General Teacher's Guide: Mammal Survey

Level 1

ease of implementation: moderate

Why It's Easy for You

- Activity can be done with the provided print-outs, laminated materials, and a ruler. No additional supplies are necessary!

Conditions and Challenges

- A number of materials need to be printed and (if possible) laminated before starting
- Student data collection packets need to be printed and stapled
- During COVID-19, procedures need to be modified

OVERVIEW

Students work as ecologists to help identify animals living in a certain area by doing a "wildlife survey," or more specifically, a mammal survey. They are assigned as research assistants to help Dr. Seafha Ramos with her data collection! Their work on identifying animals by their tracks and scat is informed by Traditional Ecological Knowledge (TEK) and Western Ecological Knowledge (WEK). Although this lesson has many parts, it's essence is that students measure/observe four sets of tracks and scat and try to identify the animal from this data! There are four animals students are identifying: elk, river otter, rabbit, and porcupine.

Materials

Materials to Download and Print

- Student Data Collection Packets (1/student)
- Tracks and Scat sheets (1 file contains tracks and scat for four stations; laminate if possible)
- Animal Information Sheets for Stations (2/station)
- Mammal Sighting sheets (optional, 1 file contains animals for all stations)
- Station Signs (optional, 1 file contains a sign for all stations)
- Yurok Ancestral Territory Map (optional, 1/station)

Other Supplies

- Laminator (optional, teacher)
- Printer (teacher)
- Ruler (2+ per station)

NGSS alignment

5-ESS3-1 Earth and Human Activity: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

See pages 11-12 for more details about alignment

A collaboration between: SCIENCE DELIVERED!
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With additional support from many individuals. (Please see webpage)

Find all TEK lessons at STEMTradingCards.org/TEKlessons
Also check out Science-Delivered.org
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Why do a Wildlife Survey?

A wildlife survey is useful for many ecological research studies and wildlife management. In a wildlife survey, researchers might record what animals (or plants) live in a certain region, how abundant the animals are, and where they spend their time. A wildlife survey might be used to determine if the numbers of an endangered species are increasing or declining, or it might be used to determine the effects that certain development projects (like installing electrical infrastructure) might have on animals and ecosystems.

Wildlife surveys can be conducted in person; for example in some studies researchers might walk at a certain slow pace at the same time each day and record every animal they see to get a sense of mammal-density in that area. Researchers often use "camera-traps" to detect animals, where a camera is installed in a certain location and is triggered via movement to take pictures.

We have attempted to bring in as many realistic aspects of a wildlife survey into this activity as possible, but some elements must of course be artificial due to the classroom setting and to support 5th grade educational goals.

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Advance Preparation for this Lesson

- Determine how many total stations you need for your class (we recommend students work in groups of 3-4). There are four stations, each representing an ecological "area": forest, prairie, creek, and the Klamath River. You might wish to duplicate stations if you have a larger class.
- Print and (if desired) laminate the "Track and Scat Sheet" for stations.
- Print "Animal Information Sheet for Stations." Print 1-2 copies per station.
- Print and staple "Student Data Collection Packet" for each student.
- (Optional) Print the "Mammal Sighting" sheets. (Do not laminate as you will be folding them).
- (Optional) Print and (if desired) laminate "Station Signs" for each of the stations.
- (Optional) Print and (if desired) laminate "Yurok Ancestral Territory Map."
- If time permits, have a class discussion asking students what the benefits of doing a mammal survey could be.
- Create a plan for students who finish before the assigned time and for those who need more time to complete the assignment. See suggestions below.
- Consider how to group students (3-4/group) to build success and cooperation.
- Download and preview the "Mammal Survey Introduction Tracks and Scat Exploration" pdf presentation.

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Day-of Station Preparation for this Lesson

Place documents at each station as indicated below.

At all stations put:

- "Animal Information Sheet for Stations"(Optional)
- Corresponding "Station Sign"(Optional)
- "Yurok Ancestral Territory Map"
- 2 or more rulers

At Station A: Klamath River/Hehlkeek 'We-Roy, put:

- Tracks and scat for the: Otter
- "Mammal Sighting" animal: Elk

At Station B: Forest/Tepoonohl, put:

- Tracks and scat for the: Porcupine
- "Mammal Sighting" animal: NONE

At Station C: Prairie/Sepolah, put:

- Tracks and scat for the: Elk
- "Mammal Sighting" animal: Rabbit

At Station D: Raak/Creek, put:

- Tracks and scat for the: Rabbit
- "Mammal Sighting" animal: Otter

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Activity Instructions

1. Assign students to groups of 3-4 individuals.

2. Provide each student with their own "Student Data Collection Packet."

3. Explain the assignment to students using the "Mammal Survey Introduction - Tracks and Scat Exploration" pdf presentation.

4. Give students information on how to evaluate tracks and scat, and then model measuring tracks and taking data (see sections below, and the Teacher's Key for the "Printable Tracks and Scat" sheet).

5. Assign, or ask students to assign, 1-2 group members per group who will measure the track and then rotate these roles at each station so all students have an opportunity to serve in these roles. (Having two students measure the same track at each station serves to confirm the accuracy of collected data, especially since measuring the tracks can be tricky!).

6. Have students go in their groups to their assigned station (A, B, C, or D).

7. Students will work in groups to measure their tracks and draw and write down data about their tracks and scat. There is room to record measurements and information for one track per animal in their Data Collection Packets. All members of the group should report on the same track.

8. Students will compare the data and information collected in step "7" to the information in the "Animal Information Sheet for Stations" in order to deduce which animal visited their their station!

9. Students will also record "mammal sightings" from the mammal sightings sheets in their data collection packets. (Note there are no additional mammal sightings at Station B).

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Activity Instructions (cont)

10. Allow 15-20 minutes per station. When time is up they can rotate to the next station and repeat steps 7-9. (Teachers can post questions for the group to discuss if they finish earlier than allotted time. Students who finish early can also write down questions they have, either things they aren't sure of in the activity, things they are interested in learning more about, or write down some of the Yurok names for the animals and station names).

11. After completing all four stations, have students fill out the final page of their "Student Data Collection Packets."

12. Check as a class to see if they got group answers correct, discuss what went right or wrong in measuring and identifying tracks and scat, and have a post-activity discussion. (See below).

Script Suggestions to Introduce the Activity

Use with "Wildlife Survey Introduction - Tracks and Scat Exploration" Presentation.

One way to study animals is to identify where animals live and spend time. This helps us know animals' preferred habitats to sleep, eat, rest, and travel. Knowing where animals sleep, eat, rest and travel helps us protect these animals and their habitats. This is called a "wildlife survey" like Dr. Ramos does. Today you and your colleagues (i.e. other students) will be assisting Dr. Ramos in Yurok ancestral lands to conduct a survey of four mammals that are important in Yurok TEK!

Your task is to go to four different areas, the "A: Klamath River," "B: Forest," "C: Prairie," and "D: Creek," and look for and observe tracks and scat (and also be on the lookout for other animals!). You want to determine which animals live or travel in this area. (But remember, this is just one visit, so you will not see every animal that uses the area).

If you find tracks and scat, now you know an animal has visited that area! But what animal? You must identify the animal using the shape and size of its tracks and scat! Your team will need to take accurate measurements and drawings of each track and scat

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Script Suggestions to Introduce the Activity (cont)

Use with "Wildlife Survey Introduction - Tracks and Scat Exploration" Presentation

you find, also make sure to write down if you spot any animals walking, running, or resting in the area. Your field information will be useful in follow-up discussions and activities!

Good luck! Remember to cooperate with your teammates and show respect to the animals you are learning about!

Guidance for Measuring Tracks and Modeling

Give a brief overview of how to measure and evaluate tracks and scat. You may even decide to identify one set of the tracks and scat together as a class. Show students how to measure the length and width of tracks. (See "Teacher's Key for Measuring Printable Track and Scat"). Point out how you can see and count the toe marks in the track (however sometimes not all of the animal toes make a visible imprint!). Go over the various shapes and sizes scat can take. It can be shaped like a circle/sphere (circular) or like an oval. It can also come out like a longer tube (tubular) or smaller pellets connected on the ends (chains).

Note that small changes in how you hold the ruler can make a difference in the measurement. Encourage students to measure the tracks several times. Students can check each other's measurements; this is part of the group work.

Remind students they are using centimeters, not inches.

Classroom Lesson vs. Real-Life Mammal Survey

One goal of this lesson is to allow students to experience aspects of wildlife tracking and wildlife surveys in a classroom environment. To achieve this we must of course simplify and change many things that would occur in a "real" wildlife tracking project. When teaching, we recommend pointing out and discussing these differences with students. For example, the lesson is structured so that there are assigned "areas" around the classroom and students find 1-2 animals in each of these areas. In real life, students might find tracks and scat from multiple animals in one area (or no signs of animals at all).

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Classroom Lesson vs. Real-life Mammal Survey (cont)

Another major area of difference is in the outdoors, students might be able to use tracks to identify whether the animal was walking, running, or milling about. In this lesson students see only 2-4 tracks per animal and therefore cannot easily ascertain this information.

Finally, one aspect of this lesson was purposefully made artificial. In a "real" wildlife survey, scientists would be able to view images of tracks and scat to compare to the tracks and scat they discovered on the ground. In this lesson, students must compare their "found" tracks and scat to written descriptions and measurements. If students were allowed to compare the images of track at their stations to other images of tracks, the activity would be too simple. If students notice this artificial aspect of the assignment we recommend brainstorming differences between the activity and an outdoor survey, and also telling them that the activity is done this way for educational value! If they don't notice, we recommend pointing it out in a post-activity discussion to help them understand the differences between their classroom activity and a "real" wildlife survey.

Post-Lesson Discussion

A post-lesson discussion on this activity ensures students can fully make sense of the lesson and explore the questions and interests that the activity sparked!

We recommend asking students why they were measuring tracks and scat and what aspects of what they were doing in the classroom might differ from what they would do in the field. The class can discuss what purpose a "mammal survey" might serve.

You might consider having students write down what questions, thoughts, or ideas the activity sparked in them and center the conversation around student interest.

Continued on the next page

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Post-Lesson Discussion (cont)

Additional areas that might be interesting for discussion are:

Q: If you were in the field/nature, what other things might you be able to discover about animals and how they live in the environment, even if the animal wasn't present?

For example, you might ask students, what does a human bed look like if someone has been sleeping in it before it is made? What would the grasses and ground look like if an animal has bedded down there? (One answer: Grass is flattened or needles on the are flat and pushed up on the sides to create a soft bed).

From Dr. Ramos: "A great example I've been finding a lot during fieldwork is when elk fecal samples are found in areas where you can tell elk had been bedding down."

You might ask students: Would the direction of the tracks tell you anything about what the animal may have been doing? For example are the tracks moving toward the water or away from the water? Into the prairie or away from the prairie? What do you think this would indicate?

In nature, you can look at an animal's tracks and see if it looked like the animal was walking, running, or milling around. What may have determined what they were doing in each case?

Q: How is this study informed by TEK and WEK?

To the teacher: We don't want to definitively "divide up" parts of the study. In other words, we don't want to say "part X of the activity is TEK, part Y is WEK." Rather, we want to talk about which parts are compatible or aligned with the different approaches. You might suggest things like "The noninvasive nature of identifying animals is consistent with many values found in TEK." "Learning about animals in order to protect them and the Earth aligns with TEK/Indigenous values, and also many scientists in Western science want to protect the Earth too." "Both people practicing TEK and using WEK would identify tracks by their size and shape, but the practice of recording the data is more traditionally aligned with WEK practices." (Note, you can use the terms "Western science" and "Indigenous science" as well as WEK and TEK).

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Post-Lesson Discussion (cont)

Q: Did you have any challenges in measuring the tracks? If so, what were they? What about describing or measuring the scat? Did you learn anything you would do differently next time?

Students might share that it was hard to know exactly where to measure, or the edges of the tracks weren't always clear. Small changes in how the ruler was held might change their measurements a lot! Students may have gained ideas and techniques that helped them get more accurate measurements, like having two students measure and compare their answers.

Q: How could the information gathered in this or a real-life wildlife study be beneficial to society and the Earth?

For example, if wildlife surveys show a certain animal population has declined, then scientists can work to try to increase that animal's population. The survey might also help us learn where animals' preferred areas are for sleeping, eating, hunting, or traveling. Additionally, each of the four focal animals of this study are important in Yurok TEK, as discussed in lesson 3. Maybe even revisit the TEK illustrations, as they are intended to demonstrate the relationship between Yurok people and these four mammals. Having access to healthy animal populations helps the Yurok community in many ways, such as the availability of traditional foods (there has been research linking loss of traditional foods to increased rate of disease, such as diabetes, in many Native communities) and ceremonial regalia where TEK is practiced. Wildlife studies can benefit society at large by increasing peoples' connection to the environment such that we value healthy ecosystems, which we all depend on.

Further Support

We are excited for you to share this lesson with your students! If you have questions, comments, or suggestions for improvements please email omullins@science-delivered.org, or check STEMTradingCards.org for updated contact information. We would love to help support you or to hear about your experiences sharing TEK and more with your students.

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NGSS alignment

5-ESS3-1 Earth and Human Activity: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Disciplinary Core Ideas

- From NGSS "Human activities... have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments." -> In these lessons students are learning about Yurok culture and how protecting the Earth and environment is embedded in Yurok culture and science (TEK).

Crosscutting Concepts

The standard asks for "Systems and System Models" but many CCCs are addressed in this activity.

- Scale, proportion and quantity – Students use measurements of tracks and scat to determine what animal they came from. Students are given ranges for both tracks and scat and must determine if their measurements fit inside those ranges. They use standard units to measure length.
- Systems and system models – The theme of the series of lessons fits well into this SEP. Human actions and interactions with the environment work within a system, and animals live within ecosystems. Our actions have downstream consequences on animals, the environment, and therefore ourselves. These consequences can be positive or negative depending on the choices we make within the system. NOTE: This is the CCC written into the standard.
- Structure and Function – Although this CCC isn't a major focus, students might notice the different shapes and structures of the tracks and how that relates to how the animal functions in its environment. They might also discuss the relation between size of the tracks and scat and size of the animal.
- Stability and Change – Like "Systems and system models," this CCC is connected to the series of lessons. Human activities have changed the environment over time, causing ecosystems to become "unstable." TEK is a way of life that, in many cases, has been shown to be adaptive (i.e. flexible enough to change when necessary) and promote stability of human-nature interactions, which support the environment and ecosystems.

Scientific Practices

Look up the grade bands and objectives for the SEPs below to learn more details about what is expected for 5th graders. The performance expectation only asks for "Obtaining, Evaluating, and Communicating Information" but many, if not all, SEPs are addressed in this activity.

- Planning and Carrying Out Investigations – Students do minimal planning in these lessons but do carry out an investigation to identify different animals. They "make observations and measurements" and must work together to identify the best ways to measure the tracks and scat.
- Analyzing and Interpreting Data – Students "represent data" in a graph, and "compare and contrast" the data obtained from their investigation. They use and analyze their data to identify animals.

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Scientific Practices (cont)

Look up the grade bands and objectives for the SEPs below to learn more details about what is expected for 5th graders. The performance expectation only asks for "Obtaining, Evaluating, and Communicating Information" but many, if not all, SEPs are addressed in this activity.

- Using Mathematics and Computations Thinking – Students "organize simple data sets" by recording, keeping track of, and comparing their data, and they measure and record data from tracks and scat.

- Engaging in Argument from Evidence – Students must make a claim about what tracks and scat belong to which animals based on the evidence they collected and comparing it to previously gathered data.

- Obtaining, Evaluating, and Communicating Information – Prior to this specific activity students worked with texts to learn about the Yurok relationship with animals, TEK and WEK, studies done by Dr. Ramos, and information about the animals they are tracking. During this prior reading students were obtaining and evaluating information. NOTE: This is the SEP written into the standard.

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Lesson 5 File List

Below is a stand-alone list of the files for Lesson 5. This information is also found in the Lesson 5 Teacher's Guide.

"Lesson 5: Mammal Survey, General Teacher's Guide"

This document. It contains the overall instructions and background for the activity for the teacher.

"Mammal Survey Introduction - Tracks and Scat Exploration"

A pdf presentation aimed to introduce the activity to students, show real locations, and promote discussion in the class.

"Printable Tracks and Scat" (and associated Teacher's Guide)

This pdf contains tracks and scat of all four animals. Print and, ideally, laminate these and place one per station. There is a separate teacher's guide for this document with guidance on measuring tracks.

"Printable Animal Information Sheet for Stations"

This document contains information about the tracks and scat of the four animals featured in this lesson. Students must reference this information to determine which animal's tracks and scat they see at each station. Place 1-2 copies of this document per station.

"Printable Student Data Collection Packet" (and associated Teacher's Guide)

A packet for students to record their data. Although students work in a group and should have the same data, each student should record their own data individually. Note that each packet has 7 pages. There is a separate teacher's guide for this document.

(Optional) "Printable Mammal Sightings Sheet"

These sheets have pictures of animals and can be placed at stations (except station B). Students "visually spot" this animal (vs. identify the animal from its tracks) and record their sighting on their data sheet. The idea is that on a mammal survey you can use a variety of methods to determine if an animal has been in the area, and also to show students there are different species of wildlife in each area. These sheets are fun to use but can be skipped to simplify the activity.

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Lesson 5 File List (cont)

(Optional) “Printable Station Signs”

These are station signs that can be printed and placed at stations! They include a picture from the actual area, and the area name in English and the Yurok language.

(Optional) “Printable Yurok Ancestral Territory Map”

This map shows the real-life locations that correspond to each station. Print one/station, or place the map on the document camera while students work.

"Lesson 5 File List"

A stand-alone list of all files for Lesson 5.

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