**eMammal Species Richness**

**Teacher Instructions**

Students will conduct this activity after all eMammal images have been collected and uploaded. \*Note: Camera traps should still run to collect data. This activity simply provides a stopping point for students to analyze the data collected from the school year.

**Materials**

eMammal Species Richness worksheet

**Background Information***Species richness* is described by the number of different species that inhabit a given area. How the area is defined will change the number of species that are present. Usually, bigger areas have more species; this is especially true when comparing the same habitat type (e.g., a small desert versus a big desert). When comparing different habitat types, however, a small area may have many more species. For example, a small rain forest will have more species than a large desert.

 Camera traps only collect data on mammals, and only mammals larger than 100 grams. In the eastern United States, this includes animals larger than an eastern chipmunk (*Tamias striatus*) but excludes bats. Most of the diversity within mammals is in small mammals and bats, so species richness calculated by camera traps only represents a subset of mammal diversity.

 Often, ecologists attempt to estimate species richness in very large areas. There are probability-based species richness estimators that calculate a range of species richness values based on how many species are captured in different subareas. Those methods require complicated statistics, so only basic species richness is presented here. Ecologists may start with a list of expected species from past research or local knowledge.

**Student Activity**

Students complete the eMammal Species Richness worksheet. They will need to refer to the “eMammal Predictions vs. Observation Table” to answer the questions. The questions on the worksheet should first be completed by students alone or in small groups. The answers they provide can be discussed as a class so that they understand that species richness naturally varies across ecosystems.

**eMammal Species Richness**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Refer to your filled-out eMammal Predictions vs. Observation Table.

1. What species did you predict correctly? List and count them here:
2. What species did you detect that you were not expecting to see? List and count them here:

Transfer the following information from your eMammal Predictions vs. Observations Table.

**Location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Predicted species richness: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Using the column “Present,” sum all of the numbers. Enter your total in the space next to “Actual Species Richness” at the bottom of the table and also in the space below:

**Actual species richness: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Compare your Actual Species Richness value to your predicted value. Which is higher?
2. What do you think it means to have a high species richness?
3. Is a higher or lower species richness value better? Why?
4. Would different ecosystems have different species richness values? Why or why not?

Below are pairs of ecosystems. Circle which one you think will have a higher species richness when including all animal species (not just mammals).

(7) Coastal dunes Swamp

(8) Tundra Rain forest

(9) Pine forest Cave

(10) Deep sea Coral reef

(11) National park City park

**eMammal Species Richness Teacher Answers**

**\*Note: Questions 1–3 will be unique to each data set.**

1. What do you think it means to have a high species richness?

A high species richness means that there are more species in an area. Note that an area can have a high species richness value, but not necessarily have an equal representation of each species. For example, there may be 10 species present, but nine of those may be represented only once.

1. Is a higher or lower species richness value better? Why?

When comparing animals in the same habitat type and in the roughly the same geographic location, then a higher species richness value is better, because there are more species in the area and the area has not lost species (likely due to human intervention). However, some habitats naturally have more species than others. For example, few animals are adapted to live in cave habitats, and therefore a low species richness value in a cave habitat compared to other habitats does not mean that it is a worse habitat. The most diverse habitats are those that are warm and wet, with a consistent amount of light (e.g., tropical rain forests, coral reefs).

1. Would different ecosystems have different species richness values? Why or why not?

Yes, because ecosystems have different climates that make it easier or harder for life to flourish. In the deep sea, there is very little light, and fewer organisms will have evolved adaptations to survive in this habitat. In the desert, organisms have to evolve to deal with high temperatures and little water. These ecosystems, which are more extreme in temperature, light, and nutrient availability, will have a lower species richness.

Below are pairs of ecosystems. Circle which one you think will have a higher species richness when including all animal species (not just mammals). Correct answers are in red.

(7) Coastal dunes Swamp

(8) Tundra Rain forest

(9) Pine forest Cave

(10) Deep sea Coral reef

(11) National park City park

\*Note: Question 11 is open to debate and subject to conditions such as geographic location. One may argue that a large city park in tropical area could have a higher biodiversity than a national park in the artic. Typically, cities are thought to have reduced biodiversity because many species are sensitive and do not thrive well in human development; however, humans also inadvertently increase biodiversity through invasive species (e.g., landscaping with ornamental plants).