eMammal: A Wildlife Stakeout

Students will deploy camera traps to collect information about the types of mammals present in a particular location. They will use custom software to upload and analyze the images captured, accurately identify the mammals photographed and share data with researchers.

Packet Contents

Objectives

- Students will use camera traps as a tool for scientific investigation.
- Students will demonstrate how to set up a camera trap correctly.
- Students will accurately identify regional mammals in the community.
- Students will use software to upload images and data to eMammal, a citizen science project.

Introduction

Your students will be enlisted as citizen scientists for eMammal, a joint wildlife research project of the North Carolina Museum of Natural Sciences and the Smithsonian Institution. Using camera traps (purchased or borrowed), your students will help scientists collect important data on how mammals use and respond to human-modified landscapes. Camera traps are motion-triggered infrared digital cameras used to capture images of wildlife to reveal when and where they are active. The first day of this project, students will do research in the classroom to learn about mammals in their region. The second day, they will practice setting up the camera trap. The third day, they will mount the camera trap at a site on the school grounds. On the fourth day (three weeks later), they will retrieve the camera to download images, tag them with correct species names, and upload the photos and data directly to the eMammal database using custom software provided by eMammal.

There are several ways to accomplish these goals with students, depending on logistics. You may want to set up a camera with a whole class of students during regular class times. Alternatively, you might divide the class into small teams of four or five students and work during planning or recess times. You may rotate student participation throughout the school year. Upon retrieving the camera, you may choose to ID photos as a class or in small teams. Camera trapping may be done in any season.

Real Science Application

Human development activities usually have a negative effect on wildlife, yet there are many species that can thrive in altered ecosystems. Some species even seem to prefer such habitats. Besides adapting to human disturbances, mammal populations and interactions between species are changing. Some species that were overhunted are rebounding, while others have expanded their range as populations of top predators decline. For example, coyotes have moved eastward into habitats in which they have never lived. Populations are living close to and even within large cities.

Scientists want to evaluate patterns of habitat use to guide the management and conservation of different mammal species. They also want to determine how potential conflicts between humans and wildlife might be avoided. To understand the impact of human development on mammal distributions, researchers need data from wildlife habitats that represent varying degrees of human use. The initial phase of eMammal studied the impacts of hunting on mammal populations. Volunteers placed cameras in parks and natural areas where hunting occurred and in areas where hunting did not occur. They also placed cameras along trails and away from trails to learn how mammals respond to trails and their use by humans.

eMammal researchers are now focusing on how the distribution of mammals changes from natural areas to human-dominated landscapes. Your students will be helping eMammal researchers answer important scientific questions, such as "How do animal communities change along a gradient from urban to wild areas?" and "How do different human activities affect wildlife in these areas?" By deploying camera traps on school grounds, students can help collect valuable data on mammal populations and movement in specific locations. Once students have identified all the animals in their photos and uploaded the images, one of the experts from the eMammal team will review them. The photos and data will appear in the eMammal database for researchers to use in current investigations.

Time & Location

This project may span one to two months depending on the chosen schedule of camera deployment. Cameras should be deployed for three weeks to acquire sufficient images and data. This work can be completed in any season.

Day 1: Introduction to mammals (classroom)
Day 2: Camera traps: how to use (classroom and school grounds)
Days 3-4 (not consecutive): Capturing images and identifying animals (classroom and school grounds)

Teacher Materials

The minimum materials required for eMammal in the classroom are a camera trap, memory card, batteries and a computer with Internet access. The Bushnell™ Trophy Cam HD camera trap takes three-picture bursts and is less expensive. The Reconyx™ PC800 Hyperfire Professional IR camera trap takes 10-picture bursts and is more expensive. If your resources are limited, you may be able to borrow a kit for this project (see Teacher Preparation). For a sample budget, see eMammalSampleBudget.xlsx.

- Reconyx™ PC800 Hyperfire Professional IR camera trap or Bushnell Trophy Cam™ HD camera trap
- Master Lock Python™ Adjustable Locking Cable (fits the Reconyx camera)
- Braided steel cable, 7’ x 3/8” x 10mm (fits the Bushnell camera)
- 8GB SD4 memory cards (one per camera)
- SD-to-USB adapter or card reader
- Rechargeable AA NiMH ~2500mAh batteries (eight for Bushnell, 12 for Reconyx. Do not mix battery types.)
- Charging station for rechargeable batteries
- eMammal software (see Teacher Preparation)
- Projector to use with AnswerGarden Web app and Frayer Model
- Computer(s) with Windows or Mac platforms
- Method for showing Internet videos to class
- Access to online deployment form (https://docs.google.com/forms/d/1Z-3RahHFBraJe4x9OXh-w93OpiYwAJJvilbt81_11NQ/viewform?c=0&w=1)
- Guided Notes Answer Key (GuidedNotesAnswerKey.docx)
- Camera set-up instructions (CameraSetUp&RetrievalInstructions.docx)
- eMammal Training Guide (eMammalTraining.pdf)

Student Materials

- Folder for storing paperwork (one per student)
- Access to computers and Internet for viewing North Carolina mammal species information (See Teacher Preparation)
- eMammal Data Sheets (eMammalDataSheet.pdf) (one per student)
- Quick Profile Assignment (QuickProfileAssignment.docx) (one per student)
- eMammal Animal Identification Guide (eMammalAnimalIdentificationGuide.pdf) (one per group)
- Checklist of the Mammals of North Carolina (NCMammalChecklist.pdf) (one per student or group)
- Guided Notes for Camera Trap Deployment Videos (GuidedNotes.docx) (one per student)
- North Carolina wildlife magazines (several per class, optional)
- Sticky notes (several pads of different colors per group)
- Frayer Model template (FrayerModelTemplate.docx) (one per student)

Safety

Students will be working in the field—scouting locations and setting up and taking down camera traps. Some specific issues they may encounter include insect bites (e.g., fire ants, mosquitoes, chiggers, ticks, etc.); troublesome vegetation (e.g., thorns, poison ivy); or potentially hazardous terrain (e.g., uneven ground, exposed roots and other tripping hazards). Most districts and schools have adopted standardized science safety procedures. We recommend that you follow what has been implemented. Also, the National Science Teachers Association has produced material concerning safety in the science classroom. You can find these resources at: http://www.nsta.org/safety/. The organization also provides a safety acknowledgment form for students and parents: http://www.nsta.org/docs/SafetyInTheScienceClassroomLabAndField.pdf/.

Student Prior Knowledge

- Students should be familiar with characteristics of some animals in their community.
- Students should understand simple food chains/webs.

Teacher Preparations

For overall project:

- Obtain all the project materials listed in Teacher Materials. You may be able to borrow a kit for this project from the Science House at N.C. State University in Raleigh or one of the three satellite offices in Enka, Hickory or Morehead City, N.C. (http://www.thesciencehouse.org/satellite-offices.php). Kits will be available in fall of 2015. Contact the director of the office nearest you.
- Set up your eMammal account at emammal.si.edu. At the same time, e-mail Dr. Stephanie Schuttler at the North Carolina Museum of Natural Sciences (stephanie.schuttler@naturalsciences.org) to get username approval. Once username is approved, download software at emammal.si.edu. (Note: The eMammal software runs only on computers with Windows or Mac platforms. It is not compatible with iPads or Chromebooks.)
- Thoroughly review the eMammal Training Guide (eMammalTraining.pdf).
- Practice operating the camera.
- Become familiar with local ecology and the mammals that may be present on your school grounds or in your region. For species information, visit the North Carolina State Parks Web site at http://www.dpr.ncparks.gov/mammals/accounts.php. You may search for species by county at http://www.dpr.ncparks.gov/mammals/county_list.php?search_type=County+List. For species profiles and fact sheets, see the N.C. Wildlife Resources

Commission Web site at http://www.ncwildlife.org/Learning/Species.aspx#5528104-mammals. You may also wish to call on local and state wildlife experts and nearby researchers and scientists for input.

- Review the two instructional videos, eMammal Camera Function (https://youtu.be/dRDyMm5eJe4) and Camera Set-up Guidelines (https://youtu.be/KlZmfgNRqhI).

For Day 1:

- Prep folders with student names (one per student).
- Make copies of handouts:
- Frayer Model template (FrayerModelTemplate.docx) (one per student)
- Quick Profile Assignment* (or give students access to electronic document) (QuickProfileAssignment.docx) (one per student)
- eMammal Animal Identification Guides (eMammalAnimalIdentificationGuide.pdf) (one per group)
- Checklist of the Mammals of North Carolina (NCMammalChecklist.pdf) (one per group)
- eMammal Data Sheets (eMammalDataSheet.pdf) (one per student)
- If wildlife magazines are available, set them out on tables.
- Set up projector and media player.
- Arrange access to computers and Internet for students, if possible (to use Internet sites http://www.ncwildlife.org/Learning/Species.aspx#5528104-mammals and http://www.dpr.ncparks.gov/mammals/accounts.php).
- Use the Web app AnswerGarden (http://answergarden.ch/about-AnswerGarden/) to create this question: What animals might we catch on a camera trap on our school grounds? Obtain html address for this question to project on screen. (AnswerGarden is a minimalistic feedback tool that may be used in the classroom for polling and brainstorming. It is free and easy to use. If you cannot access AnswerGarden, use another poll-taking strategy, such as grouping sticky notes.
- Prepare a sample Frayer Model. For reference:
- Word = mammal
- Definition = any vertebrate (an animal with a backbone) within the class Mammalia
- Characteristics = 1) hair or fur; 2) warm-blooded; 3) live birth; 4) produce milk for young (these characteristics apply to mammals with a few exceptions, e.g., platypus)

- Examples of animals that are mammals (e.g., cow, dog, bat, porpoise, deer, whale)
- Examples of animals that are not mammals (e.g., insects, reptiles, amphibians, fish, birds)

- *If you are unable to access computers for the Quick Profile Assignment, you may prepare species profiles from the Web resources ahead of time for students to use.

For Day 2:
- Choose outdoor location for practicing camera set-up.
- Prepare to show the two instructional videos:
- eMammal Camera Function (https://youtu.be/dRDyMm5eJe4)
- Camera Set-up Guidelines (https://youtu.be/KlZmfgNRqhI).

For Day 3:
- Review video on using eMammal software: https://youtu.be/aRCEXNJf2Jk.

Activities

Day 1: Introduction to mammals

1) Give students a brief overview of the eMammal citizen science project and describe how they will participate. Pose the question: What animals might we catch on a camera trap on our school grounds? Use AnswerGarden or other polling method to produce a list. (5 minutes)

2) Place students into pairs or small groups and distribute folders and Frayer Model handouts. Project the Frayer Model so that everyone can see. Explore the question, "What is a mammal?" (5-10 minutes)
    1. Have students discuss what they think a mammal is. Listen to ideas and then provide a formal definition.
    2. Have students discuss characteristics of a mammal. Listen to ideas and then provide the four characteristics.
    3. Have students generate their own list of examples of mammals. They may elect to draw an example or two. Compile and create a class list of examples.
    4. Have students generate a list of animals that are not mammals. They may elect to draw an example or two. Compile and create a class list of examples.

5. Have students file their work in their eMammal folders.

3) Lead a discussion of how camera traps might be used to study mammals. Have students work in their groups or pairs to brainstorm responses to the three questions below. Students should use sticky notes to record their ideas. Have them use a different color for each question and stick their notes to a classroom board for review and discussion. (10-15 minutes)
    1. What are the pros of using wildlife camera traps to observe animals?
    2. What are the cons of using wildlife camera traps to observe animals?
    3. What questions might we answer by using wildlife camera traps?

    Review class responses and provide feedback to students about their ideas.

4) Give each student a Quick Profile Assignment handout (or give them an electronic version to use). Each student is to choose a mammal from the N.C. Wildlife Resources Commission list. (20 minutes) The profile should contain the following information:
    - Common and scientific name
    - Three characteristics of or facts about the mammal
    - Picture or photograph of the mammal
    - Answer to question: How likely would we be to capture this mammal on our camera traps?

5) At the end of the period, ask students to discuss: What mammals are you looking forward to capturing with the camera trap on our school grounds? (5 minutes)

Day 2: Camera traps: How to use

1) Lead a discussion in which students brainstorm reasons that scientists study animal activity and behavior. Ask them to create a list in their eMammal folder. (5-10 minutes)
2) Allow students to view how-to videos for setting up camera traps. (10-15 minutes) They may view on individual computers, if possible, or you can arrange to show videos to the class. Have them complete the Guided Notes handout as they watch.
    Video 1: Camera Function (https://youtu.be/dRDyMm5eJe4)
    Video 2: Camera Set-up Guidelines (https://youtu.be/KlZmfgNRqhI).
3) Take students outside to a place where they can practice setting up camera traps (20-30 minutes). Have them work in small groups, taking turns. As students practice, have a running discussion about what makes a good or poor location for a camera trap. Some example parameters include:

- knee height, slightly downward angle
- clear of vegetation within ~2 meters of camera
- not on slopes
- pointing away from sunrise/sunset
- good detection distance

4) At the end of the period, have students discuss the question: Why is it important for the camera trap to be set up correctly? (5 minutes)

Days 3 and 4: Capturing images and identifying animals

1) Deploy camera at desired location (10-15 minutes), fill out eMammal Data Sheet and complete online eMammal Deployments form (https://docs.google.com/forms/d/1Z-3RahHFBraJe4x9OXh-w93OpiYwAJJviIbt81_11NQ/viewform?c=0&w=1).
2) Leave camera deployed for three weeks (this provides the most useful data set).
3) Retrieve camera from deployment site. (5-10 minutes)
4) Remove and secure SD card.
5) Have students make any comments on their data sheets about the working order or condition of camera.
6) Show video on using eMammal software: https://youtu.be/aRCEXNJf2Jk and then load pictures from camera into eMammal software. [Note: Screen images for inappropriate content before showing to students.]
7) Identify animals in photo sequences.
8) Upload photos to eMammal database.

Extension Activities

None

Assessment

Have students complete a R.A.F.T. assignment to demonstrate their understanding of how to use a camera trap as a scientific tool.
Role = Expert camera trapper
Audience = Students that are new to eMammal
Format = Brochure
Task: Prepare a how-to guide that explains the process of setting up camera traps, identifying animals and using eMammal software.

Community Engagement

- None

Critical Vocabulary

Characteristic: a feature or quality particular to an animal

Community: a group of organisms living in the same area at the same time

Ecosystem: a biological community of interacting organisms and their environment

Food chain: a hierarchy of organisms, each dependent on the next as a source of food

Food web: a system of interdependent and interlocking food chains

Habitat: natural home and environment of an animal species

Invasive species: a species that is not native to a location and has negative effects on the native ecosystem

Mammal: warm-blooded, vertebrate animals that are distinguished by possessing hair or fur, producing milk for their young, and giving birth to live young

Native species: a species that originated in its location naturally, without human intervention (intentional or accidental)

Population: a particular group of organisms living in an area

Species: a group of organisms that have similar individuals capable of exchanging genes or interbreeding

Modifications

- None

Alternative Assessments

- None

References

None

Supplemental Information

- None

Curriculum Alignment

This section contains the curriculum alignment of each lesson in the module to the North Carolina Standard Course of Study, specifically the Common Core and Essential Standards, as well as the Next Generation Science Standards.

NC Essential Standards

- 6.L.2 Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

- 6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

- 8.L.3 Understand how organisms interact with and respond to the biotic and abiotic components of their environment.

- 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem.

- 8.L.3.2 Summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including:
- Coexistence and cooperation
- Competition (predator/prey)
- Parasitism

Next Generation Science Standards

MS-LS2 Ecosystems: Interactions, Energy and Dynamics

- MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

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