Lesson 6: Mammal Math

Objectives:

- Students analyze data through calculations and graphs
- Students their data to camera trap data across the state

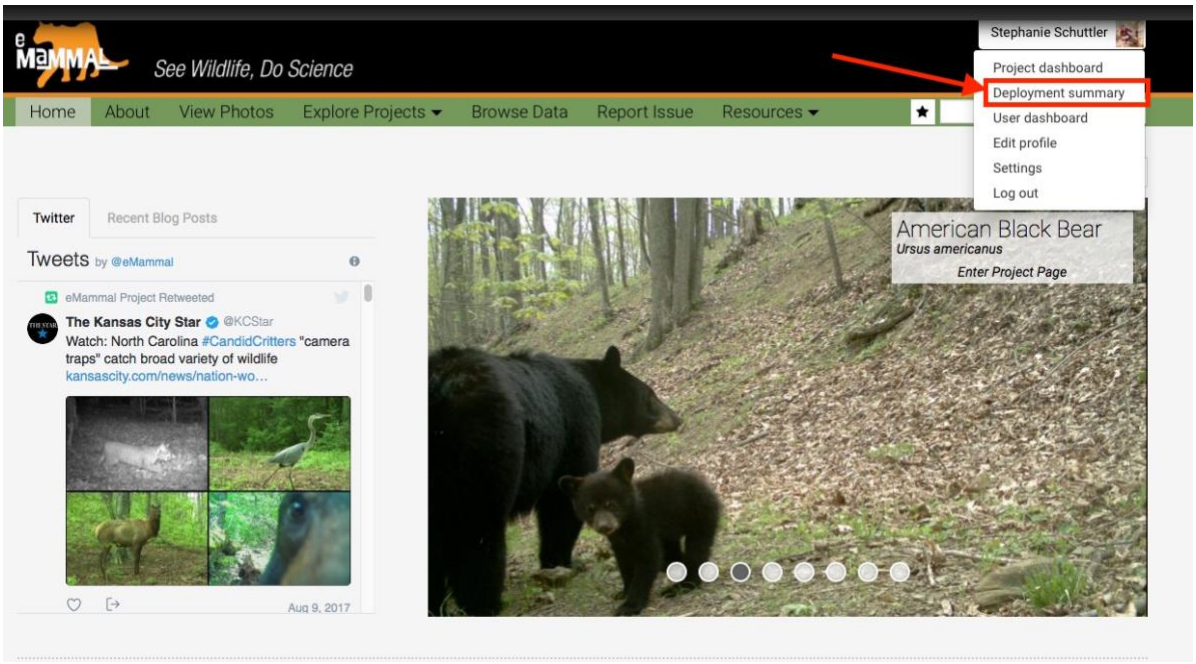
Timing and Implementation: 60 minutes. Complete lesson after photo uploads are complete and expert-reviewed (you will receive an email alert).

Materials:

- Graph paper
- Mammal Math and Management Worksheet
- Computer to connect to nccandidcritters.org

Procedure:

1. Before class, prepare data from your camera trap deployment. Go to eMammal.org and once logged in, click on your username in the top right. Choose "Deployment Summary."



2. You should see the page "Summary of Deployment for (Your Username)." Scroll to the bottom and to see your deployment (or a list if you have done more than one). Click on a deployment to take you to the data table needed for detection rate. You should see a summary table of your deployment. Recreate the table on the board or on a worksheet for all students to see.

Summary of Deployment Broadview Kenan 2016

View | Edit

Summary of Students Discover North Carolina: 223 total deployments

Species	Number of Detections
Northern Raccoon	2
Coyote	9
White-tailed Deer	31

Summary of Broadview Kenan 2016	Total #
Species	3
Detections	42
Days	54

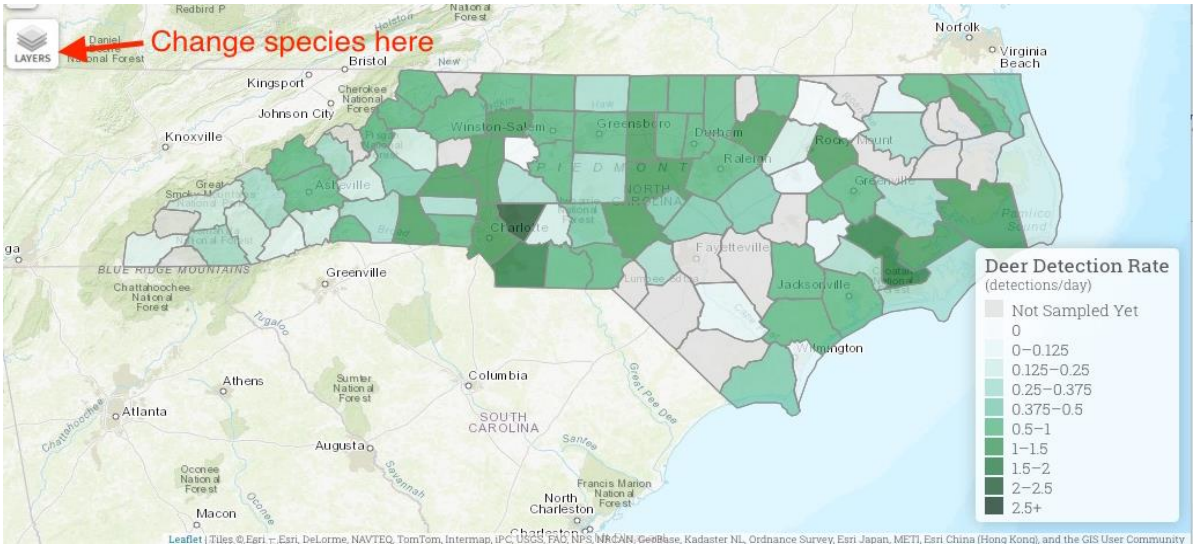
3. Discuss the importance of analysis.
    - *How do scientists use data to answer questions about mammals?*
    - *How do scientists make sense of the data?*
    - *Are there 9 coyotes or did we see 1 coyote nine times? (Ask a similar question using your data table.)*

4. Divide the class into groups. Assign each group a species detected in your deployment, and have them calculate the **detection rate** of that species.
    - The detection rate is the number of times one species is detected for the whole deployment divided by the number of days the camera trap is run. This can give you an estimate of how many times that species is seen per day for that site. For example, if white-tailed deer are seen a total of 40 times over a 20 day period, the detection rate is 2 deer per day.

$$\frac{40}{20 \text{ days}} = 2 \text{ per day}$$

5. Discuss the results.
    - *Which species had the highest detection rate? Lowest?*

6. Compare your results to your county and other counties across the state on the NCCC website. As a class or with students on their own devices, click on “Get Started” on the home page. You can click on any county to get the detection rate of deer, black bears, and coyotes. To change species, click on “layers” in the upper left corner of the map:



7. Discuss detection rate and results. Emphasize that the camera trap deployed by the classroom is one sample, but scientists require many samples to draw conclusions and make management decisions, which is why NCCC is requiring hundreds of camera trap sites across each county.
    - *How do our detection rates compare to those in the county? Others in NC?*
    - *Why calculate detection rate? Why not raw numbers?* ***Detection rate standardizes data for the number of days the camera trap has been run. More camera traps run in a county results in more camera trap days and therefore more animals. If we used raw numbers, this would not be a fair comparison.***
    - *Why do animals vary across the state?*

8. Go back to the original data table and categorize each species as herbivores, omnivores, and carnivores, drawing upon knowledge of animal diets from the Mammal Profile activity. Have students calculate the detection rates for herbivores, omnivores, and carnivores. They will the sum the raw detections of animals in the same category and divide this number by the total number of camera trap days.

9. Have students graph the data by putting the “Herbivore”, “Omnivore”, and “Carnivore” categories no the x-axis and the detection rates on the y-axis. Discuss the results:
    - *Are there more herbivores or carnivores detected? If so, how does this relate to the food web discussion we had previously? If not, is our school yard community unbalanced? What other things might cause this imbalance?*

Evaluation: Mammal Math

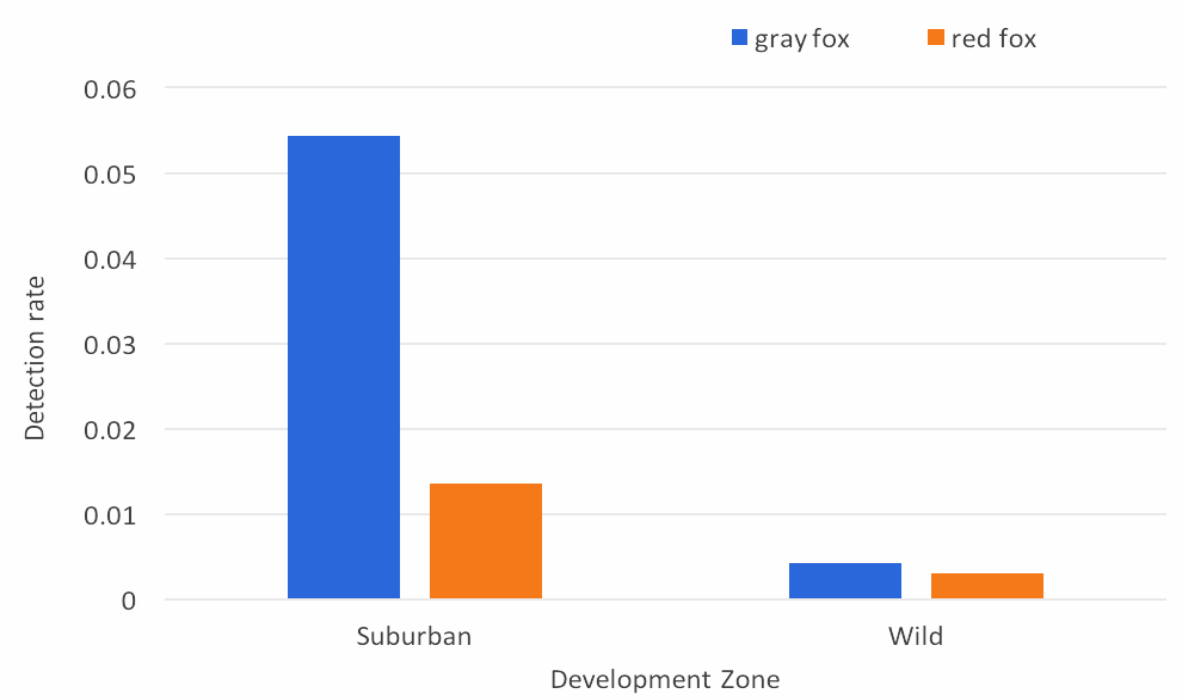
- The worksheet contains real data from a large-scale study of wildlife across Raleigh, NC! Students calculate the detection rates from camera traps of species in wild and suburban areas to examine the effects of humans on wildlife.

Mammal Math

Below is a table of the number of detections of common mammals captured from suburban yards and wild areas (state and national parks) in Raleigh, North Carolina. Scientists want to find out which species are most impacted by development.

Habitat	Days	coyote	cat	dog	Eastern cottontail	gray squirrel	gray fox	raccoon	red fox	opossum	deer
Suburban	7504	104	547	454	244	2525	408	1080	102	360	5907
Wild	2310	45	0	23	62	185	10	126	7	78	2122

1. Look at the graph below for the gray and red fox and answer the following questions.



In which habitat does the gray fox have a higher detection rate?

In which habitat does the red fox have a higher detection rate?

Which species is more likely **negatively** impacted by human development? How can you tell?

Which species is more likely **positively** impacted by human development?

For the species that is **positively** impacted, why do you think this is? In other words, are there any benefits that an animal could get from living in an area where humans live?

2. Now make your own graph. Choose two different species from the table below and calculate their detection rates for wild and urban areas. Use the empty table below to help you.

Habitat	Days	coyote	cat	dog	Eastern cottontail	gray squirrel	gray fox	raccoon	red fox	opossum	deer
Suburban	7504	104	547	454	244	2525	408	1080	102	360	5907
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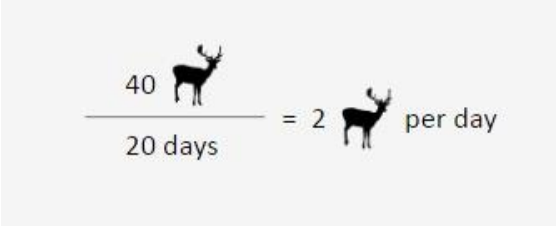

Species name	Habitat	Days	Number of detections	Detection rate (number of detections/days)

On a separate sheet of graph paper, make a graph with detection rates on the y-axis and mammal species on the x-axis. Answer the following questions based on your results.

Which species seems to be most **negatively** affected by development? Why do you think this is?

Which species seems to be the most **positively** affected by development? Why do you think this is?