CHAPTER 2: WHAT MAKES A GOOD SITE

"You don't have to trek to a far-off jungle to find a good site. Discoveries can be made in a backyard or a field or the wooded area of a local park"

—ERIC QUINTER
(*Selecting a Site*, p.177)

TARGET QUESTIONS: **What makes a good site for studying biodiversity? What are the advantages and disadvantages of your site and your team plot?**

PREREQUISITES: Core Activities in Chapter 1

CORE ACTIVITIES:

LESSON 1

How Do Scientists Select Their Sites?

LESSON 2

Planning How to Measure and Mark the Plots

LESSON 3

Staking a Claim

Optional Mapping Activities

- Field Trip to Map the Site
- Creating a New Map
- Adding Team Plots to the Map

LESSON 4

Compiling Data about the Site

ASSESSMENTS:

Assessing the Class Site and the Team Plot

WEB COMPONENTS:

FOR STUDENTS

- Selecting a Site*
- Profile of Eric Quinter*
- Site Report (available in the Reproducibles section of the Teacher's Guide)
- Map of major biomes of North America
- Link to information on latitude and longitude
- Profile of Eleanor Sterling*
- Profile of Helen Hays*

* All Web reading selections for students are available as blackline masters.

OVERVIEW OF CHAPTER 2

Students read a selection that describes how scientists at the American Museum of Natural History decide on sites to study. Then they apply this new information to develop a list of criteria to use for assessing the advantages and disadvantages of their own site.

Students work in teams to develop a plan for measuring and marking their plots and discuss what kinds of tools they need and how they might get or invent them.

In the field, students work in teams to mark and measure the plot they will study.

In the Optional Mapping Activities, students collaborate to create a new map of their site and contrast it with the map they created in Chapter 1. Later they add the locations of the team plots to the site map.

BACKGROUND INFORMATION FOR THE TEACHER

Perhaps the best way to get students invested in the topic of biodiversity is to get them involved in discovering for themselves the breadth and scope of the variety of life-forms that exist locally. At their own site, they will conduct systematic observations of plants and animals. You will pick a specific site in which your students will work, and they will mark their team plots and record observations in their field journals. In this way, students will emulate the fieldwork carried out by biologists. They will observe, record, identify specimens, collect data, communicate, and share results. Like some Museum scientists, students may also exhibit their work to the public at the end of the project. Our hope is that, in the process, students will come to love and appreciate nature and become future stewards of the planet.

SELECTING TEAM PLOTS WITHIN THE SITE

At this point, you have already selected the outdoor site for the study. Now there are choices to be made about the selection of the smaller team plots, or quadrats, within the boundaries of the site. Quadrats are sampling plots, usually square, that vary in size depending on the organisms under study. In *Biodiversity Counts*, students will set up a $2m^2$ plot (2 meters by 2 meters) for each team of three or more, or about 10 quadrats per class.

There is a wealth of data to be collected from each small square, and taken together the quadrats will help to create a profile of your area. From the quadrats, students can collect data on such topics as the numbers and relative abundance of organisms present, the percentage of ground covered by vegetation, and the environmental factors limiting the occurrence of an organism. They can observe relationships within and among plant and animal communities, and begin to understand why an organism may be restricted to a particular place.

The quadrat technique is a fairly simple way to collect data that can be replicated. And if the same quadrats are studied over several seasons or even over several years, they may reveal patterns or changes that relate to the diversity of organisms and their abundance at a particular site.

It is at this stage that students will begin to discover the importance of measuring accurately, using appropriate tools, asking relevant questions, and keeping good records of their observations. Some of these skills they will learn by trial and error: For instance, in the previous chapter students learned the importance of keeping good records when their initial records failed to give them enough information.

One of the first decisions students must make is how to position the quadrats within the class site. Consider the following possibilities.

- Allow the teams to select their own plots. This probably will result in a sprinkling of quadrats over the whole general area. There are two advantages to this approach: Students will be immediately invested in the plot they have selected themselves, and they will have done some thinking about what makes theirs a good area to study.
- You could set up plots on alternating sides of one or more transect lines. Here's how it is done.

Select an area that encompasses a variety of features: trees, bushes, grasses, rocks, bare spots, and human-made features such as trash barrels, pathways, or fences.

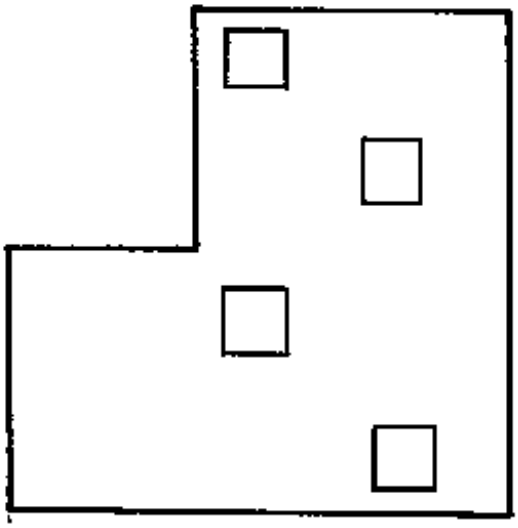
Using a measuring tape or a long piece of twine, lay down one or more transect lines. The length of the transect line depends on how many $2m^2$ plots you want to position along its sides. You will need 2 meters along the line for each plot.

Beginning at the zero mark at one end of the transect line, say on the right-hand side, have a student team measure off a $2m^2$ plot, using the line as one of the 2-meter sides of the square.

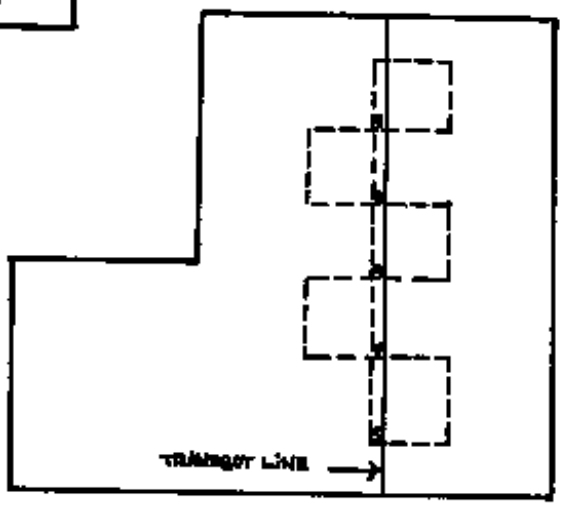
Have the next team position its square on the opposite or left side of the line. They will begin measuring at the 2-meter mark.

The third team positions its square on the opposite or right side and begins measuring at the 4-meter mark. And so on, until all quadrats are marked.

Then, either assign teams to plots or let them pick their own. The advantage of this more structured plan is that it keeps teams working in close proximity and allows for easier communication and comparisons on site.



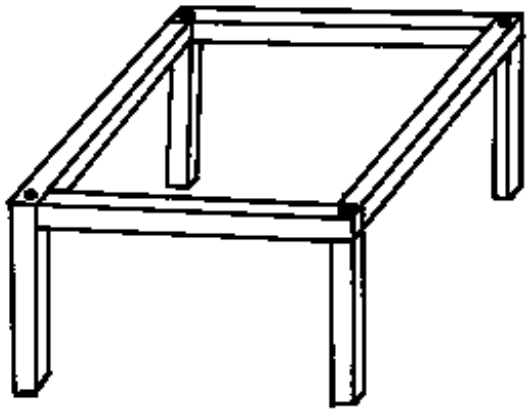
A SITE WITH A SPRINKLING OF PLOTS



A SITE WITH PLOTS LAID OUT ALONG A TRANSECT LINE

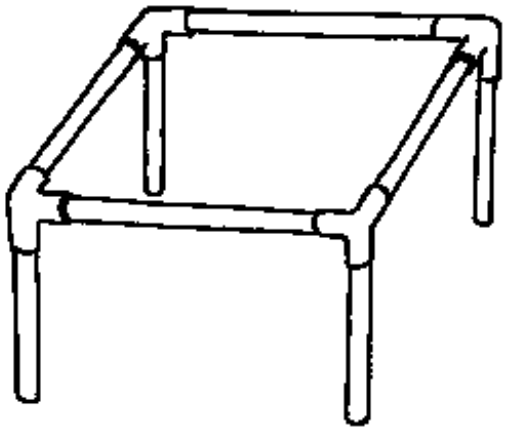
MEASURING IDEAS

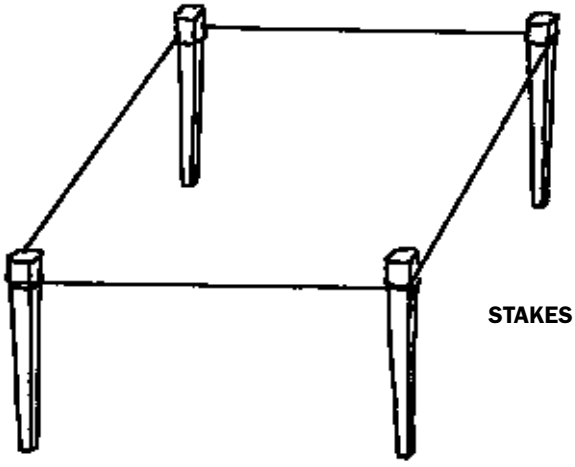
In order to map out and mark their plot, students will need metersticks, tape measures, or other measuring devices of their own invention. They may make a simple measurement tool using an 8-meter length of string knotted every 2 meters and then tied together at both ends to create an easily portable square. They can also build 2m×2m frames made of wood or plastic pipe that they place on the plot each time they visit it. (Try to enlist the help of the shop teacher, the art teacher, or some parents to construct permanent frames.) Other alternatives are stakes or popsicle sticks pounded into the ground and connected with yarn or twine, or small, colored flags.



FRAME OF WOOD

FRAME OF PVC PIPE





STAKES AND TWINE

1
LESSON

LESSON 1

HOW DO SCIENTISTS SELECT THEIR SITES?

TIME 1 class session

MATERIALS
- ❑ A large sheet of chart paper and markers to record student criteria for selecting a site

WEB COMPONENTS: STUDENT READING SELECTIONS

Selecting a Site

OPTIONAL: Profile of Eric Quinter

1. Ask students to read the two selections and to prepare for a discussion on the following questions:

- How did the Museum scientists decide which sites to study?
- What questions were the scientists trying to answer? Why did they think their sites would be good places to find answers?
- How do they record their data? Give some examples from the two articles you read about keeping journals.
- Why do field scientists draw maps of their study sites? What kinds of data are recorded on the maps?
- What is a site inventory? How does an inventory help scientists understand the biodiversity of an area?

2. Discuss the readings.

3. To make sure that students clearly understand the selection process, ask them to use all this information to create individual lists of what would make an ideal site for the* Biodiversity Counts *project. Then have them discuss that list with their team. Have one student from each team report on the discussion. Compile their ideas on the large sheet of paper labeled "Criteria for a Good Site." Your class might develop a list similar to this one:

Criteria for a Good Site

We can see it from our window, and we can walk there every day.

It has many different kinds of plants, like grass, trees, flowers, and bushes.

Many different kinds of animals live there, like insects, birds, and mammals.

There is a wet spot with different kinds of marsh plants, frogs, small fish.

We like to go there.

It is big enough for all of us to work there at one time.

No one will mess with it when we are not there.

4. Finally, ask students to weigh the pros and cons of the site they will study. Help them to predict both the advantages and disadvantages of their area. You may want to tell them the criteria you used to select the site, too, and any compromises you made.

2

LESSON

LESSON 2

PLANNING HOW TO MEASURE AND MARK THE PLOTS

TIME 1 class session

WEB COMPONENTS: STUDENT READING SELECTIONS

OPTIONAL: Profiles of Eleanor Sterling and Helen Hays

1. Explain to students that, within the boundaries of the site, each team will select its own smaller plot to study in depth. Suggest that they all use the same-size plot—2m^2. Describe the two options for selecting plots. (See the Background section for complete details).

- Student teams may select their plots anywhere within the boundaries of the site.
- The class may lay down one or more transect lines, and then teams can pick their location along the line.

Help the class come to a decision on which option they will use.

2. Discuss the logistics of measuring and marking the team plots. Ask students to think about the following and develop a plan:

- What tools will you need to measure out your area? What equipment do we have available? What can you bring in? What might you invent or build so that you do not have to remeasure every time?
- How will you mark your plot so that you can find it again? Can you leave the markers in place, or will you need to set them up and take them down each time you visit?
- How will you find your plot again? How will you record its location? What permanent features could you use as points of reference?

3. Remind students of the article they read called "Selecting a Site" in which the scientists told about the questions they were trying to answer through their research projects. Explain that each team will need to begin developing a list of their own questions to research at their team plot. Give them time to discuss the problem with their teams and to jot down some preliminary questions they would like to investigate.

- How do scientists decide what to study in the field? Why is it important to develop good questions?
- What tools and methods do they use that you could adopt?

4. Discuss the objectives for the next field trip with the class. Ask students to share their plans for how to accomplish the tasks.

3

LESSON

LESSON 3 **STAKING A CLAIM**

TIME 2 or more field sessions

MATERIALS

- ❑ Field journals
- ❑ A variety of tools (brought in and invented) for measuring and marking the plots. These may include rulers, metersticks, tape measures, twine, and $2m^2$ frames.

WEB COMPONENT

Site Report

1. Before you take the class to the site, check that each student has a journal and that they have brought along all the tools they think they will need to measure and mark their team plots.

2. Remind students of their objectives for the field trip. (Note: You may want to spread the tasks over several field trips.) Review the following objectives:

- Each team will begin the survey of its $2m^2$ plot. Teams should measure it out precisely and mark its borders. If the markers cannot remain in place, students will have to remove them before they leave the area. Students may also want to create a map in their field journals so that they can locate their plot easily the next time.
- The teams will spend some time observing the plot and discussing questions they might ask about it. They should note their observations and questions in their field journals.
- Each team will also fill in as much information as possible on its copy of the Site Report. Go over the form with the class. Encourage them to speculate about why the items are important and how they might affect what students will discover as the study progresses.

3. As students work on site, use some of the questions below to guide them:

Tasks	*Focus Questions*
To mark and measure their team plots	How did you measure your plot? What tools did you use? How will you mark the boundaries of your plot?
To develop a system for finding the team plot	How will you find your plot the next time? Did you draw a map? What permanent features did you use as points of reference?
To make preliminary observations	What have you observed about the plants and animals in your plot? Where have you recorded your observations?
To record data on the Site Report	How much data have you been able to record on the Site Report? What tools have you used to collect the data? Which items will require further research? What reference materials will you use?

TEACHING TIP: LAST-MINUTE CHECKS

Help students to get into the habit of doing a quick last-minute check before leaving the site. Have them check:

- The condition of site itself. It should be as good as or better than the way you found it.
- Their field notes. Make sure entries are legible, intelligible, and complete. Include notes about what needs to be followed up, either at the field site or back at school.

OPTIONAL MAPPING ACTIVITIES

ACTIVITY 1	**FIELD TRIP TO MAP THE SITE**
TIME	1 class session and 2 or more field sessions
MATERIALS	❑ A variety of tools for mapping the site. These may include graph paper and clipboards, rulers, metersticks, tape measures, twine, and a compass.

TEACHING TIP: SUPPLEMENTAL MAPPING ACTIVITIES

If your group has not had much experience with mapping, have them practice by first drawing a map of the classroom as seen from overhead. The map should be drawn to scale and represent all the objects in the classroom (within reason). Show students how to create a legend for the map, using symbols to represent objects. This is a good opportunity to reinforce measuring skills and using tools such as the compass, metersticks, and measuring tapes.

1. Before you visit the site, discuss the objective of the field trip, which is for students to make a map of the entire site. Give students time to discuss how they will approach the

job in order to create an accurate, complete, and clear map in a reasonable amount of time.

2. Then take the class to the outdoor site. Define the boundaries of the site, remind students of the safety rules, and then ask them to work in teams to map the site. You may want to divide the site into zones and have different teams responsible for each zone.
3. As students work, circulate among them and use some of these questions:

Tasks	*Focus Questions*
To develop a plan for mapping the entire site	How shall we divide up the area? How have you divided the tasks within your teams?
To collect data necessary to create an accurate map of the site	How are you measuring distances? What tools are you using?
To draw a map of the site	What symbols will represent the different objects at the site? Have you created a legend for the map?

OPTIONAL MAPPING ACTIVITIES

ACTIVITY 2	**CREATING A NEW MAP**
TIME	1 class session
MATERIALS	❑ A clean overhead transparency film, markers, and overhead projector for Map Number Two. Alternative: a large sheet of craft paper and markers. ❑ Map Number One, which students created after their first field trip.

1. When you return to class, have students use their data to collaborate and create a class map of the site on an overhead transparency (or on a large sheet of chart paper). Label it Map Number Two.

2. Compare this map with the one students created after their first field trip (Map Number One). Ask them to contrast the two maps.

- What was the purpose of our first trip outdoors? How was that different from the purpose of our second trip?
- How do your two maps reflect those differences? Where do you find more data, more evidence?
- Which map is a better representation? How do you define "better"?
- Would someone else be able to recognize the area from the second map you made of it? Why or why not?
- How could we improve the second map? What other tools might we need to do a better job?

Note: Save both maps for future reference.

OPTIONAL MAPPING ACTIVITIES

ACTIVITY 3	**ADDING TEAM PLOTS TO THE MAP**
TIME	1 class session and 2 or more field sessions
MATERIALS	❑ A variety of tools for mapping the site. These may include graph paper and clipboards, rulers, metersticks, tape measures, twine, and a compass.

1. After students have selected and marked their team plots in Lesson 3, display Map Number Two again. Invite each team to the map to draw in its plot in the correct location.
2. Save the map for students to make additions in later lessons.

4 LESSON

LESSON 4 **COMPILING DATA ABOUT THE SITE**

TIME 1 class session

WEB COMPONENTS

Map of Major Biomes of North America

Site Report

Links to information on latitude and longitude

1. Work with the class to compile the data they gathered in the field on the Site Report.

2. Then have students use other resources to complete the rest of the form:

- Have students consult a map of the major biomes of North America on-line, such as the one found at the University of Tennessee's Web site <http://fp.bio.utk.edu/bot120lect/Biomes/biomemap.htm>, to work out the particulars of their region. If students are not familiar with the term, you will need to explain that the land surface of Earth is classified into broad vegetation types called biomes. Major biomes include tundra, coniferous forest, deciduous forest, tropical forest, temperate grassland, savannah, and desert. Each biome has its own characteristic climate, vegetation, and animals. Biomes might be thought of as macrohabitats, or habitats on a grand scale. They may be further divided into ecosystems, habitats, and microhabitats. (Please see Chapter 6 for more information.)
- To determine latitude and longitude, students may consult maps and atlases, look for information on the Internet, or call the local airport.

ASSESSMENT: ASSESSING THE CLASS SITE AND THE TEAM PLOT

1. Ask students to assess their class site and their team plot within the site. Try these questions:

- For studying biodiversity, what are the advantages and disadvantages of the whole site?
- What are the special advantages of your team plot? Why did you select it?

2. Have teams prepare statements describing why they think theirs is a good plot in which to study biodiversity. Post the statements on-line.

   Record the statements on the class chart or concept web.