

Planet Ark • Teaching Guide

Written by Adrienne Mason

Illustrated by Margot Thompson

About the Book

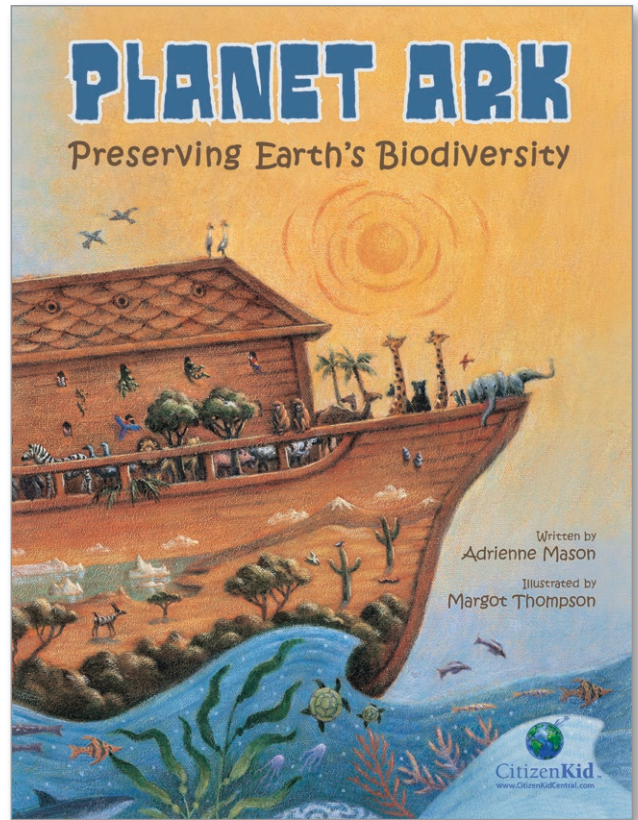
Young readers can learn how to be modern-day Noahs and protect the world's plants and animals from extinction not by building a giant boat, but by making small changes in their everyday lives — from planting trees to turning off the tap — to help preserve the world's biodiversity. *Planet Ark* is part of CitizenKid™, a collection of books that inform children about the world and inspire them to be better global citizens.

About the Author

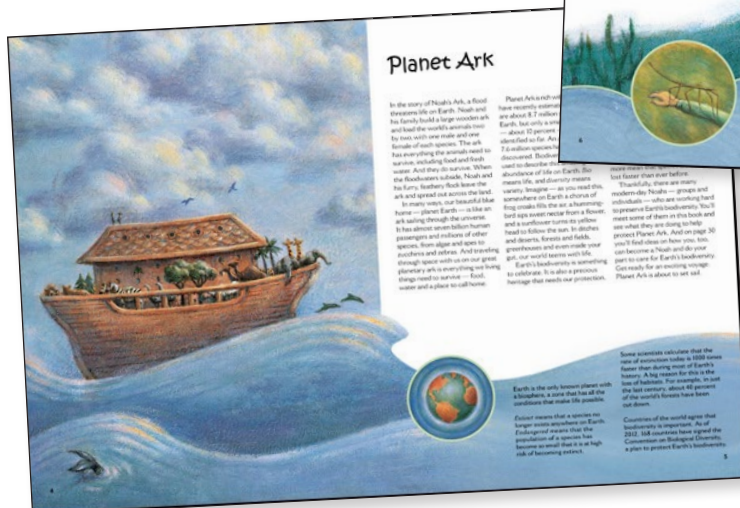
ADRIENNE MASON is the author of 30 books, including *Bats, Snakes, Owls* and other books on wildlife. She also does research and writing for museums and interpretive centers. She lives in Tofino, British Columbia.

About the Illustrator

MARGOT THOMPSON is an illustrator and designer who has illustrated several books for children, including *Tree of Life* and *Biomimicry*. She studied science at the University of Toronto and illustration and design at the Ontario College of Art and Design. As well as illustrating books, she works as an exhibit designer at the Royal Ontario Museum in Toronto.



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Goals

- To define biodiversity as a characteristic of habitat
- To examine a habitat for biodiversity in plant and animal life
- To analyze the importance of biodiversity

Essential Questions

- What is biodiversity?
- How can biodiversity be studied?
- Why is biodiversity important, locally and globally?

Next Generation Science Standards

Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Required Materials

- Several copies of field guides of regional plants, birds and other organisms
- Yardsticks or meter sticks
- Tape measures
- Stakes
- String
- Permanent markers
- Pencils and notebooks

Overview

After reading *Planet Ark: Preserving Earth's Biodiversity* by Adrienne Mason, students will embark on a project investigating biodiversity in their own community. The class will learn about and then build line transects and plots in an outdoor area near the school. They will study the area and maintain a logbook and plot map, cataloging each species of organism (likely plants and insects) that they observe. They will discuss the importance of biodiversity on a very local level.

Outcomes

- Students will be able to define *biodiversity*, *ecosystem*, *habitat*, *genetic diversity* and *habitat diversity*
- Students will work cooperatively to build line transects and/or plots
- Students will create species lists and maps
- Students will discuss the importance of biodiversity

Common Core State Standards

CCSS.ELA-Literacy.RI.4.3

- Explain events, procedures, ideas or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.

CCSS.ELA-Literacy.RI.5.3

- Explain the relationships or interactions between two or more individuals, events, ideas or concepts in a historical, scientific or technical text based on specific information in the text.

CCSS.ELA-Literacy.RI.4.2 and CCSS.ELA-Literacy.RI.5.2

- Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

Advance Preparation

Before beginning the activities, you will need to find a location for your students to conduct line transect or plot sampling studies (described below). Choose an outdoor spot, preferably one to which you can walk and that you can visit several times over the course of a week (or longer!). Attain proper permissions to bring your students to this spot. Possibilities include:

- A green spot in a city park
- The edge of a pond
- A field with grass that has not been chemically treated
- A section of woods
- A marsh
- An area of trees planted along a street

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Lesson Activities: Discovering Biodiversity

DISCUSSION OF *PLANET ARK*

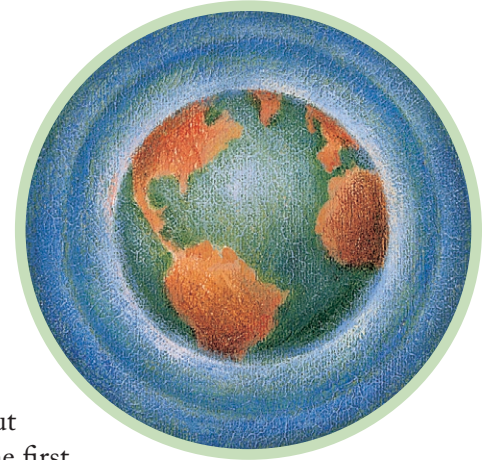
Note: This discussion can be broken up over five class meetings and does not need to be completed in its entirety before beginning the line transect and plot sampling studies. It is divided into sections to aid in your organization of class time.

Part I

Define the main concepts covered in the book, including:

- *Biodiversity*: the variety of life on earth (page 5)
- *Species*: a group of organisms that can breed with one another and produce offspring (page 6)
- *Genetic diversity*: the diversity within a species (page 6)
- *Habitat diversity*: the variety of natural places where organisms live (page 6)
- *Ecosystem*: all of the organisms that live in an environment, as well as the nonliving things — such as climate — that affect them (page 8)

You may write these definitions on the board or ask students to find them in the book and read them aloud. Ask a volunteer to read the paragraphs on page 6 about genetic and habitat diversity (the second-last paragraph in the first column and the first paragraph in the second column). As a large group, brainstorm a list of species that live in your region. Encourage discussion about species genetic diversity and regional habitat diversity.



Part II

Divide students into groups and ask them to read pages 10–11. Provide pencils, markers and unlined paper, and ask each group to draw their version of the real world wide web (a food web). Encourage creativity.

Before reading the section on dirt (pages 14–15), explain that students will be looking at very specific areas of ground when they set up their line transect and plot sampling studies, which will likely include a lot of dirt. Encourage them to pay special attention to this section, because you will be asking them to evaluate the dirt health of their plot later on. Now review these pages with students, asking a volunteer to read aloud each of the paragraphs.

Part III

Engage in a discussion about invasive species, breaking the class up into five groups. Assign each group one paragraph from page 16. Ask them to read and summarize the paragraph, writing their summaries in one to three sentences. Bring the groups together and ask for a volunteer from each group to read the summaries of page 16, in order of the paragraphs.

After discussing pages 16–17, bring out the field guides you have found for the science activity below. Help students familiarize themselves with some of the local native species, and use the guides to help determine if it will be likely that the students will see any invasive species during their outdoor activity.



Part IV

Turn to page 22 and point out that the fellow mentioned at the top of the page gave his name to the field guides you might have in the classroom. Ask students to discuss how this may have come to pass. What was special about John James Audubon? What did he care about and devote his resources to? Do they think Audubon influenced biodiversity? How so?

Read the last two paragraphs on this page aloud to the class. If they have already set up their line transects and plots outside, ask the class if they think it would be possible to turn their sample areas into miniature protected habitats. Some things to consider:



- What does it mean to preserve land?
- What are some things you can't do on preserved land?
- Who does preserved land benefit? Does it negatively impact anyone?
- Who owns the land?
- Do you need anyone's permission to conduct a short-term study on the land? If so, how would that affect turning the space into a preservation?

Read pages 24–25 and ask the class similar questions about if they could farm on the land they've plotted out. What type of land is it, and what possible crops could you grow there?

Part V

Turn to page 27. Divide the class into seven groups and tell them they'll be practicing their writing skills today. Assign one of the boldface terms to each group and ask them to brainstorm ideas about how biodiversity affects their concept. Students should be encouraged to think creatively and write a short story, a nonfiction paragraph or a newspaper article about biodiversity and their topic. Encourage them to address the essential question, *Why is biodiversity important?* Provide writing support as needed.

ACTIVITY: LINE TRANSECT AND PLOT SAMPLING STUDIES

Explain to the class that while they are reading all about biodiversity in *Planet Ark*, it's a good time to explore a local habitat and discover its biodiversity. Take a moment to focus on the advantages of diverse plant life, because chances are your students will primarily discover plants (and likely insects) in the activity outlined here. Explain how strong plant biodiversity provides nutrients to a greater variety of animals and predicts the overall environmental health of a region.

Assign students to groups of three or four and provide each group with a field guide about local plants, animals and other organisms. Encourage students to look through the field guides and explain that they will likely see some of these species in the habitat they're about to visit. Assure students they won't need to memorize all the names of the plants and animals, but ask them to try to familiarize themselves a bit so they know what they're looking for.

Study Design and Procedure

Divide students into four or six groups. If you have four groups of students, assign two of them to line transects and two to plot sampling. If you have six groups, assign three to each type.

Line Transects:

Explain that a line transect is a long, narrow sampling area. Because it extends over a long portion of land, it gives a large sample and can reveal lots of different species. Tell students in these groups that they will be staking out transects that measure 10 yards (10 meters) long.

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Plot Sampling:

Explain that plot sampling involves studying a square area that is divided into subplots to look carefully at one specific piece of land. Students in these groups will be staking out plots that measure 8 yards by 8 yards (8 meters by 8 meters).

Note: You can adjust these measurements based on your location. Your goal is to have no two groups' plots or transects overlap. If necessary, have students work in larger groups so that you need fewer plots and transects.

Students completing a line transect study should follow these steps:

1. Tie one end of the string firmly to a stake.
2. Measure out 10 yards (10 meters) of string. Using a permanent marker, place a mark at each yard/meter, so that there are 10 marks on the string.
3. Tie the other end of the string (at the 10 yard/meter mark) to another stake and cut away the extra string.
4. Place each stake firmly in the ground, with the string pulled taut.
5. Look for plants and organisms along the 10-yard (10-meter) transect.

Note: Students can include any life they see within a width of 1 yard (1 meter) on either side of the string.

Students completing a plot sampling study should follow these steps:

1. Measure a square area of 8 yards by 8 yards (8 meters by 8 meters) and place a stake at each of the four corners.
2. Outline the plot study area by tying string firmly to the stakes.
3. Once the plot has been laid out, students should spread out to cover the entire plot area to survey and identify the species of organisms they see.

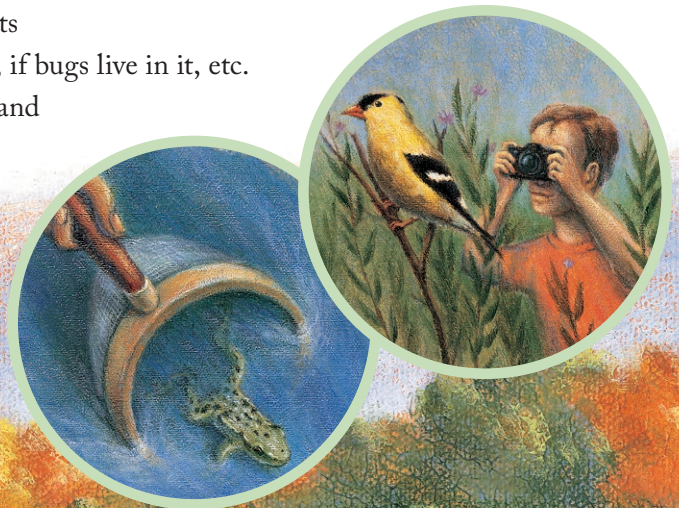
For both groups:

Students should keep a logbook of all the plants, insects and other organisms they observe in their plot or transect. They should measure the plants and describe their shapes, if they have flowers and what colors they observe. They can also draw pictures of the plants, as well as the bugs and other organisms they see, in addition to trying to identify them scientifically.

Have students take notes on the species of plants and animals they observe in their studies. Their logbooks should contain:

- lists of types of plants and other organisms
- pictures of some of the samples
- a map that they can use to compare what changes between visits
- observations about the dirt in their plot or transect — its color, if bugs live in it, etc.

Encourage students to measure plants (though not trees) to see if and by how much they grow between visits. Measurements should be included on maps and in their logbooks.



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Study Discussion

When you get back to the classroom, discuss how many different plants and organisms each group found.

- What types of leaf shapes did they see in plants?
- How many different blooming flowers were found?
- How many different types of insects were observed?
- What other types of organisms did they see?

Use the field guides to help students identify the plants and animals they observed, and ask them to think about how the animals are helped by greater plant diversity. Did they notice any invasive species?

Now return to pages 14–15 of *Planet Ark* and ask students to talk about the dirt health of their plots and transects. Students can make hypotheses about what types of changes they think they will see over the course of the activity, based on the health of the dirt they looked at initially.

Ongoing Study

Students should be encouraged to return to their plots and transects each day for at least a week, or as long as possible. If you can continue this activity through the end of the school year, go for it!

Once a week, discuss the new data that comes in. What does the data tell you about the habitat? Was more biodiversity found in one area than in another? Do the students hypothesize that this area is healthier than the area with less diversity?

Questions for Further Discussion:

- Compare and contrast each plot or transect studied. Which area had the greatest diversity of life? Which area had the highest population number? Why were some areas more diverse than others?
- Discuss environmental stresses that might have affected your habitat of study. What would happen if a hurricane or tornado struck your study area? What about chemical pollutants? Do you think your habitat is strong enough to survive?
- Based on this activity, do you think humans should take measures to ensure biodiversity? Why or why not?



For additional activities, videos and more, visit
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