**Habitat in a Hoop Activity Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Background**

Ecologistshave developed methods to monitor the health of an environment by measuring its biodiversity. Biodiversityis a measurement of the number of different speciesof plants and animals that live in a particular habitat. Usually, the more varied the species of consumers**,** producersand decomposersthat exist in an area, the healthier the ecosystem. Likewise, fewer species in a certain ecosystem may indicate harsher conditions.

Many different random sampling techniques and tools exist to estimate numbers of plant and animal species living in an ecosystem. Once data are collected, a ***biodiversity index*** is calculated, indicating the relative health of a habitat. A low biodiversity index indicates fewer varieties of plants or animals living in a particular ecosystem. A high biodiversity index is usually a sign that an ecosystem is teeming with a wide variety of animal and plant life and that the environment itself, such as soil, water and air, are relatively clean and healthy.

Another important factor in the study of biodiversity is the presence of ***keystone species*.** Keystone species are plants or animals that have been found to create a mini ecosystem within a larger habitat.

For this inquiry-based activity, students will randomly sample (study, observe, and report) the producers, consumers and decomposerswithin 2-3 different vegetative communities at Bottomless Lakes. Producersmake their own food. Consumerseat the foods produced. Decomposersrecycle nutrients back into the ecosystem.

**Do we need to look at this whole area to get an idea of what is here?** No – scientists like to take smaller samples rather than look at a very large area in great detail. For example, you can eat a few potato chips and have a pretty good idea of what the rest of the chips in the bag are like.

**Goal**

Students will study and record dataand observations within a sample area of a hoop, determining which habitat contains the highest number of living things.

**Objectives**

Perform random sampling measurements.

Define and identify consumers, producers and decomposers.

Record data, map area, and write/draw observations.

Calculate biodiversity index for each sample area.

**Materials**

Hoops – one for every 3-4 students

Clipboards

Pencils

Hand lenses

Data recording and observation sheets

**Procedure**

1. Groups will be assigned an ecosystem area on the school map and go there.
2. One student from each group will close their eyes and gently tossthe hoop. This is ***not*** an Olympic event!
3. As a group, students will observe, study and record everything that’s inside the hoop – no matter where it lands***.*** It is important to conduct random sampling – do not re-throw the hoop because you don’t like where it landed***.***
4. Students will work as a team to identify (use phones and/or Chromebooks or iPads) and record what’s within the sample area of the hoop – use hand lenses to look closer at your habitat.
5. Students should note how many types of species ***and*** how many of each species they find.
6. Once plants and animals within the sample area have been identified, recorded and drawn (in the circle provided), students will compute the biodiversity index for that sample area by following the instructions on the Biodiversity Calculation below.

**Biodiversity Index =** $number of species in the area ÷ total number of individuals in the area$

1. Students will re-group in the classroom and report on their sample area.
	1. *What was their biodiversity index?*
	2. *What were the keystone species they observed?*
2. Based on all group reports, students will discuss which sample area had the highest biodiversity and why.
	1. *Consider all biotic and abiotic factors (i.e. water availability, exposure to sun and wind, soil quality, predators, human interaction, etc.)*

**Definitions**

*Biodiversity***:** the variation of life forms within a given ecosystem, biome, or for the entire Earth. Biodiversity is often used as a measure of the health of biological systems. The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution.

*Biodiversity Index* **–** a formula scientists use to describe the amount of species diversity in a given area.

*Consumers* **–** organisms that cannot make their own food. They obtain nutrition by eating other animals and plants.

*Data* **–** refers to a collection of facts usually collected as the result of experience, observation or experiment, or processes.

*Decomposers* **–** an organism, often a bacterium or fungus, that feeds on and breaks down dead plant or animal matter, thus making organic nutrients available to the ecosystem.

*Ecologists* **–** scientists who study the relation between organisms and their environment and examines the effects of environmental conditions on plants and animals.

*Ecosystem* **–** a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all of the non-living physical factors of the environment.

*Habitat* **–** an ecological or environmental area that is inhabited by a particular animal or plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

*Keystone Species* **–** a species that plays an important ecological role in determining the overall structure and dynamic relationships within a biotic community. A keystone species presence is essential to the integrity and stability of a particular ecosystem.

*Producers* **–** organisms that produce their own food. Producers are fundamental to the food chains of all plant ecosystems. They take energy from the environment (in the form of sunlight or inorganic chemicals) and use it to create carbon-based organic molecules.

*Random Sampling Measurements* **–** the process of collecting, analyzing and measuring only a small representative portion of a larger group. Each item must have the same likelihood of being selected.

*Species* **–** a group of organisms having many characteristics in common and ranking below a genus. Organisms within a species reproduce with others of the same species and produce fertile offspring.

**Location # Location Area**

Draw and write about **everything** that you see within your hoop habitat survey. Include a description of the organism and the number of each organism. Use the internet to identify the different types of plants, animals, rocks, insects, soil, and wildlife signs within your biodiversity survey.

**Biodiversity Index =** $number of species in the area ÷ total number of individuals in the area$

*For total individuals, count each bush, tree, flower, weed, grass stalk (not individual blades), etc.*

**Analysis**

1. Why was it important to randomly choose your site?
2. Which organism was the most numerous on your plot?
3. What was your hoop habitat’s biodiversity index?

3. Biomass is the weight of the living organisms in an area. Which has more biomass in your

 site, producers or consumers?

4. Did the organisms with the most biomass also have the greatest number of organisms?

5. How do different amounts of biomass of producers and consumers correlate with the trophic

 levels they occupy on the energy pyramid?

6. How does the amount of energy available from *producers* in your hoop compare to *consumers*?

1. In your lab book, arrange the organisms you discovered in your hoop into a food web, according to energy flow. Include at least two food chains in your web.
2. Why is energy a one-way flow?
3. What differences would you expect between your hoop habitat and a natural habitat?
4. What are the possible reasons for these differences?
5. List and describe at least two clear ideas or concepts you learned from this activity. These should relate to energy, food webs, ecosystems, biodiversity, human interaction, etc.