Backyard BioBlitz Educator's Guide

Subject
Science

Skills
gathering (collecting, observing, researching), citizenship (working in a group)

Vocabulary
biodiversity, species, morphospecies, rapid assessment, sampling

Time
Two sessions

Materials
Biodiversity Month Registration Form, Backyard BioBlitz Report, copies of Backyard BioBlitz Survey

OPTIONAL - plastic bags and plastic containers with lids to collect specimens; thermometers; magnifying glasses; and field guides

AT A GLANCE
Take a firsthand look at biodiversity in your community.
Enter the Biodiversity Month Backyard BioBlitz by registering with Biodiversity Month and reporting the total number of different plants and animals your group was able to find, including any species you were able to positively identify. Results will be collated with other groups across the country.

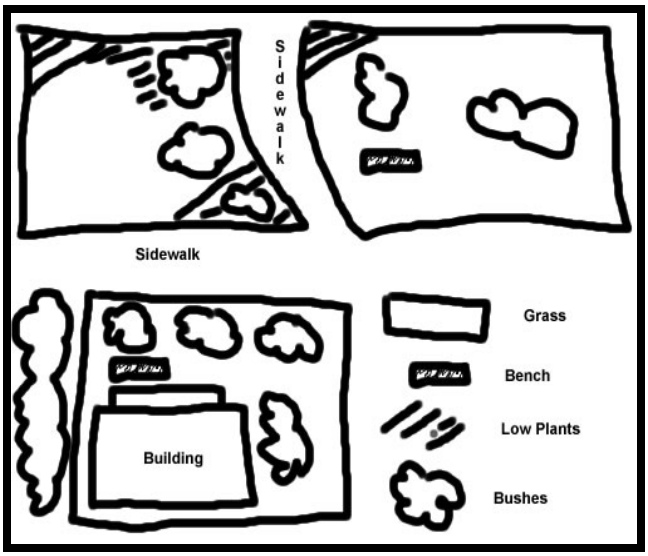
OBJECTIVES
Design and carry out a biological inventory of a natural area.

You don't have to travel to the rainforests of the Amazon or the coral reefs of Australia to discover biodiversity. Just walk out the door and you'll find an amazing diversity of life in backyards, vacant lots, streams and ponds, fields, gardens, roadsides, and other natural and developed areas. In this activity, your students will have a chance to explore the diversity of life in their community. They'll also get an introduction to how scientists size up the biodiversity of an area—and why it's so hard to count the species that live there.

BEFORE YOU BEGIN

Pick a day in May 2002 to conduct your Backyard BioBlitz. Schedule one session before that date for planning with the class and one session for the survey. Register with Biodiversity Month using the online *Biodiversity Month Registration Form*.

You will need to gather field guides and other resources about your area. Your state's Department of Natural Resources or Fish and Game Department may have brochures and other information about trees, other plants, and animals in your state. Your state University Cooperative Extension Office may also have resources and may know of local scientists and naturalists who would like to help with your Backyard BioBlitz.



You will need to find a nearby natural area where the students can conduct their Backyard BioBlitz Survey. School grounds, a nearby park, or the grounds around a neighborhood nature center can all work. Just be sure that your area is safe for your students (no broken glass or other hazards) and that you have the permission of the owners if needed. For example, if you're using your own school grounds, you probably don't need permission, but if you're using a nearby city park, you should check with the city parks department first. You will also need to sketch a quick "site map" for the students. This map should show the boundaries of the study area and a rough delineation of different plant types. For example, areas with shrubs would look different from grassy areas (see example). Be sure to have a copy of the *Backyard BioBlitz Survey* form for each student (downloadable from the Biodiversity Month Backyard BioBlitz website). You may also want optional plastic bags and plastic containers with lids to collect specimens, thermometers, magnifying glasses, and field guides.

Getting to Know Biodiversity

The variety of life on Earth

Biodiversity is the variety of life around us. It includes the variety of genes, which are tiny structures inside every living cell that makes each species and individual unique. Biodiversity also includes the variety of species. Scientists categorize living things into groups called species. Members of the same species usually have a unique set of characteristics (like body shape and behavior) that distinguish them from other organisms, and are able to breed to produce fertile offspring. For example, morel, preying mantis, corn and humans are all different species. Biodiversity also includes the variety of Earth's ecosystems, such as savannas, rainforests, coral reefs, marshes and deserts. Biodiversity is interconnected in a web of life. Genes affect how a species looks and behaves, and the different species and their interactions make up the different ecosystems.

When scientists want to know what lives in a particular area or region, they rely on a number of tools and techniques. Here's a quick look at some of them.

Bird's-Eye View

Aerial photographs and satellite images can give conservation biologists, wildlife managers, and others a lot of information about a region. For example, different cover types such as coniferous forests, deciduous forests, or grassy areas show up in these pictures as different colors or patterns. Scientists can use the photographs to delineate features on the ground before they ever visit an area. Knowing what grows on the ground can be useful for predicting where animals might be, whether areas could sustain certain animal populations, and for planning strategies to manage these populations. Scientists can also compare pictures taken at different times to look for changes in such things as forest cover and land-use patterns.

See It for Themselves

No matter how much aerial photographs or satellite images tell us about a study area, scientists like to visit the area to see for themselves if the information they gleaned from the photos is accurate. The process of going to an area to verify information is called ground-truthing. Ground-truthing gives scientists a firsthand look at the areas they're interested in and can help guide further studies.

Sampling

Scientists rarely have the time to identify every single plant and animal that lives in a particular area. And even if they did have the time, it would be extremely expensive for them to do so. For these reasons, scientists rely on statistics to get an idea of species diversity. The scientists look closely at only small portions—or samples—of the total area they're interested in. Then they use mathematics to extrapolate their findings to the larger whole. For example, an entomologist might sample the insects in some individual trees in the rain forest to get an idea of species diversity throughout it. Scientists frequently use aerial photographs or satellite images to decide where to do their sampling. If an area they want to study is covered by both woodlands and grasslands, for example, scientists will take samples in both.

Fast Fact-Finding

In the race to save the world's biodiversity, scientists have developed methods to find out as much information about a particular habitat as quickly as they can. In such rapid assessments, teams of scientists work together. Each member of the team has a specialty, such as botany (plants), entomology (insects), or ornithology (birds). The team members travel to the study area together, collect as much information as they can in the short time allowed, including carefully collecting specimens of individual organisms, and then return to their laboratories or offices to sort out and identify what they found. Rapid assessments can be particularly effective in assessing the biodiversity of remote areas where it would be too expensive to employ researchers for more extended periods of time. However, rapid assessments provide only snapshots of what's found in particular areas and usually can't cover extensive geographic areas.

Identifying the plants and animals found

To describe the biodiversity of an area, scientists have to identify the species they find. Most species have at least one common name. For example a puma might be called a cougar or a mountain lion. This can be very confusing! Scientists use Latin words to give scientific names to species. Not only does this clear up the confusion over common names but it allows scientists who speak different languages to share information. When a scientist refers to a particular plant or animal by its scientific name they are using a combination of its genus (the broad group of related organisms to which it belongs) and its species (the smaller group of more closely related organisms to which it belongs). For example, a coyote is referred to as *Canis latrans* (*Canis* is the genus name and *latrans* is the species name). Grey wolves, a closely related species, are *Canis lupis*. The genus name is capitalized and the species name is not. The genus and species names are always italicized.

If a species is well-known, or has very distinct characteristics, it can be quite easy for a scientist to find its name from an identification key. However, sometimes the scientist may know that a particular plant or animal is different from the other plants or animals found, but it may take days, weeks or even months of research to find its correct name. In fact, if the plant or animal has never been seen before it may not even have a name yet. So that the scientist can include the species in the rapid assessment, even though he or she doesn't know its name, the scientist will give it a temporary or 'morphospecies' name, for example, "morphospecies 1" might be a hard to identify black-eyed bug, "morphospecies 2" might be an elusive silver tongued toad.

WHAT TO DO

A Look at Biodiversity

In this part of the activity, your students will have a chance to go outside and take a firsthand look at biodiversity in their own backyard. Observation is very important in science. This activity is a great opportunity for students to develop their observation skills.

1. Set the stage

Ask your students to imagine that the school board is planning to add another building to their school. One factor that's important in the board's decision to build is how biodiversity might be affected by the development. The board is planning to meet in just two days to decide whether they should add the building to the school, and it has asked the students for a list, or inventory, of all the species found on the site. (Rapid assessments are usually conducted because a decision about land use must be made quickly, and the species living on the land in question are being factored into the decision. If you're in a non-formal setting or if you can't use your schoolyard for the Backyard BioBlitz, adjust the school board scenario accordingly.)

What kinds of things would your students need to consider as they inventory the biodiversity of this area? List their ideas on the chalkboard. If the students don't suggest anything, ask them if there might be differences depending on the time of year. Would they expect to find the same species in areas covered by grass as in areas where trees grow? Do they think the relative numbers of individuals, or the population sizes, of each species might be important? Stress that knowing what lives in an area, knowing where different things live within the area, and having an idea of the size of the populations of different living things are all important pieces of information that wildlife managers and conservation biologists try to find out when they investigate the biodiversity of different land areas. Save all the questions the students generated for the wrap-up (step 7).

Ask your students how they think scientists find answers to questions like the ones they've generated. (Scientists may use aerial photographs, satellite photos, and special maps; they may interview knowledgeable people and consult historical records; and they usually go to the areas of interest and look at the plants and animals firsthand.)

2. Explain the task

Explain to the students where their study site is located and pass out copies of the "site map" you sketched earlier. Also pass out copies of the *Backyard BioBlitz Survey* form. Explain each of the different categories listed on the survey sheet and give some examples of each.

Divide the students into groups of five to seven and explain that the team members have to work together to design a way to fill out their sheets as completely as possible in a relatively short time. Where are they going to look? What are they going to look for? How will they record what they find? Are they going to draw sketches of different species, collect specimens, or take very detailed notes? How are they going to divide up the work?

Tell them they will have only 30 minutes to work at the site, and let them know whether they'll be able to bring samples back to identify. (Remind the groups that correct identification of different species is not a necessary goal of this activity. "Green needle bush" and

Do's and Don'ts of Field Work

Do's

- Do be sure that you have all the materials you need before you head to the study site.
- Do be a careful observer.
- Do take careful notes about what you find, including information about the locations and characteristics of plants and animals.
- Do handle animals with care—and handle them as little as possible.
- Do return animals you find to the places where you found them.
- Do replace logs and rocks to the position you found them.
- Do stay within the boundaries of your study area.
- Do try to identify unknown species while you're in the field.
- Do wash your hands carefully as soon as you return to the classroom.

Don'ts

- Don't damage trees or other plants by digging them up, ripping off leaves, or tearing at the bark. Be careful when collecting specimens.
- Don't put anything you find—such as berries, leaves, mushrooms, and bark—in your mouth. Also, don't put your fingers in your mouth until after you have returned to the classroom and washed your hands thoroughly.
- Don't chase after, yell at, or throw things at animals you see.
- Don't touch or collect animal droppings, dead animals, mushrooms, or human refuse such as bandages, broken glass, rusty cans, or needles.
- Don't reach under logs or rocks, crevices, or other spaces if you can't see into them.

"shiny black bug" are as correct as "juniper" and "patent leather beetle." However, depending on your group and the time you have available, you can teach your students to use field guides and incorporate accurate species identification into the survey.

Review the "Do's and Don'ts of Field Work," adding any additional points needed for your particular area.

Now give the students time to work in their teams to come up with their study plans.

3. Review the study plans

Once the students have designed their study plans, meet with each group independently and have the group explain its design. Make sure that each group has evenly divided the amount of work to be done among the group members, will be getting to all areas of the study site, and has accounted for inventorying the full range of species types listed on its survey sheet.

4. Conduct the Backyard BioBlitz

Take the students to the study area and give them approximately 30 minutes to conduct their surveys. *If possible ensure that each group has an adult supervisor.* Although identification to latin species name is not the main goal of this activity, you might want to have field guides available for students to use to help identify what they are seeing.

Students can collect specimens to take back to the classroom. Pass out plastic bags and small containers for use in specimen collection. Some things should not be collected: animals, delicate or rare flowers, dangerous plants (poison ivy and poison oak), and endangered plants. Have the students draw sketches of items that should not be collected or are hard to describe. (Again, refer to the "Do's and Don'ts of Field Work.")

Don't forget to look everywhere, including:

- on the ground
- on tree trunks
- in tree branches
- in leaf litter
- on plant stems and leaves
- under and around logs
- under rocks

5. Finalize findings

Give the teams time to review and identify what they found, and consolidate information. Have them make notes on the sketch of the area to indicate where certain things were found or where animals or plants were concentrated. You may even have the students prepare a presentation around any specimens they collected to share with the class.

6. Share results and send in the Biodiversity Month Reporting Sheet

Have the groups report on their findings and discuss the processes they used. How many different living things did they find? Where did they find different things? Did they find any native species? Non-native species? Were species evenly distributed across the site or did the students find greater variety in particular areas? If there were distribution differences, where did they find the greatest diversity? Do they think that as a group they found everything out there? What factors might have affected the number of species they found? For example, would they have expected to find the same number and types of species if they'd done their Backyard BioBlitz at a different time of year? Or with magnifying glasses? Did one team have a way to complete the investigation that worked particularly well? What was the hardest thing about conducting their Backyard BioBlitz? Were they surprised by anything they found or didn't find?

Biodiversity Month would like to learn about the plants and animals you found in your Backyard BioBlitz. It doesn't matter whether you were able to identify them to species, or if you just knew that they were different from any other plant or animal found and gave them a morphospecies name e.g. "Morphospecies 1, black eyed bug," "Morphospecies 2, silver tongued toad." Compile a list of the total number of different plants and animals found (include both species and morphospecies). Check the list very carefully for duplicates, so that the same type of plant or animal isn't counted twice. It's likely that the different groups will have found some of the same plants and animals, but they may have called it different things! For example, one group may have listed "Morphospecies 1 = black and red bug," another group may have listed "Morphospecies 13 = red winged beetle," a third group may have known its common name "Box elder bug," while another group may have even found out its scientific name *Leptocoris trivittatus*. By talking as a group and discussing what the species looked like and where it was found, you can tell whether or not these different names in fact refer the same species.

When you have your final list of the different plants and animals found, fill in and submit the on-line *Backyard BioBlitz Report* form. Please also send us any digital photographs or pictures about your Backyard BioBlitz.

Biodiversity Month will use the *Backyard BioBlitz Report* form to collect information from schools and youth groups across America to find out how many species were counted in backyards across America, which had the most species, and which had the coolest and most unexpected or unusual species. Every school's results will be posted on the Biodiversity Month webpage.

7. Wrap up

Do they think these kinds of rapid assessments are useful? What kinds of organisms have they probably missed? (It's often difficult to find all the species in an area in a short amount of time. Because animals tend to come and go from different areas, they can be missed if the amount of time spent looking for them is too short. Very small or microscopic organisms can be hard to find and identify. Also, there are often seasonal changes in the organisms in an area, so an inventory conducted at one time of year might be very different from an inventory of the same area at a different time of year. But despite their problems, rapid assessments are often very useful because they are a way to quickly get a good idea of the diversity of species in an area. When time is short, a BioBlitz may be the only way to go.)

Assessment

Have each student write a mystery movie review of the "Backyard BioBlitz" that the class conducted. The critique should identify which members of the teams played what roles in the blitz, weaknesses in the "plot" or in their study plans, how the blitz was organized (directed), and so on. Encourage the students to use the movie metaphor to look for strengths and weaknesses in the Backyard BioBlitz as an assessment of diversity of an area.

Unsatisfactory—The student does not use the movie metaphor, critique the Backyard BioBlitz, or complete the activity. The student does not complete any part of the assessment requirements.

Satisfactory—The student uses the movie review to identify both what happened in the Backyard BioBlitz and the different roles of individuals in conducting the diversity measurement.

Excellent—The student uses the movie review to identify strengths and weaknesses in the Backyard BioBlitz as it was conducted and the use of a Backyard BioBlitz in general for measuring diversity.

Writing Idea

Have your students write an article explaining the process they used to collect their data, including any conclusions they may have drawn during the activity.

Extension

If you use a natural area for this activity, you can have students keep track of changes in it from season to season and year-to-year by comparing their data with that collected by other groups in the past. You can also do an urban blitz to identify the plants and animals that live in a city block.

Resources

- Your state Department of Natural Resources or Fish and Wildlife Department.
- Your state University Extension Office.
- All the Birds of North America by Jack L. Griggs (Harper Collins, 1997).
- The National Audubon Society Field Guide to North American Birds: Eastern Region by John Bull(Knopf, 1995).
- The National Audubon Society Field Guide to North American Birds: Western Region by John Farrand (Knopf, 1994).
- The National Audubon Society Field Guide to North American Mammals by John Whitaker (Knopf, 1996).
- The National Audubon Society Field Guide to North American Trees: Eastern Region by Elbert L. Little (Knopf, 1998).
- The National Audubon Society Field Guide to North American Trees: Western Region by Elbert L. Little (Knopf, 1998).
- The National Audubon Society Field Guide to North American Wildflowers: Eastern Region by John Thieret (Knopf, 2001).
- The National Audubon Society Field Guide to North American Wildflowers: Western Region by Richard Spellenberg (Knopf, 2001).
- Eco-Inquiry by Kathleen Hogan (Kendall/Hunt Publishing Company, 1994).
- Global Biodiversity: Status of the Earth's Living Resources edited by Brian Groombridge (Chapman and Hall, 1992).
- Yuck! A Big Book of Little Horrors by Robert Snedden (Simon and Schuster, 1996).
- The World Wildlife Fund WOW: Windows on the Wild, a biodiversity magazine. *http://www.worldwildlife.org/window/overv.html*
- American Museum of Natural History. Biodiversity: It Takes All Kinds to Make a World *http://www.amnh.org/nationalcenter/it_takes_all_kinds/*

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