Sample Site Selection and Set-Up

Overview

You will choose multiple Land Cover Sample Sites within your 15 km x 15 km GLOBE Study Site. These sample sites will serve as the locations where you take land cover measurements. You will need these measurements to create your land cover type map. Preferably, you should collect at least one Sample Site for each class of land cover that you observe in your Study Site. You will need data from additional Sample Sites to perform an accuracy assessment to validate the land cover map you created. You may also decide to establish additional Sample Sites whenever you are unsure or curious about the land cover in any area. Some of these sites you may only visit once. In other sites, you may want to study changes in vegetative growth throughout the seasons so you may visit these sites frequently. The following provides instructions on how to select and setup these Sample Sites.

Instructions

ALL Land Cover Sample Sites within the GLOBE Study Site must have the following characteristics:

- Homogeneous – the same MUC class throughout.
- 90 m x 90 m in size.
- Oriented in the cardinal directions
  See *How to Lay-Out Land Cover Sample Site.*

All Land Cover Sample Sites are visited at least once but can be visited multiple times during different times of the year, or different years, in order to conduct studies on changes in biomass over time.

For instance, instead of taking measurements only ONCE during peak growth, measurements can be taken TWICE a year, every year. Your semiannual visit should occur once during peak growing season and once during the least active season (summer vs. winter, rainy season vs. drought, etc.). If you have no temperature or rainfall-dependent seasonality in your region, take measurements only once a year.

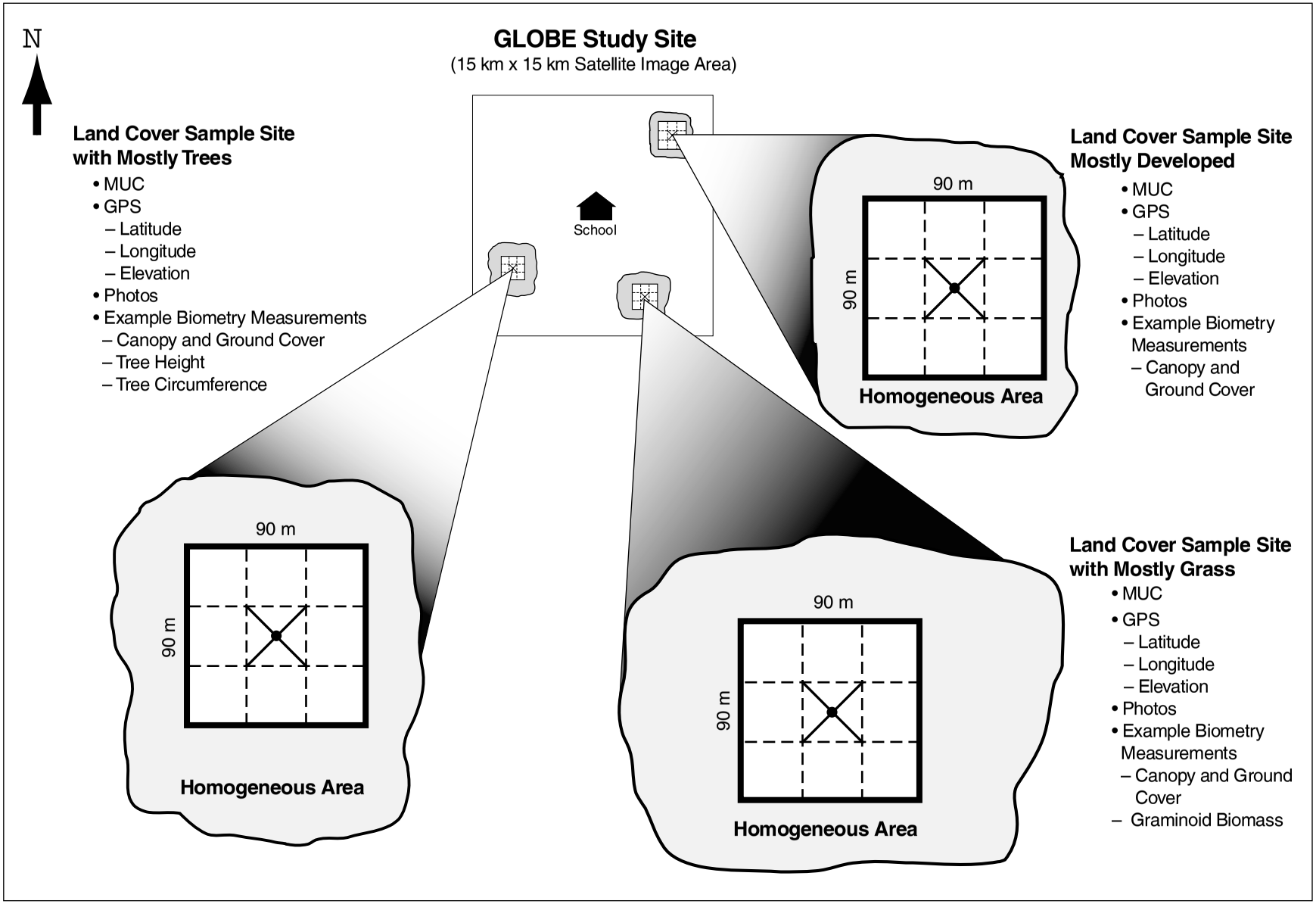
You should permanently mark any trees and shrubs that you measure, since you will return to measure the same ones each time. When you enter your data, make sure that you enter the tree or shrub heights and circumference in the same order each time. This way, you will be describing changes/growth in the same tree or shrub when you report your data.

How to Lay-Out a Land Cover Sample Site

Select a 90 m x 90 m homogeneous area. Use your Landsat TM images and/or your local knowledge to help you locate candidate sites. An area that is homogeneous has the same MUC class throughout the site.

In order to determine if your site is at least 90 m x 90 m in the cardinal directions, pace out

Figure LAND-SS-1: Types of GLOBE Land Cover Sites and Examples of Measurements to Take



(refer to *Pacing* in *Investigation Instruments*) 90 m from one of the corners of the site. Pace in two directions, either North or South AND either East or West. This will give you an estimate of where two more corners are. Estimate the location of the fourth corner. If the entire area is homogeneous, the site is appropriate. (For example, if a 30 m x 30 m area within a forested site has less than 40% canopy cover, the site is not homogeneous.)

Name the site. The Site Name should be unique and identify the site unequivocally. It should not be frivolous.

Note: Areas that look the same on the Landsat image may not be homogeneous and may not have the same MUC class throughout the site. You must make the final determination at the site.

How to Take Biometry Measurements

Once you have established that the site is a 90 m x 90 m homogeneous area aligned in the cardinal directions (N, S, E, and W), you need to determine its MUC Level 1 class. Biometry measurements are taken in the center 30 m x 30 m pixel of the 90 m x 90 m Land Cover Sample Site. Students take some of the biometry measurements as they pace along a diagonal(s) of the center pixel.

The amount and types of biometry measurements are determined by the information you need in order to classify the site to the most detailed level of the MUC System. See Figure LAND-SS-1 for examples of what measurements might be appropriate in specific types of land cover sites. Canopy cover and ground cover should almost always be taken in a natural site. These measurements will help you determine the Level 1 MUC class. Tree and shrub species identification, as well as tree, shrub and/or graminoid height, will help you determine the higher level MUC classes. Tree and shrub circumferences and graminoid biomass are helpful to scientists and to your students when they are studying changes in biomass over time or making specific classifications using satellite imagery. Refer to the *Biometry Protocol* for detailed instructions.

If the site is not visible from the road/path, record the related compass directions and number of paces needed to reach the corner or center of the site from the road/path. You can mark the corners or the center of your site for future visits. While this is not necessary, you may choose to. If there is a chance you may return at a later date, you should mark the center of the 90 m x 90 m site so you can quickly find it.

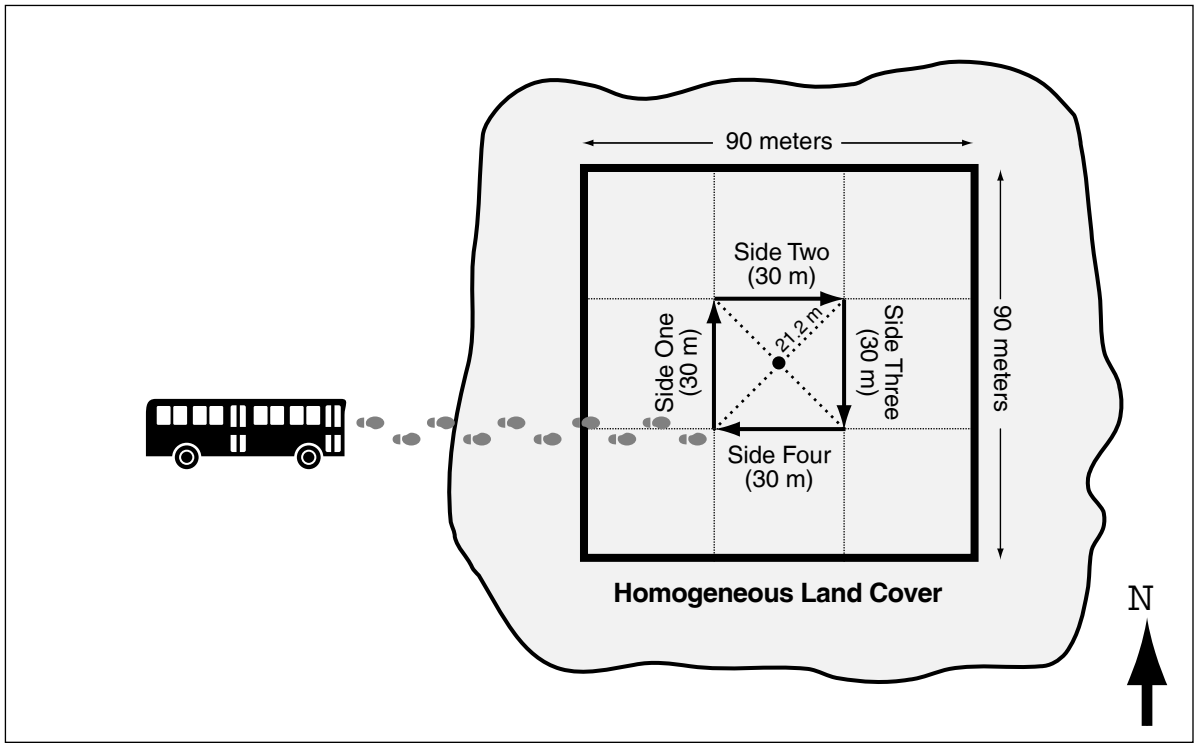
Take Biometry measurements following the *Biometry Protocol.* This will involve doing the following:

- Mark the center of the 90 m x 90 m site where you will be taking measurements. See Figure LAND-SS-2.
- Divide the students into four groups. Assign each group a direction to walk and take canopy and ground cover measurements along a diagonal from the center. Using a compass, assign each group one of the following directions: NE (45°), SE (135°), SW (225°), and NW (315°).
- Each diagonal measures 42.4 m, each group should walk half of a diagonal or 21.2 m.
- If you choose, put markers at each corner.
- Combine the data from each group in order to choose your final MUC class, and submit the data to GLOBE.

Validation Data

Student Map Classification	MUC 71	MUC 811	MUC 92	MUC 0222	MUC 1222	MUC 91	MUC 93	MUC 824	MUC 4223	Row Totals
MUC 71	I									1
MUC 811		I						II	I	4
MUC 92		I	I			I				3
MUC 0222				II						2
MUC 1222					I					1
MUC 91			I			I				2
MUC 93			I				I			2
MUC 824										0
MUC 4223										0
Column Totals	1	2	3	2	1	2	1	2	1	15

Figure LAND-SS-3: Marking the Center Pixel



If you choose to spend additional time in the field or would like to practice additional pacing and compass skills, here is one way to mark the center pixel of a 90 m x 90 m Land Cover Sample Site. See Figure LAND-SS-3.

- Place a marker where you want one corner of your center pixel to be.
- Use your compass and measuring tape to move 30 meters in a cardinal direction (North, South, East, or West). Place a second marker at the end of this transect. This forms side one.
- From the second marker, move 30 meters perpendicular to side one. Place a third marker at the end of this transect. This forms side two.
- From the third marker, move 30 meters perpendicular to side two and parallel to side one. Place a fourth marker at the end of this transect. This forms side three.
- From the fourth marker, move 30 meters toward your original marker. If this transect ends within 2 to 3 meters of the original marker, you are successful. If you are farther away from the marker, check your compass bearings for each side, check the length of each side, and try again.
- Establish the center of your square by pacing the diagonal transects of the square and placing a marker where the two paths intersect. You may use string to make these diagonals. Also note that the two diagonals should be of equal length.

Frequently Asked Questions

1. What if our homogeneous site is not 90 m x 90 m?

If your site is not homogeneous, you will need to find another site that is at least 90 m x 90 m where the land cover is the same throughout.

2. In the 1997 GLOBE *Teacher's Guide,* the *Land Cover/Biology Investigation* talks about Qualitative and Quantitative Land Cover Sample Sites and Biology Study Sites, but not in this version. Why? How has the chapter changed?

In this 2003 version of the *Teacher's Guide*, we removed the terminology for the different types of Land Cover Sites. In the 1997 version, biometry data were collected and entered in the GLOBE database only for Quantitative Land Cover Sample Sites and Biology Study Sites for Closed Forest, Woodland, and Herbaceous Vegetation (MUC 0, 1, and 4). Now biometry data can be collected for most MUC classes. It is up to teachers and students to decide how much biometry data should be collected. We would like you to collect ground and canopy cover data along the entire length of both diagonals within the 30 m x 30 m center area of your 90 m x 90 m site.

3. What should we do if we have already established a Biology Study Site, a permanent Land Cover site to which we return year after year, but it is not a 90 m x 90 m homogeneous area?

If the area around the Biology Study Site is homogeneous with your old Biology Study Site, you can use it, simply expand the area so it is 90 m x 90 m around your center. This will now be simply called a Land Cover Sample Site. You can still visit it repeatedly and take measurements in it. However, if the area around your old Biology Site is not homogeneous, your data will be difficult to compare with satellite images. There is a certain amount of error in the GPS readings, so even if you are in the center of the site, the reading could actually place you anywhere in the 90 m x 90 m area surrounding the center. You will need to find another suitable site. You could still use the old Biology Study Site for practice.

4. What can I do in an urban area?

You can perform the full investigation. In an urban area, most of the sites will be developed rather than natural classes. This is fine, so collect as many Land Cover Sample Sites as you can. These are very important to scientists because urban land cover types are difficult to identify and distinguish in Landsat TM imagery.

5. What if a pond runs through our 90 m x 90 m area?

If a pond or stream runs through your 90 m x 90 m site, it is not homogeneous and is not a valid site. Try to move the site over to exclude the pond and make it homogeneous.

6. What if a stream runs through our site?

If the stream is so small (narrow) that it doesn't alter the MUC class of any 30 m x 30 m part of the site, it is ok. If not, move the site to exclude the stream.

7 What if the site is on private property?

If the site is on private property, please get permission before entering the area.

8. What do I do if my Land Cover Sample Site has experienced catastrophic change since my last visit?

If your site experiences catastrophic change (i.e. fire, wind damage, hurricane, tornado) between visits, please describe this in the metadata section and do the measurements on any existing vegetation (trees, graminoid vegetation). Scientists are very interested in rates of recovery or succession in such sites. If the 90 m x 90 m site is homogeneous, please do the *Land Cover Sample Site Protocol.*

9. There is a small clearing about 10 m x 10 m in area in our forested site. Is the site still homogeneous?

Yes, if the 30 m x 30 m area that surrounds the clearing has the same MUC class as the rest of the site.