison dung.

Enhanced Soil

As bison carcasses decompose, minerals and nutrients are left in the soil.

Bison dung contains nutrients left over from the digested plants. Each patty deposits nutrients, particularly nitrogen, into the soil below and around it.

Enhanced soil interacts with: bison carcass, bison dung.

Insects

After a bison dies, flies and fly larvae dismantle and consume the decaying carcass.

Within seconds of the arrival of the bison dung, insects fly, crawl, or squirm their way towards it. One pile of bison dung can house over 300 insects at one time.

Insects interact with: bison carcass and bison dung.

Go Wood Bison!

Insectivores

Insectivores are animals or plants that eat insects. Shrews, frogs, songbirds, and bats are all insectivores. They eat the insects found around bison dung.

Insectivores interact with: insects.

Grasshoppers

Grasshoppers are plant eating insects that benefit from bison by the increased plant growth as well as the increased mosaic of habitat types created from bison grazing.

Grasshoppers interact with: increased plant growth and bison grazing.

Voles and Lemmings

Microtine rodents are types of voles that eat green vegetation. Along with lemmings, they benefit by increased plant growth near bison.

The rapidly re-growing and tender young plants spurred on by grazing bison are very palatable to voles and lemmings.

Voles and lemmings interact with: increased plant growth and bison grazing.

Rough-legged Hawks

Rough-legged hawks consume voles and lemmings and ground squirrels that feed near bison.

They may even use bison bones in their large ground nests.

Rough-legged hawks interact with: voles and lemmings, ground squirrels, and bison bones.

Geese and shorebirds

As bison graze along lake shores they disturb the organic matter. This disturbed area provides an ideal foraging area for geese and shorebirds looking for easily accessible invertebrates.

Geese and shorebirds interact with: bison grazing.

Dung Beetles

Some beetles such as dung beetles have a sensitive sense of smell that allows them to track odorous dung piles from long distances. These insects feed on microbes living in bison dung. When dung beetle populations are high they can dismantle an entire dung patty in only a few days.

Dung beetles interact with: microbes.

Go Wood Bison!



LESSON 5

Wood bison habitat diorama

Standards: Next Generation Science Standards 2LS4-1, 3LS4-3, 4-4, 4-PS4-2, 5-LS1-1, 2-1, and MS-LS2-5

Subjects: Science, visual art

Skills: Model building, creative thinking, presentation

Setting: Indoors

Vocabulary: Habitat, behavior, forage, seasons

LESSON OVERVIEW

Students build models showing wood bison habitat use.

MATERIALS Wood bison habitat diagram, shoe-box or similar-sized box (one per student), construction paper or cardstock (multiple colors preferred), paint/markers/colored pencils, scissors, glue, and other materials (cotton balls for snow, spruce branches, sticks, dried vegetation, wood bison and plant cut-outs).

GUIDING QUESTIONS What is habitat? How does wood bison habitat use change throughout the year?

BACKGROUND

After a few hundred years of absence, wood bison were reintroduced into western Alaska in 2015. As the wood bison become accustomed to their new environment, biologists at the Alaska Department of Fish and Game are studying how wood bison use different habitat types throughout the year.

Although biologists are still learning about wood bison habitat use, recent findings suggest that wood bison graze on many plant types depending on what is “greening-up”; young plants are more digestible than mature plants.

During spring, wood bison often forage on newly emerged vegetation in or along the edges of lakes and rivers. As summer progresses, other vegetation “greens-up” and wood bison eat a variety of plants including semi-aquatic plants, sedges, grasses, and shrubs. Once winter hits, wood bison switch to a sedge dominated diet. Sedges are particularly important because they store nutrients in their stems and leaves as well as in their roots during the winter (grasses store all of their nutrients in their roots), making them a nutritious and accessible food item for wood bison. Because the ground is covered by deep snow, the wood bison locate these sedges by sweeping their noses or heads across the ground. Although wood bison do not eat trees, they do use them to provide shade during hot days and protection during storms.

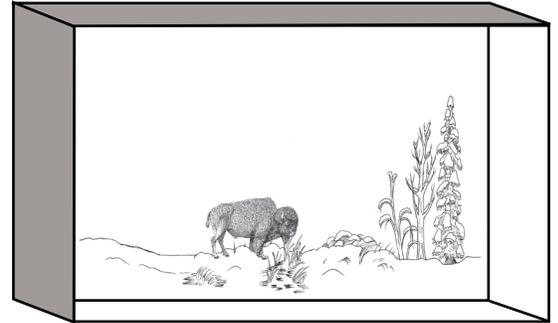
PROCEDURE

In advance. Ask students to collect shoebox-sized boxes and any other natural materials.

1. Provide each student with a **Wood bison habitat diagram** (page 23). On the board review how wood bison use different plants throughout the year.
2. While supervised, ask students to prepare their dioramas by using scissors to remove the front panel of their boxes (the box should now have only five sides, see example).

Diorama example:

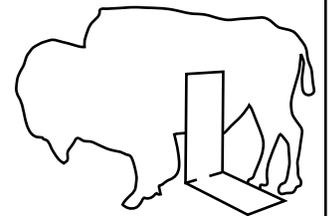
Shoe-box dioramas can illustrate any environment. This example shows a wood bison in the winter. This wood bison sweeps the ground with his nose to expose sedges beneath the snow.



3. Ask students to choose, and plan their habitat according to the time of year or scenario they wish to depict in their diorama (winter, spring, summer, fall).
4. Use paint/markers/colored paper to prepare the inside landscape of the box. For example, paint the inner back, top and side walls blue with a bright sun for a hot summer day.
5. Add the appropriate forage habitat for the chosen time of year. Students can either paint the vegetation onto the walls of the box, or make 3D illustrations using dried vegetation or cut out plants. Make sure that each diorama includes the basic components of an animal's habitat: food, water, shelter, and space.
6. Draw and color (or use the **Wood bison cut-out** on page 45) a wood bison. Make sure to use stiff paper so that the wood bison stands upright (see instructions for creating a free-standing wood bison).
7. Position the wood bison and other props inside your diorama, gluing the bottom tab to the bottom or sides of the box.
8. Add any finishing touches. Be creative, use items such as cotton balls to represent snow.

Free-standing wood bison!

For a free-standing wood bison, make a support tab by gluing a paper L-shaped tab to the back side of the wood bison. Also add tabs to the back of trees and shrubs to create a 3D effect.



EVALUATION

Have students present their dioramas to the class, describing what kind of habitat is associated with their wood bison during that particular time of year.

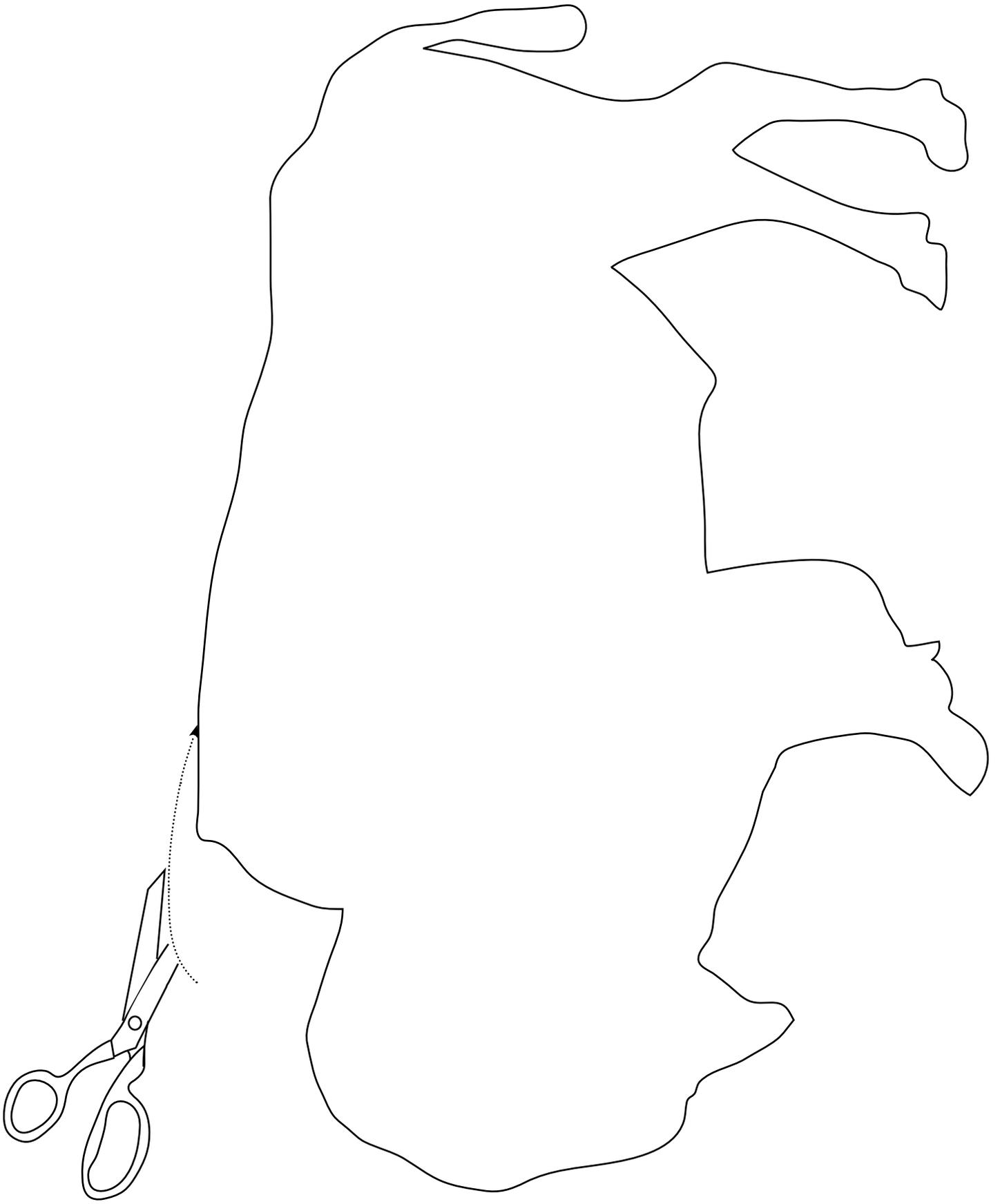
EXTENSION

Ask students to identify components of a food web in their dioramas. Review the basic requirements that plants and animals need to grow. Use the "Habitat: Basis for Survival" lesson in ADF&G's curriculum "Wildlife for the Future" to explore habitat requirements for all living things.

ADDITIONAL RESOURCES

www.wildlife.alaska.gov > Animals > Mammals > Wood bison

ADF&G's Wildlife for the Future curriculum can be viewed online at <http://www.adfg.alaska.gov/index.cfm?adfg=alaskawildlifecurriculum.wildlifeforfuture>





LESSON 6

Walking in wood bison habitat

Standards: Next Generation Science Standards 2LS4-1, 3LS4.3, 4LS1-1, and 5-PS3-1

Subjects: Science, visual art

Skills: Sample collection, data recording, observation

Setting: Indoors and outdoor

Vocabulary: Botany, plant press, sedge, grass

LESSON OVERVIEW

Students go for a nature walk to collect vegetation used by wood bison.

MATERIALS Scissors, small zip-lock bags (to collect samples), moist paper towels, markers, data notebooks, pencils, newspaper, corrugated cardboard (two times the number of students, cut into ~8.5 x 11 in. rectangles), two large rubber bands.

GUIDING QUESTIONS Why do botanists collect plant specimens? What is the difference between a sedge and a grass? Do all plants provide the same quality of nutrients?

BACKGROUND

Interior Alaska is characterized by spruce, birch, and aspen forests with moss and shrub understory, but grasslands and sedge meadows abound along river valleys and in recently burned areas. These habitats are perfect for grazing wood bison.

During summer, wood bison forage on a variety of vegetation types including aquatic plants, horsetails, sedges, grasses, and shrubs. In winter, wood bison eat mostly sedges which they locate under the snow by sweeping their nose across the ground. Sedges store nutrients in their stems, leaves, and roots even during the winter (instead of just the roots like grasses), making them a rich and available energy source for wood bison.

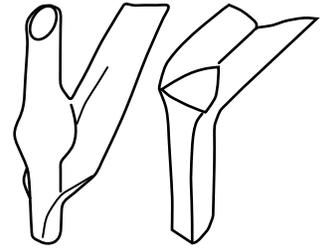
ADF&G Biologists say that important plants for grazing wood bison are the sedges *Carex aquatilis* and *C. utriculata* and grasses in the genus *Calamagrostis*.

PROCEDURE

In advance, choose a location for your nature walk. If possible select an area with a meadow or pond, where both sedges and grasses are present. However, even around the school yard, it is possible to find the types of vegetation that wood bison use.

Sedge or grass?

Sedges occur in wetlands, while grasses occur in more dry areas. As the saying goes "sedges have edges, rushes are round, grasses have joints [and are hollow] right up from the ground." Grass flowering heads also have a fish bone pattern, while sedge flowering heads have only one multi-faceted bract.



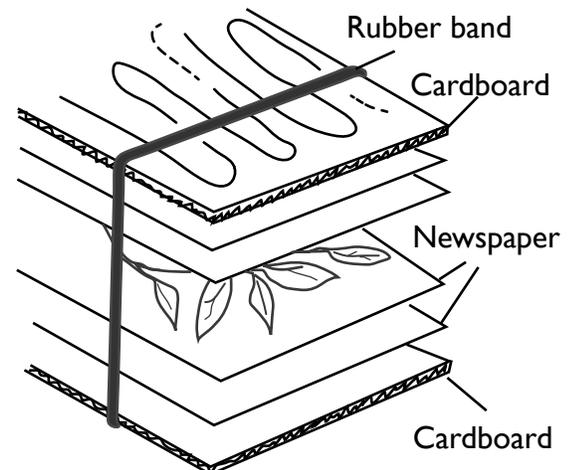
Note: You may also find rushes (which are round, but not hollow or jointed). Rushes do not appear to be important to wood bison in Alaska at this time.

PROCEDURE

1. Explain the difference between a sedge and a grass (sedges have edges and grasses have joints).
2. Brainstorm where these vegetation types occur around town.
3. Have students prepare their data collection notebooks by writing the heading "wood bison habitat collection" across the top of the page. Tell them to create a table with six columns labeled "sample number, vegetation type, location, ground description, plant description, and sketch."
4. Go outdoors. Search for and collect sedges and grasses. Also collect semi-aquatic vegetation, shrubs, and trees!
5. Place all plant specimens individually in zip-lock bags. Add a moist paper towel to the bag to help prevent wilting. Label the bags with the sample number.
6. Each student records his or her data and observations in their data collection notebook. For each sample include:
 - sample number
 - identify the sample as semi-aquatic vegetation, sedge, grass, shrub, birch, aspen, poplar, or spruce tree
 - location (i.e., school yard, near the park, next to the road)
 - site description (i.e., dry area on a small rise, wet and swampy area near a pond)
 - description of the plant when the specimen was collected
 - plant sketch

It is easy to make a plant press!

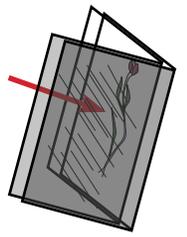
Plant presses are used by botanists around the world to dry specimens. Pressed plants can provide a history of habitat even after it is long gone. The Smithsonian still has plant specimens that were collected and pressed by Edward Harriman and his crew of scientists during their 1899 expedition across Alaska. Although plant presses come in many forms, the simplest press (shown here) can be made with cardboard, newspaper and rubber bands.



Hint: To get your specimens flat, place a heavy book on top of your press!

PROCEDURE CONT.

7. In the classroom, prepare the samples for pressing by brushing off loose soil and blotting away moisture.
8. Fold several newspaper pages in half. Arrange each sample (you may have to fold longer plants in half) on the inner most fold. Next to it place a label with the sample number, date, and student's name.
9. Make layers. Place the piece of newspaper with your specimen inside between two pieces of newspaper, then between two pieces of cardboard (make sure the cardboard is corrugated to allow air circulation).
10. Once all specimens have been compiled, place two large rubber bands or string around the entire stack. It is helpful to use two small pieces of plywood as the outer sections. Bungee straps or heavy books can be used to increase pressure.
11. The plant specimens will take two to four weeks to dry.



EVALUATION

Ask students to draw and label a sedge and a grass.

ADDITIONAL RESOURCES

<http://arctos.database.museum/SpecimenSearch.cfm>

<http://www.amnh.org/explore/curriculum-collections/biodiversity-counts/plant-identification>



LESSON 7

Wood bison habitat relay

Standards: Next Generation Science Standards 2LS4-1, 3LS4-3, and 4LS1-1

Subjects: Science

Skills: Sample collection, observation, teamwork

Setting: Indoors

Vocabulary: habitat, behavior, forage, vegetation, sedge, grass

LESSON OVERVIEW

Students play wood bison habitat relay where they match specific wood bison behaviors with their associated habitat types.

MATERIALS White card stock paper, white school glue, vegetation samples from wood bison habitat Lesson 3: Walking in Wood Bison Habitat (alternative: print and cut-out habitat relay illustrations for semi-aquatic vegetation; sedges; grasses; shrubs; birch/aspen/poplar; and spruce trees), wood bison habitat/behavior table.

GUIDING QUESTIONS How does vegetation shift with proximity to water? How is wood bison behavior associated with habitat type?

BACKGROUND

Throughout the summer, lake and river levels rise and fall often related to season or weather conditions. As water levels drop they uncover new ground where young vegetation can grow. These young plants provide important forage for wood bison, particularly late in the summer when other plants have matured and no longer provide a rich source of nutrients.

PROCEDURE

*This lesson uses the vegetation samples from wood bison habitat lesson 3- walking in wood bison habitat. If these samples are not available, print and cut-out (or have students draw) plant samples from the **Habitat relay illustrations** on page 53.*

1. Mount dried plants from Lesson 3: Walking in Wood Bison Habitat by arranging the specimens on white paper (preferably, stiff card stock variety). Use dabs of white school glue to hold specimens down securely. Make sure to write the plant type and collection location at the back of each page.
2. Ask students if they have noticed that plants growing near water usually look different than plants growing farther away on dry ground?

PROCEDURE CONT.

3. Review the **Wood bison habitat/behavior table** (page 52) to make sure that students can describe each habitat type's proximity to water (semi-aquatic vegetation, sedges, grasses, shrubs, birch/aspens/poplar, and spruce trees).
 4. Ask students if they think that all plants are used by animals in the same way. Tell them that wood bison use many habitat types, but for different things. Review the habitat/behavior table with the students. Let them know that they will be quizzed on their ability to associate each habitat type with its wood bison use.
 5. Spread the mounted vegetation cards out along the far end of the room (a gym-sized area is best). Include at least two samples from each category (semi-aquatic vegetation, sedges, grasses, shrubs, birch/aspens/poplar, and spruce trees).
 6. Divide the class into two (or more) groups. Form two lines opposite the vegetation cards.
 7. During **round 1**, the teacher calls a habitat type (**Wood bison habitat/behavior table**: semi-aquatic vegetation, sedges, grasses, shrubs, birch/aspens/poplar, and spruce trees). The first student in each team runs to the far end of the gym and finds the associated vegetation card and returns to his/her team. After placing the card on the ground the student goes to the end of the line and sits down.
 8. The teacher continues to call habitat types (call them out of order) until each team has a complete set of vegetation cards.
 9. Team members should place their vegetation cards in order according to their proximity to water.
 10. The first team with all members seated and their vegetation cards in the correct order, wins.
 11. During **round 2**, the teacher calls a "wood bison use" from the **Wood bison habitat/behavior table** (for example, "these plants are eaten year-round"), the first student in each team runs to the team's pile, finds the habitat type associated with that behavior, (for example, "sedge") and holds it up for the teacher to check. After positive identification, the player carries the specimen back to his/her team. After placing the card on the ground the student goes to the end of the line and sits down.
 12. The teacher continues to call wood bison uses until each team has a complete set of vegetation cards.
 13. The first team with all members seated and their vegetation cards in the correct order, wins.
-

EVALUATION

Input a GPS location data point from the tracking wood bison lesson into Google Earth. Ask students to identify the habitat type. Locate a lake near the wood bison location. Can students point out the different habitat types as they transition from the water body to treeline.

EXTENSION

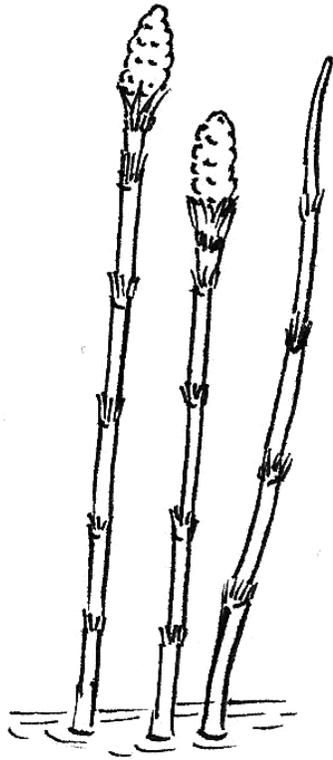
Discuss how wood bison know that there is more nutrition in certain vegetation types? Could this be related to a genetic preference?

Wood bison habitat/behavior table

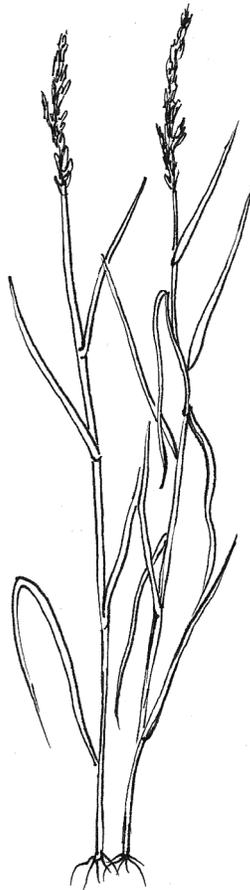
Habitat type	Wood bison use
Semi-aquatic plants	<ul style="list-style-type: none"> • These plants are preserved through the winter and still green when thaw occurs in the spring. Wood bison feed on these plants during the spring when other plants have not yet “greened-up.” • Semi-aquatic plants are often the first plants to “green-up” in the spring.
Sedges	<ul style="list-style-type: none"> • Throughout the summer as water levels drop in lakes and ponds these plants grow along the newly exposed shoreline. • These plants are eaten year-round. • Particularly during the winter, wood bison search for these critical plants under the snow by sweeping their head and nose along the ground. They are one of the only plants available that store some of their nutrients in the stems and leaves during the winter instead of trapped under the frozen ground in roots.
Grasses	<ul style="list-style-type: none"> • These plants are eaten only in the summer when they are green and new, young leaves and stems provide nutritious value.
Shrubs	<ul style="list-style-type: none"> • Young leaves of these plants are eaten during the summer. • This plant also provides shade and protection from the heat of the sun.
Birch, Aspen, Poplar trees	<ul style="list-style-type: none"> • These plants provides shade and protection from the heat of the sun.
Spruce trees	<ul style="list-style-type: none"> • These plants provides shade and protection from the heat of the sun.

Proximity to water ↓

*These bison/habitat interactions are based on observations of wood bison in the Lower Yukon and Innoko rivers.



Semi-aquatic vegetation
Equisetum



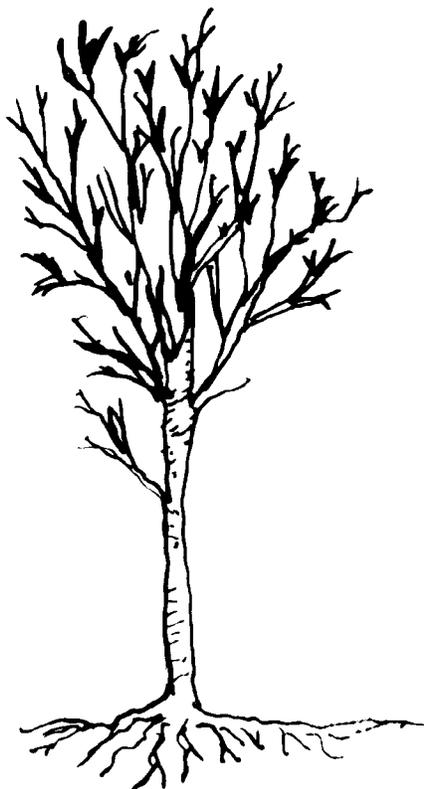
Grass
Calamagrostis tenuis



Sedge
Carex aquatilis



Willow
Salix spp.



Birch, Aspen, Poplar trees



Spruce Trees
picea glauca

LESSON 8

Wood bison and friends



Standards: Next Generation Science Standards MS-LS1-5 MS-LS2-2, 2-LS2-1, and 3-5-ETS1-1

Subjects: Science, visual art

Skills: Team work, communication, inference, problem solving

Setting: Indoors

Vocabulary: Wood bison, muskoxen, form and function, adaptation, trait

LESSON OVERVIEW

Students build wood bison and muskoxen using recycled materials.

MATERIALS Household items such as cans; cardboard; foam; bottles; toilet paper and paper towel rolls; wire; scraps of fabric; paper; aluminum foil (clay can be used as a substitute); glue; tape and/or string; scissors or knives; small slips of paper (quantity: number of students times the number of groups); cleaning materials.

GUIDING QUESTIONS How can you differentiate between a wood bison and a muskoxen? What physical traits make wood bison and muskoxen well suited to their habitat?

BACKGROUND

It is now possible to see both wood bison and muskoxen in western Alaska. Both species live in open grasslands areas, and from a distance can look similar.

How much do wood bison weigh?

Although muskoxen can weigh up to 800 pounds, an adult male wood bison can weigh over 2,000 pounds! That is as much as four 4-wheelers.



The most obvious difference between wood bison and muskoxen is their size. Wood bison are considerably larger (up to six feet tall) than muskoxen (between 4-5 feet tall). Wood bison also have a large hump above and forward of their front shoulders giving their back a distinct triangular shape. Muskoxen have a light colored patch called a "saddle" in the center of their back. Muskoxen legs are usually hidden by their long, shaggy hair, thus from a distance they look like a large dented barrel.

PROCEDURE

In advance, ask students to collect an assortment of household and recycled items.

1. Ask students if they have seen a wood bison or muskoxen. List the distinguishing characteristics of the two species on the board (use the **Wood bison/muskox ID guide** on page 58 to help).

PROCEDURE CONT.

2. Divide students into groups of two or three.
 3. Instruct each group to design and sculpt either a wood bison or muskoxen (make sure they keep their sculpture species a secret).
 - Focus on sculpting three to four key characteristics (i.e., horn shape, back shape, hair length).
 4. When the sculptures are complete, number each and display them around the room.
 5. Ask students to guess the species of each sculpture. Students should record their guesses, any distinguishing characteristics they noticed and the sculpture number on a slip of paper.
 6. On the board, tally the number of correct versus incorrect identifications of each sculpture.
 7. Discuss which characteristics were easiest/most difficult to distinguish and sculpt.
 8. Ask students to describe any shared features of muskoxen and wood bison that help them survive in their environment.
-

EVALUATION

Using several photographs ask students to identify muskoxen and wood bison from a distance.

EXTENSION

Investigate adaptations of other northern animals that help them survive their cold environment. See the "Tundra Adaptations" unit in ADF&G's Alaska Wildlife Curriculum "Alaska's Tundra & Wildlife."

ADDITIONAL RESOURCES

www.wildlife.alaska.gov > Animals > Mammals > Wood Bison

www.wildlife.alaska.gov > Animals > Mammals > Muskox

ADF&G's Alaska Wildlife Curriculum can be purchased online at <http://www.adfg.alaska.gov/index.cfm?adfg=curricula.awc>

Wood bison:

- Large in size (about 6 ft tall)
- 1,200–2,000 pounds
- Large hump, usually lighter in color
- Long tail (2 ft in length) with tuft at end
- Woolly hair does not obscure belly and legs
- Longer hair on head, shoulders and neck
- Dark brown head, beard, nose and legs
- Black horns that curve out and up from above the ears



U-shaped horns, above ears



From a distance notice that the wood bison legs are visible and the large hump gives the wood bison's back a distinct triangular shape.



Muskoxen:

- Much smaller in size (4-5 ft tall)
- 400–800 pounds
- Small or no hump
- Tail not visible
- Long hair obscures belly and upper legs
- Distinct light colored "saddle"
- Light brown nose and lower legs
- Light brown horns span the forehead, and sweep down and out from below the ears

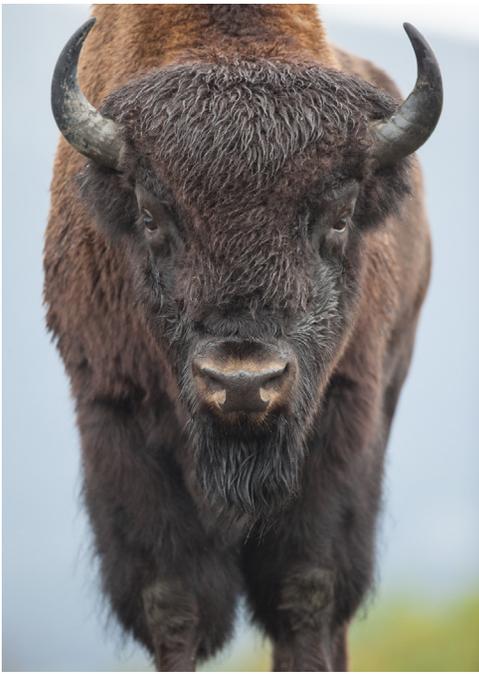


W-shaped horns, below ears



From a distance notice the distinct light colored "saddle" and the shaggy hair making the muskoxen look like a big dented barrel.





GRADES 3-6 DURATION 30-50 minutes GROUP SIZE 4-30

LESSON 9

Wood bison jeopardy

Standards: Next Generation Science Standards 3LS3-1 and 3LS4-2

Subjects: Science, government and citizenship

Skills: Wildlife identification, wood bison natural history, responsible hunting

Setting: Indoors

Vocabulary: Male, female, population size, hunting, resource management

LESSON OVERVIEW

Students test their knowledge of wood bison gender and age characteristics with a game of jeopardy. Using these skills they discuss hunt management techniques to maintain herd stability.

MATERIALS Wood bison age-gender ID PowerPoint presentation, wood bison age-gender jeopardy PowerPoint, projector and projector screen, mini white boards (optional, quantity equal to the number of groups).

GUIDING QUESTIONS How do you differentiate between a male and female wood bison? Why is it important to know the gender of an animal? Why would hunt managers restrict harvest to a specific gender or age?

BACKGROUND

When wild wood bison populations in Alaska reach a sustainable size, hunting will be allowed. Over time, wood bison (like moose or other wild game) may become a part of the culture and food supply of the people in western Alaska. To promote stewardship of the species and responsible hunting in the future, it is important that youth throughout the region understand wood bison ecology and be able to distinguish wood bison age and gender.

Not only are identification skills useful for providing natural history information to visitors, but they are also important for hunting. Herd size can be manipulated by managing harvest. For herd growth, managers limit harvest of cows and calves. However, once a herd has stabilized or grown too large for its habitat, harvest of cows and calves is often allowed.

PROCEDURE

In advance, download the **Wood bison age-gender ID PowerPoint** and the **Wood bison age-gender jeopardy PowerPoint** from www.adfg.alaska.gov > Education > For Educators > Teacher Resources > Curricula Home > Alaska Wood Bison Curriculum.

1. Ask students to suggest several reasons why being able to distinguish between age and gender classes of wood bison is important.

PROCEDURE CONT.

2. View the **Wood bison age-gender ID PowerPoint** presentation. As a class, take the wood bison gender and age quiz at the end.
3. On the board make a list of the distinguishing characteristics of a cow and bull wood bison as well as the horn shape for the four age classes.
4. Form groups of 3–4 students. Ask the first group to pick a category and a point value from the main page of the **Wood bison age-gender jeopardy PowerPoint**.
5. Click on the selected box to see the question. Students must give the answer in the form of a question (the teacher may want to set a time limit for answering questions).
 - If mini whiteboards are available: Regardless of turn, all groups answer each question in the form of a written question on their white boards. If the team whose turn it is answers incorrectly, the other teams show their answers and are awarded the point value for that question if they answered correctly.
6. To see the answer, click the screen again. If a team is correct, they are awarded the point value of the question. Click the "home" icon in the lower right corner to return to the main page.
7. Once all questions are answered, the team with the most points wins.

EVALUATION

Ask students to draw a wood bison of a specific age and gender. Check to make sure that the appropriate distinctions are made.

EXTENSION

To further explore Alaska's hunting regulations see the "Wrangling the Regulations" lesson in ADF&G's curriculum "Wildlife for the Future."

Aging wood bison!

Calf- horns 1-3 in. stick out and up.

Yearling- horns are straight and at a 45°.

Mid-aged- horns are "L" shaped.

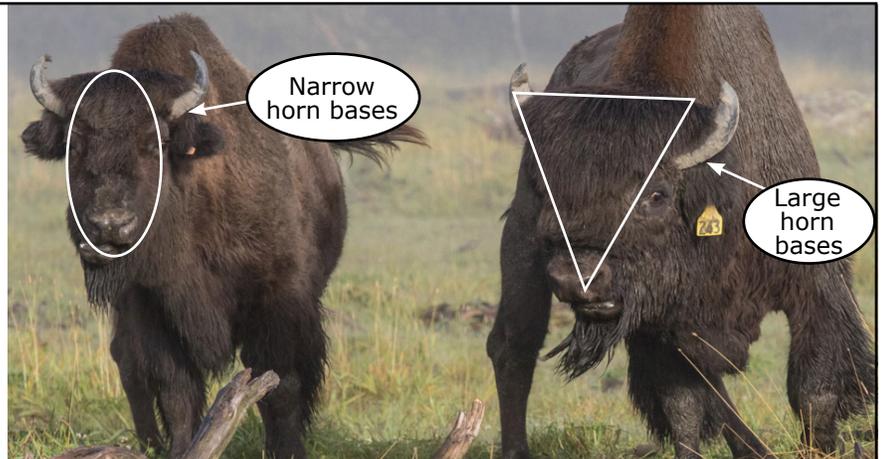
Older cows- horns are "C" shaped.

Older bulls- horns often broken from fighting during the rut. Horns can be "C"-shaped, but bases are often so thick that the shape is less distinct.



Wood bison gender ID!

The easiest way to tell the gender of a wood bison is by the presence or absence of a penis sheath. However, during winter long hair may make this distinction impossible. In these instances, width of the horn bases and shape of the head should be used to identify the gender.



LESSON 10

Your living community



Standards: Next Generation Science Standards 3-5-ETS1-1, Alaska Cultural Standard B and E

Subjects: Science, economics

Skills: Teamwork, business, discussion, listening

Setting: Indoors

Vocabulary: Community, ecotourism

LESSON OVERVIEW

Students learn to recognize the importance of working together as a community to create a stronger ecotourism industry.

MATERIALS Community role cards, ball of yarn.

GUIDING QUESTIONS What is ecotourism? How does teamwork create a stronger community?

BACKGROUND

Communities and relationships are strengthened when members interact through a locally based economy. Together, all the people and businesses that make up the community can improve the health and productivity of the system. Everyone in the community has their own role to play. Money from ecotourism slowly moves through the hands of everyone in the community, over time benefiting each person.

The reintroduction of wood bison in Alaska presents an opportunity for rural development in communities near the wood bison. This is a unique opportunity to not only bring financial opportunities to communities, but also to share Alaska’s unique and rare cultural heritage. However, a healthy economy built around ecotourism requires teamwork. By working together communities will become stronger, healthier, and more productive.

PROCEDURE

1. Define “community” on the board. Ask students to brainstorm the kinds of actions that bolster feelings of harmony within the community versus resentment and hostility.
2. Assign a wood bison ecotourism business to each student. Make sure that one student (or the teacher) is assigned the “visitor” card. Explain that healthy communities are comprised of many individuals and businesses that work together.

PROCEDURE CONT.

3. Form a circle. Have each student hold their **Community role cards** (see page 65–70) so that they can read their role description and their classmates can read their role.
 4. Begin with the individual assigned as “visitor.” The “visitor” holds onto the free end of a ball of yarn and tosses the ball to another student holding a business that the visitor relies on. This yarn toss represents the flow of money, cooperation, and respect between individuals.
 5. Students continue to make connections between businesses by tossing the yarn around the circle (and describing the relationship) until all businesses have received a connection (some businesses may be connected to several other businesses, or back to the visitor).
 6. (Optional) Remove a student from the circle. Ask the class to suggest how the removal of that business impacts the other businesses in the community. Show this broken connection visually by having each student connected to that business drop their yarn. Demonstrate how the loss of even a single business can impact the entire community.
-

EVALUATION

Ask students to describe three businesses that they think would benefit their community. Ask students to identify several potential conflicts between businesses. Why do these conflicts occur? Can they suggest ways to address these conflicts?

ADDITIONAL RESOURCES

Steps to Success for Rural Entrepreneurs: Starting an Ecotourism Business in Alaska -view the downloadable PDF at <https://seagrant.uaf.edu/bookstore/pubs/M-88.html>

I am a **BOAT CAPTAIN**. I transport visitors and their guides up and down the river in search of wood bison. I also transport gear and supplies between villages. My job is essential for keeping visitors happy. Without me, few visitors would see the wood bison.

I am a **MECHANIC**. I fix things! Boat motors, snowmachines, four-wheelers, trucks, even planes.... You name it, I can fix it. I also maintain the local equipment so that fewer things break down and customers do not get stranded on their adventures. My job is really important, without me the whole village stops moving.

I am a **NATURALIST GUIDE**. I have learned about the natural environment near my community. I can identify all the birds, mammals and many of the plants. I even know some of the traditional uses of plants. Even when bison are not near our community, I can show visitors all kinds of amazing things about nature.

I am a **BISON VIEWING GUIDE**. I know all about wood bison. I have learned about their history (and their near extinction), how they are doing in their new environment, what they eat, when the new calves were born, and lots of other things. I also keep track of where the herd is. I bring visitors to the wood bison and help keep tourists safe.

I am a **CULTURAL GUIDE**. I am passionate about my Native history. I understand the importance of sharing my culture with other people, not only in my community, but visitors as well. I show my clients examples of Native cultural activities such as netting fish, dancing and singing, and story telling. I also provide examples of traditional uses for berries, fish, and meat.

I run a **BED AND BREAKFAST**. I love making people feel at home. I also have an extra room in my home and like to keep it clean and inviting. I provide a safe and comfortable place for visitors to stay while they are in town.

I am a **CARVER**. I love to be artistic. I am also passionate about nature and my culture. By combining these passions I have developed a business carving natural and cultural scenes into drift wood, horns, and bones. I carve all kinds of useful items too! My favorites are my cribbage boards and knife handles.

I am a **PAINTER**. I love expressing myself through art. I enjoy painting landscapes with wood bison, birds, and the other mammals that I see near my community. I started selling these paintings to visitors. I found that they appreciate my art as well!

I am a **FUR SEWER**. I love to be creative. I also like to hunt and trap. I use the skins from these animals to make all kinds of items. I sell my beaver mittens, caribou hide slippers, and wolf ruffs to visitors and community members.

I run an **ARTISANS MARKET**. I love arts and crafts as well as business and marketing. I have an eye for beautiful things and help local artists sell their products to visitors. I provide a central location to sell many different kinds of locally made items. I post pictures of the products on social media, which helps me gain new customers on my online www.etsy.com shop.

I am a **MECHANIC**

I am a **BOAT CAPTAIN**

I am a **BISON VIEWING
GUIDE**

I am a **NATURALIST
GUIDE**

I run a **BED AND
BREAKFAST**

I am a **CULTURAL GUIDE**

I am a **PAINTER**

I am a **CARVER**

I run a **ARTISANS
MARKET**

I am a **FUR SEWER**

I run the **AIRPORT SHUTTLE**. I am the first person to greet visitors to my community. I enjoy talking to new people, telling them about my community, and learning about their homes. I not only provide a ride for visitors coming and going to my community, but I also transport supplies, equipment, and mail.

I sell **FUEL**. If it were not for me, no visitors would come to my community. In fact, my whole community would be stranded. I provide fuel for boats, snowmachines, 4-wheelers, vehicles, and airplanes. I am very careful that no fuel is spilled on the ground when I am fueling.

I run an **INTERNET CAFE**. I love having friends, family, and visitors around! I also make good strong coffee and delicious baked goods. Many visitors need a place to connect to the Internet and phone home. I put all these pieces together and built a small Internet cafe. Here visitors have access to the Internet, enjoy snacks, and relax in a comfortable atmosphere.

I am a **TRAVEL AGENT**. I have strong communication skills, and am great at planning and organizing. I started a travel agency. Visitors come to me for help planning their trip to my community. I book flights, reserve a guide, find a place to stay, organize transportation from the airport, plan meals, and everything in between. I make travel to my community easy and stress free.

I am a **COOK**. I love creating tasty meals! I enjoy feeding my family and friends, and now I am putting this passion to the test by cooking for visitors. I not only provide breakfast and dinners for people staying at the Bed and Breakfast, but I also pack lunches for people during guided trips.

I am a **HUNTING GUIDE**. I am a passionate hunter and I enjoy sharing this passion with others. I guide visitors on hunting trips, showing them where the good spots are and helping them to harvest their game. For now I specialize in moose, but in the future, when the wood bison populations are large enough, I plan to guide wood bison hunts too!

I am a **AIRPLANE PILOT**. I love being able to see my community and the country around it from the sky. There is nothing as satisfying as spotting a big bull moose, a new born wood bison, or a migrating swan from the air. I love to share these experiences with others. I not only transport visitors between villages, but I also take people on flight-seeing tours.

I am a **MARKETER**. I enjoy taking photos, keeping up on social media, and connecting with new people. I use these skills to help market local businesses online. I take photos of visitors enjoying local businesses and post them on social media sites, write short articles about experiences in the community, and keep up on online advertising techniques.

I am a **WEB DESIGNER**. I love computers. As a kid I enjoyed making computer games, now I am putting those skills to use. I design and maintain websites for local businesses. This allows them to provide information about their businesses online as well as book new clients.

I am a **FISHING GUIDE**. There is nothing I love more then catching a giant fish on a rod and reel. Recently some visitors came to town to see the wood bison, and I happened to be headed down to the river to catch fish. They joined me and it was the highlight of their trip. I now run a fish guiding business. Sometimes we walk streams fishing, other times we float the river.

I sell **FUEL**

I run the **AIRPORT
SHUTTLE**

I am a **TRAVEL AGENT**

I run an **INTERNET CAFE**

I am a **HUNTING GUIDE**

I am a **COOK**

I am a **MARKETER**

I am a **AIRPLANE PILOT**

I am a **FISHING GUIDE**

I am a **WEB DESIGNER**

I am a **TRAPPER**. I enjoy being outdoors following animals, and learning about the world around me. My knowledge of the land and animal behavior helps me to be a better trapper. I provide furs and bones to people in my community for sewing and crafts.

There are many artists and craft makers in my community, but I specialize in creating **BISON ART**. I use the bones, horns, and hooves of hunted bison for carving. I make jewelry, knife handles, belt buckles, and other items which I sell to visitors.

I run a **STORE**. I am organized and enjoy business. I sell food, supplies, and extra items that visitors may need when they come to my community. Many people rely on me, not just visitors. The entire community purchases the items I stock at my store.

I am a **KNITTER**. I love wool. I spend my time hiking around my community looking for places where muskox or wood bison have brushed up against vegetation. I pick their hair off the vegetation and spin it into wool to use for knitting. I sell handmade knit hats, scarves, and socks to visitors and community members.

I rent **BOATS, SNOWMACHINES, and 4-WHEELERS**. Although many tourists prefer fully guided trips, some visitors are more adventurous and want to experience nature on their own. I provide this opportunity by renting boats, snowmachines, and 4-wheelers.

I am a **CARPENTER**. I can build just about anything. You need a new cabin? I will build it. Have a broken chair? I will fix it. I can even lay concrete and fix sinks. I have tools and I know how to use them! I love working with my hands and improvising new ways to do things.

I run a **HEALTH CLINIC**. I am passionate about helping others and providing quality health care to community members and visitors. I respond to emergencies, provide first aid, and interact with physicians to provide the best treatment to my patients. I am proud to be a certified Community Health Aide.

I am a **VISITOR**. I am not from here, but I cannot wait to explore the area. During my trip I am excited to see wildlife, meet local community members, and learn about rural life and traditions.

I am a **BISON ARTIST**

I am a **TRAPPER**

I am a **KNITTER**

I run a **STORE**

I am a **CARPENTER**

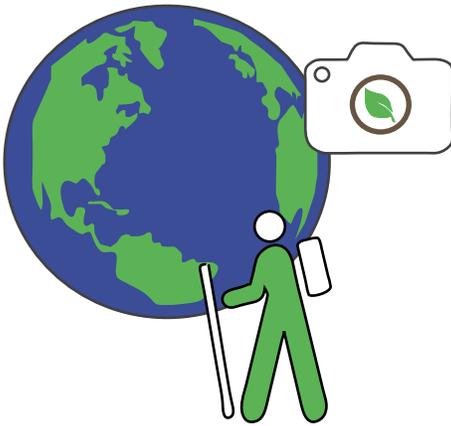
I rent **EQUIPMENT**

I am a **VISITOR**

I am a **CERTIFIED
COMMUNITY HEALTH
AIDE**

LESSON II

A wood bison economy



Standards: Next Generation Science Standards 3-5-ETS1-1, Alaska Cultural Standard B and E

Subjects: Science, economics, visual art

Skills: Business planning, research, critical and creative thinking

Setting: Indoors

Vocabulary: Business plan, marketing, ecotourism

LESSON OVERVIEW

Students plan and market businesses to support an ecotourism industry for wood bison viewing and hunting.

MATERIALS My wood bison business plan (one per student), access to Internet for researching business ideas.

GUIDING QUESTIONS Why is a business plan important? How can ecotourism and development benefit a rural community? What is the role of community members in conservation of wood bison?

BACKGROUND

Even though wood bison have value just by existing and providing wildlife viewing opportunities to community members, they are also valuable as a draw for ecotourism. People from around the world are interested in viewing, photographing, and hunting wild wood bison. To do this, visitors need guide services, lodging, and meals. Ecotourism cannot only help protect wood bison, but it can also benefit the village economy. In addition to ecotourism, scientific study of wood bison will also benefit the local economy as knowledgeable local hires are needed to monitor wood bison and provide resources to visiting scientists.

Ecotourism has been successful across the globe. Rather than utilizing mass commercial services, visitors are choosing to use small-scale, local businesses to enjoy fragile, pristine, and relatively undisturbed natural areas in a low-impact way. This form of ecotourism fosters respect for different cultures, provides funds for ecological conservation, and directly benefits the economy in local communities.

With planning, creative thinking, and successful advertisement communities across western Alaska can create an ecotourism economy surrounding wood bison. Entire communities benefit, not just a single guide agency or bed and breakfast. Over time, funds that come into the community through ecotourism will benefit all community members.

BACKGROUND CONT.

In addition to interacting with wood bison, visitors need a place to stay, transportation, and food to eat. Many visitors are also interested in Native culture and understanding life in rural Alaska. Sale of locally made arts and crafts can also be part of a successful ecotourism economy. To be effective in rural Alaska, ecotourism requires the entire community working together as a team!

PROCEDURE

1. On the board, define ecotourism. Ask students to make comparisons with other tourism strategies (such as cruise ships). Make a list of pros and cons that ecotourism might bring to their community.
 2. Brainstorm with students potential ecotourism businesses within their community (see the **Wood bison business ideas** on page 74 for help).
 3. Have students choose a business. If students already participated in Lesson 9: Your Living Community, they may want to use the same business they were previously assigned.
 4. (Optional) Write each business on the board, draw lines between related businesses to demonstrate how each business benefits the rest of the community for success. Emphasize the importance of the entire community working together to create a sustainable ecotourism industry.
 5. Give each student a **My wood bison business plan** booklet (see page 75–78). Use online resources and interviews with community members to research and plan each business.
 6. Once the business plans are complete, each student gives a three minute presentation describing their business to the rest of the class and prospective ecotourists.
 7. Ask each student to plan a “wood bison vacation” according to the three minute presentations made by their fellow students. If desired, limit the amount of money each visitor can spend or the number of businesses they can use.
-

EVALUATION

Ask students to list three ways that a wood bison ecotourism industry can benefit their community.

EXTENSION

Provide students with a “start-up” budget. Allow students to plan how they will spend their money to purchase equipment and market their businesses. This can provide an opportunity for older students to review small business loan and grant options.

ADDITIONAL RESOURCES

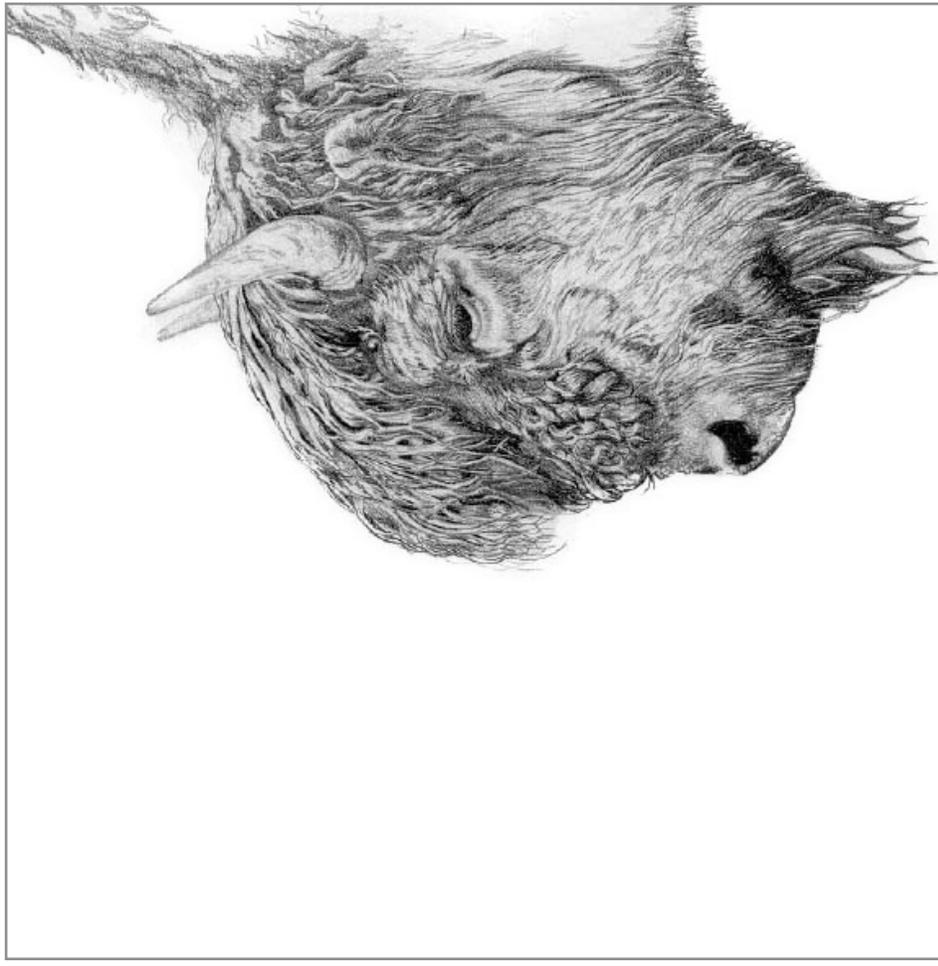
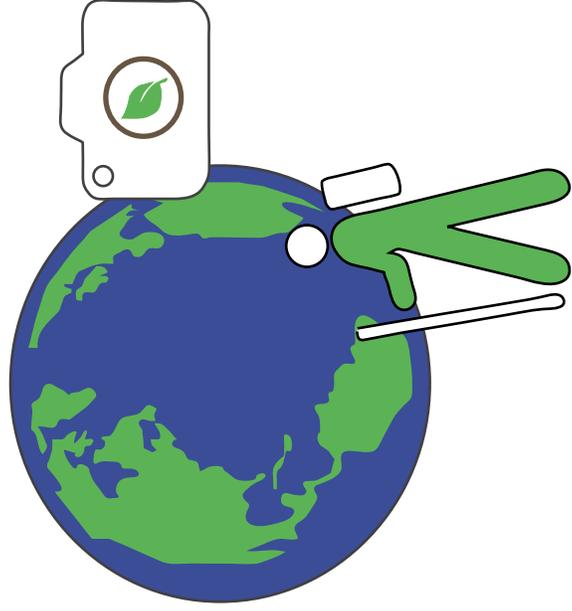
Steps to Success for Rural Entrepreneurs: Starting an Ecotourism Business in Alaska -view the downloadable PDF at <https://seagrant.uaf.edu/bookstore/pubs/M-88.html>

Visit the Alaska Small Business Development Center web page for information on creating a business plan <https://aksbdc.org/>

Wood bison business ideas

Business	Description and jobs within business
<i>Boat owner</i>	Boats are necessary for transporting visitors between villages and out to view the wood bison. In addition to a boat captain, mechanics are essential to keep boats running smoothly.
<i>Fuel vendor</i>	Whether it is fuel for boats, planes, 4-wheelers, or snowmachines, a fuel vendor is essential for transporting visitors.
<i>Airport shuttle</i>	Visitors need transportation from the airport to the bed & breakfast.
<i>Bed and breakfast</i>	Visitors need a clean and safe place to stay while they are in town. Some bed and breakfast may also hire a housekeeper to wash and maintain rooms, a cook, and booking manager who lines up guests and answers questions about lodging.
<i>Cultural guide</i>	Many visitors are interested in Native culture. This type of guide shows clients examples of Native and rural cultural activities such as: <ul style="list-style-type: none"> • Netting fish • Dancing and singing • Stories/oral history • Annual cycle of activities (harvest of berries, fish, meat)
<i>Wood bison viewing guide and naturalist</i>	Visitors will need a guide to locate the wood bison. The guide should be knowledgeable about wood bison natural history, as well as local plants and animals.
<i>Wood bison hunting guide</i>	Once the herd has reached a certain level, hunting may be allowed. Hunting guides will be needed to help hunters locate and harvest wood bison. Packers will be needed to haul meat and gear.
<i>Artists</i>	Visitors may purchase locally made products such as paintings, carvings, and items sewn from skins.
<i>Artisans market</i>	An artisans market is a place where multiple artists sell their products. This kind of market provides a centralized location for visitors to shop for souvenirs and locally made handicrafts.
<i>Store</i>	Some visitors may arrive in the community without the proper food or gear. They may need certain supplies from a store.
<i>Internet cafe</i>	Visitors may need or want to contact family and friends while in the village. An Internet cafe usually provides Internet and phone services as well as coffee and snacks.
<i>Travel agent</i>	Local travel agencies help visitors plan their trip. In addition to providing general information, an agent can organize all aspects of a visitors travel including sleeping and eating arrangements, transportation, tours and guide services.
<i>Marketer</i>	Marketing is the most important step to a successful ecotourism industry. Without proper advertising visitors will not know what is available. A marketer maintains social media sites, creates online and local advertisements, develops brochures, websites, and communicates with potential visitors.
<i>Health clinic</i>	An emergency health clinic is an essential business for keeping community members and visitors safe.

MY WOOD BISON BUSINESS PLAN



Business name: _____

Business owner: _____

BACKGROUND

At one time, wood bison were near extinction. Now that they have been reintroduced in western Alaska, people from around the world are interested in viewing, photographing, and hunting these giant and rare animals. Village economy's can benefit from these new visitors by providing guide services, lodging, meals, and locally-made products.

These kinds of ecotourism activities are succeeding across the globe. Rather than utilizing mass commercial services, visitors are using small-scale, local businesses to enjoy fragile, pristine, and relatively undisturbed natural areas in a low-impact way. This form of ecotourism fosters respect for different cultures, provides funds for ecological conservation, and directly benefits the economy and development of local communities.

With planning, creative thinking, and successful advertisement communities across western Alaska can create an ecotourism economy surrounding wood bison. Entire communities can benefit, not just a single guide agency or bed and breakfast. In addition to viewing wood bison, visitors need a place to stay, transportation and food to eat. Many visitors are also interested in Native culture and understanding life in rural Alaska. Sale of locally made arts and crafts can also be huge part of a successful ecotourism economy. For ecotourism to be effective in rural Alaska, it takes the whole community, working together as a team!

"Ecotourism is the responsible travel of individuals to natural areas that conserves the environment and improves the well-being of local people."

Write a business slogan!

Design your logo!

 *How will you market your business?*

- Sign near business
- Fliers around town
- Brochures
- Radio advertisement
- TV commercial
- Newspaper ad
- Magazine article
- Bulk mail fliers
- Website
- Facebook
- Instagram
- Other _____

 *How will you market?*

 *How much money will you invest in each marketing tool? Is this a one-time expense or a monthly fee?*

Marketing tool	Estimated cost
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

 *How much will it cost to launch your business?*

BUSINESS PLANS!

A well thought out business plan is essential for any successful business endeavor. The following questions will help you plan your wood bison business.

 *What is your product or service? Why is it unique and important for the local ecotourism industry?*

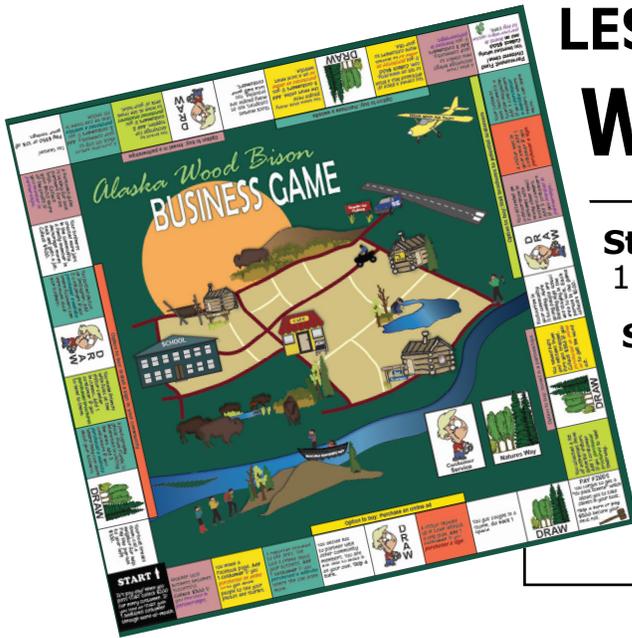
 *Who will buy your product or use your service?*

- Community members
- Transporters (boat drivers, airplane pilots ...)
- Ecotourists
- Hunters
- Other _____

 *What do you know about your customers, their needs and interests?*

LESSON 12

Wood bison business game



Standards: Next Generation Science Standards 3-5-ETS1-1, 1-2, and 1-3, Alaska Cultural Standard E

Subjects: Science, economics

Skills: Marketing, advertising, teamwork

Setting: Indoors

Vocabulary: Marketing, advertising, customer service, loans, ecotourism, value

LESSON OVERVIEW Students play the Alaska Wood Bison Business Game where they purchase marketing tools to attract customers, and learn about potential customer service and nature related issues that face small ecotourism related businesses in rural Alaska.

MATERIALS For every six students: Alaska Wood Bison Business Game playing board and associated cards, wood bison money (10 sheets per board game), two die, playing pieces (one per student).

GUIDING QUESTIONS What is marketing? How can differing attitudes toward wood bison among local community members and visitors impact ecotourism?

BACKGROUND

Ecotourism opportunities may increase in western Alaska as visitors from around the world travel to remote areas to see and potentially hunt wood bison. Whole communities may benefit from this increase in visitors if members develop businesses to support the ecotourism industry.

The wood bison business game is similar to Monopoly, but instead of buying real estate, players acquire customers by marketing their wood bison ecotourism businesses. Throughout the game, players endure the unavoidable cost of working in the tourism industry, which in rural Alaska can be particularly difficult (weather and transportation problems, customer service issues, equipment repairs, etc.). This game should be played after students complete Lesson 10: A Wood Bison Economy.

PROCEDURE

In advance, locate or print an Alaska Wood Bison Business Game playing board and associated pieces from www.adfg.alaska.gov > Education > For Educators > Teacher Resources > Curricula Home > Alaska Wood Bison Curriculum.

PROCEDURE CONT.

1. (Optional) Ask students to think of a time when someone in their community did not have enough work. Have friends or family left the area to find jobs elsewhere?
 2. Tell students that ecotourism is one way that families can make a living in rural communities.
 3. Define marketing on the board. Tell students that marketing is a way to communicate and develop relationships with potential visitors.
 4. Brainstorm marketing techniques that have worked well in their community. Can students think of instances when they purchased something because a great marketing tool was used?
 5. Introduce the "Alaska Wood Bison Business Game." Tell students that this game teaches ways to use marketing tools to draw visitors to rural communities where they can see wood bison.
-

DISCUSSION

1. Discuss with students which marketing tools worked best? Why were these tools more effective than others? Can students think of ways to use these tools in their community?
 2. Ask students to brainstorm marketing tools that could be more effective in their community (i.e., Groupons, interpretive talks, a burger stand).
-

EXTENSION

Discuss how every community is different, viewpoints of community members can influence how people respond to marketing tools. Ask students to brainstorm how members of their community view wood bison. Can students suggest ways to capitalize on those viewpoints? Explain that the value of an object or animal is different depending on the individual. Use the "Eye of the Beholder" lesson in ADF&G's curriculum "Wildlife for the Future" to explore different viewpoints.

ADDITIONAL RESOURCES

Steps to Success for Rural Entrepreneurs: Starting an Ecotourism Business in Alaska -view the downloadable PDF at <https://seagrant.uaf.edu/bookstore/pubs/M-88.html>

ADF&G's Wildlife for the Future curriculum can be viewed online at <http://www.adfg.alaska.gov/index.cfm?adfg=alaskawildlifecurriculum.wildlifeforfuture>

GAME RULES

Object of the game: Each player starts the game with \$2,000. Players use this money to maintain and market their business. The object of the Alaska Wood Bison Business Game is to gain new customers through marketing and excellent customer service.

Players: 3–6 players per board game, associated cards and playing pieces.

Starting the game: Each player chooses a playing piece from around the classroom that represents their desired wood bison business. To see who starts the game, each player rolls a die, highest roll goes first. Play then continues in a clockwise motion. Players roll two dice to move their marker down the gaming track.

Gaining new customers: As players advance around the game board, colored sections indicate the option to buy **Marketing tool cards**. While in these sections, players can purchase a **sign, mail brochures, build a website, advertise online, or develop partnerships** with other businesses. Once a player invests in a marketing tool, if they land on the associated color coded space on the gaming track, they gain new **Customers**. Potential to gain new customers increases when players purchase multiple marketing tool cards. At any time a player can sell a marketing tool back to the bank at half its original value. Customers may be sold to other players for whatever price a buyer and seller agree on.

Keeping track of customers: Players keep track of their “points,” a.k.a. customers, using the **Customer cards**.

Draw cards: If a player lands on a draw space, select a **Customer service** or **Nature’s way card** (depending on the picture indicated on the space) from the top of the deck. Each card indicates a positive or negative fate related to customer interactions or nature.

Getting paid: With each completed trip around the board players collect \$200 for every customer in their possession. If a player lands on “START” they also receive one customer through word-of-mouth.

The bank: The banking functions may be performed by one player as Banker, or every player may “help themselves.”

The end of the game: The Alaska Wood Bison Business Game is played until an agreed upon time limit has been reached. At the end of the game, assess the net worth of each business in cash and customers. Each customer is worth \$200. The player with the highest value of net assets wins.

This game was modeled after Monopoly © and The Farming Game ©.



Draw cards



Marketing tool cards



Customer cards

The State of Alaska is an Affirmative Action/Equal Opportunity Employer. Contact the Division of Wildlife Conservation at (907) 465-4190 for alternative formats of this publication. Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and through state hunting license and tag fees.

