Revised 4/20/20
Neal Smith National Wildlife Refuge

Bison Investigation

4th Grade

60 Minutes

Spring

Summary

Students listen to and look at journal entries about bison from the early 1800s, including Lewis and Clark's journal. A field leader holds a discussion about how these nature journals documented bison history and how recording daily observations is important for history. Next, students ask questions about bison characteristics and behavior and set up entries in their nature journal. Students are provided with binoculars to aide in their bison observations. Students head outside and record the number of bison they find, describe their behavior and characteristics, and sketch the bison just like Lewis and Clark and other early settlers did during the 1800s. Lastly, students share their discoveries and discuss the implications of their field work for future generations.

Next Generation Science and Iowa Core Standards

Next Generation Science

- **4-LS1-1**
  - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- **4-ESS3-1**
  - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- **4-ESS3-2**
  - Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Literacy

Writing

- **W.4.1**
  - Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

Speaking and Listening

- **SL.4.1**
  - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- **SL.4.4**
  - Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Materials and Resources

- Blank paper or nature journals
- Pencils
- Clip boards
- White board
- Dry erase marker
- Photos of Lewis and Clark expedition
- Notes from Lewis and Clark
- Binoculars (optional)

Presentation

(See background information)

Directions

1. In the classroom, welcome students, teachers, and chaperones to Neal Smith National Wildlife Refuge and remind them of your name.

2. Organize students into small groups, each led by a chaperone. Since there are five bison hides, each group can sit on a bison hide.

3. Explain to students that they will have the opportunity today to conduct an investigation of one of the Refuge's most famous animals—Bison!

4. Ask students what they already know about bison. Write the answers on a white board.

5. Once you have a list, ask the students how they learned so much about bison. What were there sources? Books, the internet, TV, and other people are all common answers. Write the sources next to each previously written fact.

6. Regardless of the source, someone had to do research for us to learn about bison. Some famous American explorers gave us a lot of this research at the beginning. Show picture of Lewis, Clark and Sacagawea. Do we know who these explorers are?

7. President Thomas Jefferson hired the Lewis and Clark expedition to explore the Western United States. The group traveled to the west coast and back, noting what they saw along the way. And one thing they saw was bison. Read an excerpt from Lewis' diary on the number of bison he saw on a hill.

8. Tell them that in 1804 Meriwether Lewis approximated that he saw 3000 bison on one hillside. Ask students to look out the window and imagine 3000 bison. It would be enough bison to color the hillside brown! Explain to the students that what is truly remarkable about Lewis and Clark's entries were that they were just reporting on what they saw. At the time, they had probably seen tons of bison on their trip out west, but they never failed to record it.

9. This would be like us recording how many ants we find, or geese are in our ponds, or squirrels in our trees. The rest of society would think it to be an unordinary and no noteworthy sighting. However, we should all be thankful that Lewis and Clark had the foresight to record their bison sightings because a hundred years after their entry, there were only 1000 bison left in all North America and 100 years after that there are only 250,000 wild bison. Explain to students that today they will have a chance to document their own history. Ask student to contemplate the thought that maybe 100 years from now someone will find it extremely interesting and important that 4th grade students, visiting Neal Smith NWR, on this exact date saw bison.

10. Based off Clark's notes and other research, scientists estimate 35 – 75 million bison lived in the United States around the time of Lewis and Clark.

11. Tell students that today, they get to be explorers like Lewis, Clark and Sacagawea. Imagine that I am the president, and I am sending you on an expedition to explore Neal Smith's bison. I know very little about them, other than what a few other explorers have told me/brought back. What are some ways you could learn more and report your findings to me?

12. Binoculars are a good way to examine bison from a safe distance. But what if we don't see any? Think about dinosaurs: scientists were never able to watch them, but we still know a great deal by looking at artifacts? Bones, fur, footprints, etc. are all examples of these artifacts!

13. We received reports that there is a field outside the bison have used. I want you to explore it for bison artifacts. Then, as small groups, bring your artifact inside and study it. You will prepare a report for the president and the other science explorers.

14. Explain to students that they now need to get ready for their bison investigation. Pass out clipboards, pencils and paper. Instruct students on how to set-up their journal entries. At the top have them record their name, date, location, and weather conditions. Then have students divide their paper into four quadrants. The labels for the quadrants should be: "Bison Discovery", "Bison Sketch", "Bison Bone Discovery", and "Bison Bone Sketch".

15. Go over an example and expectations for journal entries. Tell them that the bison and bone discovery are places for them to make educated guesses about their bones. Ask them to write down 1) what they think their bone is, and 2) what it teaches us about bison. Explain that they should write about and draw the bison in such detail that if they gave it to someone who had never seen a bison, they would be able to understand how they behaved and what they looked like. It works well to have them draw the stuffed bison that is in the bison room before they go outside. Remind them that it is similar task as Lewis and Clark, who had to write home to President Jefferson, who had never seen the West before. Encourage students to use descriptive words, labels, and numbers in their journals. Encourage them to use complete sentences and to try to use comparisons to describe the bison's color, weight, size, etc. For example, the bison looks as large as a car. Provide an example of a detailed data sheet for students to look at and examine.

16. (*Optional, only if using binocular and bison are visible*) Lastly, give students quick instructions on how to use binoculars. Explain that binoculars are a tool naturalist use to see items that are far away. Show them how to hold the binoculars and how to turn the knob to focus their view.

17. Before going outside, review rules and expectations for behaving as a naturalist. Tell students someone has already marked the area with flags where we can find bison artifacts. Once an artifact is found, your group should return to the

mowed grass and examine it. Once each group has found an artifact, we will return as a class to the bison room.

18. Give students 5-10 minutes to fill out their journals. They can use anything in the bison room as a source of knowledge. Remind them: they are to write down 1) what they think their artifact is, and 2) what it teaches us about bison. They should sketch their artifact, and where they think it belongs on a bison.

19. Once finished, ask each group to share their discovery with the class. After students share, ask students if by observing bison today- it has sparked more questions in their minds? Pose some other wonder questions to discover, like how could some of the bison artifacts we found be used by humans? Think about how so many bison disappeared over such a short amount of time. What happens when something useful like bison are hunted unsustainably? What would you recommend to the president to keep healthy numbers of bison?

20. Thank students for coming. Remind students that they do not have to be at Neal Smith NWR to be a naturalist. They can be anywhere- in a car in a parking lot, waiting for the bus in the morning, looking out their bedroom window- and find nature. Encourage students to record the ordinary because they never know the changes that time and history may bring.

Resources

Background Information

Lewis and Clark and Human Relations with Bison:

There once were 35 – 75 million bison living in the United States. The reasons there is such a large range of number for this estimate is because experts are not 100% sure and cannot seem to agree on the bison population of the past. The bison's range covered most of the United States, from just east of the Rocky Mountains, which seemed to be a barrier for them, to the east coast, into Florida, Mexico, and Canada (please see map below). It is possible that Native American's helped encourage the bison populations throughout the United States by burning the prairies and forests which encouraged the growth of their favorite foods and may have helped expand their range especially to the east.

Because of a growing population of Europeans in the east by the 1800's almost all the bison that were east of the Mississippi River were killed or chased away. The Europeans hunted them for food and to keep them out of their crops. The movement of Europeans into these areas and the prairies pushed the bison out of their previous range and father west.

The bison inhabiting the western range of the United States were hunted sustainably by Native Americans and bison populations remained at the large level until the early 1800s. However, the Louisiana Purchase in 1803 sparked American settlement into bison's habitat range, which had devastating effects. In 1803, the United States of American bought the Louisiana Purchase from France. Shortly after, the United States President at the time, Thomas Jefferson, commission the Corps of Discovery and hired two US Army soldiers, Meriwether Lewis and William Clark, to explore the Missouri River and take detailed and accurate notes on natural resources, possibilities for settlement, and current inhabitants. Lewis and Clark's journal entries were full of adventures, newly designed maps of the region, documentation of nearly 122 species of animals and 178 plants, and notes of

Native American relations. The nature journal of Lewis and Clark is a leading scientific and historical document that provides insights into the natural history of the West. Their journal inspired, along with substantial governmental incentives and dreams of a better life, Americans to expand westward.

As Americans settled in the western United States, bison populations declined. Later mass execution of the bison followed for reasons ranging from using the animals for food and clothing; to keeping them out of the crops; clearing the way for the railroad (trains could be derailed by hitting large herds of bison or held up for days as the bison passed); the control of the Native Americans who depended on bison for survival; to killing the bison for fun and/or profit by selling the hides and tongues.

By the 1900's less than 1,000 plains bison and wood bison remained. The remaining bison were those that had been rounded up by ranchers and sportsmen who did not want to see the bison disappear. When Yellowstone National Park was established, some of these bison were moved to the park so they could be protected and hopefully make a comeback. Today there are a lot more bison than there were 100 years ago. Wood bison are still considered an endangered species as there are less than 4,000 today. The American bison populations are much higher today than 100 years ago. Their numbers have rebounded to almost one million although most of these animals can only be found on farms. There are around 250,000 wild bison today. There are precious few wild herds remaining - the most famous wild herd of bison can be found in Yellowstone National Park.

Facts and Characteristics about Bison

Some people know the American bison by many different names; for example, American bison, American buffalo, buffalo, bison, plains bison, plains buffalo, mountain buffalo, and the names keep going*. Which is correct? All are correct,

the difference is that Bison bison is the scientific name for what most of us know as the buffalo or one of the other names just listed. When the French explorers first came to this country, they called the animal "Les boeufs" because they thought that the bison were wild cows or oxen and the name stuck. Bison are different than the types of buffalo that you would find in Europe, Asia, and Africa. American bison are distantly related (they all descended from a common ancestor) to animals like the water buffalo, anoa, yak, gaur, saola, and African or cape buffalo, even domestic cattle.

When bison are born, they weigh between 50 to 80 pounds and can stand soon after birth. The calves are reddish in color, have nubs for horns, and no hump on their back. They begin to get their hump soon after birth. Not having horns or a hump makes the birth easier on the mother. When they are fully grown, the tallest bone in their back (known as the hump bone) can be over a foot tall. Adult bulls (male bison) can weigh 2,000 to 2,500 pounds (about the weight of a small car) and stand up to seven feet tall at the shoulders. Females are smaller - they can be 700 - 1,500 pounds and stand about five feet tall at the shoulder. They can run for long periods of time at about 35 miles per hour. They can even swim and are surprisingly agile for their size.

A two-year-old bull calf can also stay with its mother, but as soon he turns three, the big bull runs him off to join the bachelor bulls. This is because at age three bison are sexually mature. Females or the cows keep the female calves with them their whole lives. Therefore, the large herd that might be seen roaming around Neal Smith NWR is called the “family herd” and is composed of females and male calves under the age of three.

Lone bison or bison that are in small groups of 3-5 are usually bull or male bison that have left the family herd. One male bison out of the “bachelor” group tries to or dominate and fight other males to mate with the female bison. Also, the male bison spends a lot of energy fighting off other bachelor bulls away from the cows.

Because of this, eventually the dominant bull will lose a fight with one of the younger bulls and be overthrown. The overthrown bull is then pushed out of the herd. Because of their fighting lifestyle males only live to be about 12 to 15 years old in the wild. Females can live to be 20 or a bit older because they are usually protected by the herd.

Bison eat mainly grass so they are herbivores. Their teeth are big and flat and are used to grind up the grass. They have no top front teeth (incisors), but they do have bottom ones. Bison eat by sticking out their tongue and wrapping it around the grass. They pull the grass into their mouth and use bottom teeth against their upper jawbone to cut off grass. They chew it up a little bit, and then swallow it.

Bison are ruminants which mean they have a four-sectioned stomach. The four parts are the rumen, reticulum, omasum, and abomasum. When bison eat, they first sheer off the grass near the ground and chew it just a little bit before swallowing it. The grass then goes into the rumen which acts as a fermentation vat. Here the grass mixes with stomach acids and bacteria work on the grass to help break down the plant's cells that have a hard, protective covering.

After grazing for a while, the bison lays down. A small ball of grass is forced into the reticulum which helps sort the junk from food. When bison eat, they not only eat the good grass they sometimes get pieces of wood, rocks and other stuff. The reticulum has a lot of mucus, in it and the bad stuff sticks to mucus then the grass is regurgitated into the bison's mouth. This regurgitated grass ball is called cud. The bison then chews and chews and chews before swallowing again. The cud then goes into the omasum which absorbs water and finally into the abomasum which is much like our stomach. Finally, it travels through the digestive system and out the other end.

Bison also wallow. Wallowing is when bison lower their bodies to the ground and roll to one side and then the other. Scientists hypothesize that bison wallow in order to keep insects from feasting on them. This behavior leaves large, open and muddy ruts in the prairie and bison return to these same wallowing spots over

generations. Students may observe wallows through their binoculars during the lesson.

When bison feel threatened, their best defense is to use their speed to run. However, when faced with an imminent enemy, bison will lower their head and charge. A bison will usually indicate it is going to charge by sticking up its back tail. Bison are extremely powerful and wild animals and for this reason it is extremely important to view bison from a distance and remain in the vehicle while in the enclosure.

The Importance and Relevance of Bison to the Tallgrass Prairie:

Bison are extremely important to the Tallgrass Prairie ecosystem for several reasons. One of the main reasons why bison are important to the prairie is because they help create patchiness in the prairie landscape, which fosters a greater biodiversity. Bison created patchiness by grazing, herd movement, and wallowing. As bison graze, some areas are heavily eaten or mowed why other areas remained untouched. Likewise, as bison walk through the prairie, they trample tall grasses and leave walking trails. These trails exposed some spots to heavy sunlight and leave others covered by tall grasses.

Bison also create patchiness by wallowing. A wallow is a rut with hardly any visible vegetation created by bison when the roll on their back. All these activities create sunny and shaded patches, areas that have more moisture or less moisture, and areas that burn hotter or cooler. For example, when a fire goes through an area that has been grazed by bison it burns cooler than an area that has very tall grass because it has not been grazed these areas burn hotter. These effects help create diversity dry/moist, sunny/shady, and hot/cool patches and encourage many different plants and animals to thrive in the prairie.

Other reasons scientists think prairies depend on bison include:

- Hooves and digestive tracts may help scarify seeds.
- They open areas by grazing and wallowing allowing seeds to start; therefore, plants can colonize. that some seeds may spread through bison dung and fur
- Dung and urine are natural fertilizers.
- They eat grasses and grass-like plants which help increase forbs or flowers which may help birds, insects and other animals thrive.
- Whole ecological communities of plants and animals depend on buffalo dung, wallows and other disturbed areas.
- Different prairie animals have different habitat requirements. Prairie animal depend on the variety of grass lengths created by bison for finding food, nesting, etc.

FAQ about the stuffed bison in the bison room:

1. Is that a real bison? Yes. This bison came from a ranch in Wyoming that raises bison for meat to sell. They gave us this skin so we could show you what a bison looks like up close.
2. Why does a bison have a hump? It has huge, strong shoulders and neck muscles. Why does it need such big muscles? Look at that head. Our heads are only a little bigger than our hands. Compare the bison's hoof to his head. It takes a lot of strength to hold up a head that size.
3. Are the horns real? Nope, but here are some real horns (pass around horn coverings). Do male elk, female elk, or both have antlers? Males. How about bison? Both. Do baby bison have horns? Not right away. Their horns start growing as soon after they are born.
4. Do you have bison out here? Depending upon the time of year, we also have babies (calves) that are born in the summer. Our bison came from herds at other refuges. When there are too many bison here, we give some of our herd to other refuges or tribes. There are also elk here, but it is rare to see them because they are very shy and like to hide down by the creek when it is hot.
5. What is the difference between a horn and an antler? Horns stay on for the entire life of the animal, unless you're an antelope which are the only

animals with horns that lose their horns each year. Horns are hollow and made of material like our fingernails and hair. At times little pieces flake off. Antlers fall off every year and are not hollow. They are made of bone. While the antler is growing, it has a fuzzy covering and has a blood supply. An antler this big (biggest elk antler) weigh about 12 pounds and can grow up to 2 ½ inches a day. When they fall off, they become a calcium source for small mammals.

Journal Prompt