

Circles of Life: An Introduction to Measuring Biodiversity for Citizen Science

Developed by Melissa Hodde, Seneca CCE Communications Intern

Preparing

Set up your easel and graph paper with the stickers and/or markers nearby: this is your data collection area. Toss your hula hoops more or less randomly around the outdoor space, ideally over several types of mini-terrain such as grassy areas and muddy, mulched or shaded areas. Place a clipboard, a pencil and at least one magnifying glass beside (but not inside) each hoop.

Supplies

- A pack of circle stickers in primary colors or a set of large markers
- A giant graph paper
- An easel
- Eight hula hoops
- At least eight magnifying glasses (one for every additional student if you have more than sixteen)
- Eight clipboards, pencils and sheets of paper
- A stopwatch, timer or smartphone app

Location: Anywhere outdoors with a relatively large and flat area

Time: 20 minutes

Group size: 8-24 students (ideally around 16)

Introduction

If your kids are somewhat familiar with the concepts of data and ecosystems, have them name types of data (pictures, statistics/numbers, quotes, any kind of observation) and kinds of ecosystems (rainforest, mountains, desert, meadow) to help each other visualize these concepts. If they aren't completely sure what these words mean, offer them a definition from the box below. Explain to them that they are going to study the mini-ecosystems inside these hula hoops and gather all their data to measure the *diversity* of the larger ecosystem:

in other words, how many different kinds of living things there are within the area. Lots of scientific

Focus connection

After you explain the basics to your group, help them develop a few hypotheses about what they'll find. Have they recently learned about an insect or a plant they will be hoping to see? This is a perfect opportunity to teach them to identify a few basic weeds, beneficial insects and garden pests.

studies and citizen science projects measure diversity – this is part of a scientific discipline called field research.

Gathering the Data

Have the group break off into teams of 1-3, standing around the outside of each hula hoop (make sure they don't stand on the inside!) and wait for instructions.

Let them decide who will gather and who will record the data: the gatherers will take the magnifying glasses and the recorders will take the pencil and clipboard. The gatherers' job is to count how many kinds of living things are inside the hula hoop, and the recorder's job is to write it down as they go. The boundaries between types of living things can be as specific as an American versus an invasive Asian ladybug or as general as "beetles" and "butterflies" according to the learning level of the group, so long as everyone is following the same standard. Evidence of life such as bird feathers, deer scat and worm tunnels does not count unless you choose to keep a separate tally.

Set a timer for seven minutes, and let the teams get started!

While the count is on, have your helpers check on the teams' progress and help them identify anything they're struggling with. You can also offer them tips for finding more plants and creatures, like parting the grass to look at the ground and checking the undersides of leaves. Some groups may take longer than others to get the hang of it, but ideally you want all the groups to thoroughly investigate their mini-ecosystems by the end of the seven

minutes. They may even find something exciting like a snail, a flower or a baby toad that they will want to show you!

At the end of the seven minutes, make sure everyone immediately stops looking for creatures. Have the gatherers collect their magnifying glasses, and have the recorders turn in their pencils. Then, have the recorders give their clipboards to the gatherers. Have a helper supervise the latter group in gathering up the hula hoops while a leader or another helper shows the group with the clipboards how to enter data onto the graph.

Definitions

Data: “facts that can be examined or used in an effort to gain knowledge or make decisions; information” (- The Free Dictionary)

Ecosystem: a collection of living and non-living things that interact with one another within a given area

Data Entry

Each broad category of living thing should be assigned a color, such as green for plant life, brown for insects, yellow for other invertebrates like snails and worms, and red for animals like frogs and mice. Expect tallies to be more or less weighted in this order – a lot of plants, some insects, a few invertebrates and the occasional vertebrate animal in one of the hoops. This may or may not have been a part of your group’s hypothesis earlier on if you integrated the focus connection.

For each type within the category, have the student place a single sticker of the appropriate color on the graph (or draw a thick line

through a single square). If they found grass, dandelions, a ladybug, two identical snails and a salamander, for instance, that should count as two green stickers, a brown sticker, just one yellow sticker, and a red sticker. These should all be stacked vertically in the same column, so that each hula hoop has a column of its own. As each group adds its data to the graph, you should end up with eight columns that have varying heights and color ratios according to what they found. It helps if you add broad categories in the same order for every group, so that all the plants (green stickers) end up at the bottom followed by the insects, other invertebrates, etc.

Discussion

After this is done, gather everyone to sit on the grass and look at the graph together. Did most of the groups find the same sorts of things? Did they find what they were expecting to find, or did they discover a lot of unfamiliar and unexpected forms of life?

Help the kids speculate about what a scientist could do with this information. Did they discover any invasive species? Any that are endangered or at risk, like lightning bugs and bees? How about species that are potentially harmful to humans, like poison ivy and mosquitoes? Was anything living in just one hoop that no one else found?

Have the kids imagine what would happen if you laid a sheet of plywood over one of the hula hoops and let it sit there for a year before removing it. Some of the species would move to the nearby hoops, but others would die. Which ones would return to the area from the other hula hoops, and which would take longer to return? Would some be gone forever? Pick a specific hoop from the graph if it helps them visualize this. If a species exists in only one hoop or in a few hoops that are very far away from one another, then there is a risk of that species never returning if the ecosystem is damaged. This is why diversity is so important to measure for science and conservation.

If you haven’t already, introduce the kids to a few conservation and diversity-focused citizen science initiatives they can take part in. Some good candidates include the Cornell Lab of Ornithology’s Great Backyard Bird Count, the Monarch Watch and the Museum of Science’s Firefly Watch. Other citizen science projects for kids include Zooniverse’s Planet Hunters, Snow Spotter and Penguin Watch, which can all be done from a computer. Congratulate the group: they’re ready to do some science!