Biodiversity

In our first session we will be exploring biological diversity. This is an important concept to begin with. As conservation horticulturists we strive to conserve as much diversity as possible when producing plant populations for re-vegetation and restoration. Information in the following web sites may be useful for teachers as an aide in preparing students for our upcoming activities:

http://esa.sdsc.edu/biodiv2.htm
http://www.ea.gov.au/biodiversity/publications/series/paper1/
http://www.wri.org/wri/biodiv/

Activities for Session 1

I. "Talk Story" – The objective of this opening exercise will be to assess the students' current understanding of biological diversity. Using a concept map we will attempt to link current perceptions of biodiversity, why the students think biodiversity is/is not important, how does diversity "work" (e.g. interrelationships between organisms) and what would the world be like if it lacked biodiversity.

II. Survey of Waipa Biodiversity – Students will conduct a vegetation and animal survey of selected sites in Waipa using transect and quadrant methods. Student scientists will be instructed on how to use both methods of data collection. After they have an understanding of each method they will have an opportunity to collect data from various sites (e.g. coastal strand, garden, disturbed area, back of valley). Students will sketch transect and quadrants then compare data from various sites and report findings to other groups.

III. "Talk Story" – This discussion will be used to assess if the students have a better understanding of biodiversity. We will re-visit the previous concept map and compare former ideas to any new ideas that the students have formed.

Supplemental Activities

While all age groups may participate in the biodiversity activity it may be possible to engage all students separately using various activities. For example, younger students (K-3) may perform an adapted version of this activity, by visiting the various sites and observing different types of vegetation and animals. They may be asked to count or draw the different types of insects or colors of flowers they see. Older students (7-11) may research the concept of biodiversity on the web and prepare an "article" that defines biodiversity, why it is important and threats to biodiversity. They would present their "article" to the other student scientists.

Supplies Needed

- (1) Large flip chart or roll of butcher paper (concept maps)
- (1) Easel or board to hold paper
- (9) Clipboards
- (3) Hula hoops (for quadrants)
- (3) 25 meter measuring tape (transects)
- (6) Hand lenses or magnifying glasses
- (6) 30 centimeter rulers
- (3) Compasses
- (3) Field binoculars

Waipa Biodiversity Survey

OBJECTIVES

1. Students survey various habitats in the Waipa ahupua'a using quadrant and transect line sampling methods.
2. Student teams observe and collect data on the number of different types of flora and fauna within their samples.
3. Students analyze and interpret their data, then report their findings to others.
4. Students realize that a variety of plants may occur in different habitats. They may also realize that disturbed habitats can have less diversity than non-disturbed habitats.
5. Learn why biodiversity is important.

SKILL DEVELOPED

- Observation
- Recording data
- Measuring
- Teamwork
- Problem-solving
- Data presentation
- Analytical and critical thinking
- Sampling strategies
- Oral presentation

KNOWLEDGE AND VALUES DEVELOPED

- Introduction to sampling methods
- Introduction to concept of biodiversity
- Appreciation of interrelationships in habitats
- Impact to biodiversity from human manipulation of habitats

BACKGROUND INFORMATION

Waipa is a large ahupua'a stretching from the ocean to mountaintop. Many different types of plants and animals call Waipa home. It would be nearly impossible to completely inventory all the plants and animals in this area. We can, however, come up with a good idea of the *biodiversity* in Waipa by looking closely at some parts of the ahupua'a. In other words we will investigate *samples* of Waipa.

Two important sampling methods are the *quadrant survey* and *transect survey*. A quadrant is simply an area of specific size delimited for sampling *flora*, *fauna* and *physical factors* of an environment. The size of a quadrant usually depends on the size of the site being studied. Quadrants of 1 meter squared (m^2) are typical for field sites of a few hectares or smaller. The quadrant method is useful for studying large areas with fairly similar vegetation and topography. Scientists often use quadrants to survey a forest, a field or meadow, a swamp or marsh, or a coral reef.

A transect is a line used to survey the *biota* and *abiota* across a study area. This method is useful to study sites that have varying vegetation and topography. The transect sampling method might be selected to survey coastal areas; a transect could run from the beach through coastal strand vegetation to dry shrub-land. The transect method is also useful to survey large forests that range from low to high elevations.

Biotic factors that are commonly inventoried during sampling are the flora (including flowering and non-flowering plants) and fauna (including animals with or without backbones) of a site. Abiotic factors that can be inventoried include, but are not limited to: soil type, soil temperature, soil moisture, soil pH, elevation, temperature, wind velocity, and amount of sunlight.

Word Matching

Draw a line from the word on the left to its definition on the right.

Biodiversity	All living factors in an environment
Transect Survey	Animal life
Samples	A method of sampling using an area of specific size
Abiota	Abiota
Physical Factors	Air temperature, amount of sunlight, wind speed
Quadrant Survey	Plant life
Flora	A method of sampling using a line
Fauna	A portion of a larger population or area to be studied
Biota	All the different living organisms in a given habitat

*Information in this curriculum has been adapted from: Felling, C. Field Ecology Sampling Methods. GK-12 Fellow, felling@hawaii.edu.

Waipa Biodiversity Survey

Aloha fellow scientists! Today we will be conducting a biodiversity survey of the Waipa ahupua'a using the quadrant and transect methods. Follow the directions outlined below, make sure to ask plenty of questions and don't forget to have fun!

Step 1: Divide the group into Quadrant Team and Transect Team. Each team should have 5 scientists.

Step 2: Each group must quickly decide who will be the Team Coordinator, Plant Inventory Specialists, Animal Inventory Specialist and Survey Engineer. Responsibilities for each position are:

Team Coordinator (1 per team) – Makes a table of all different types of organisms recorded by the plant and animal specialists. This includes the type and number of plants and animals observed. This data will be used to create graphs. Keep other team members on task. Take pictures of team members in action.

Plant Inventory Specialists (2 per team) – Count and record the number of **different types** of plants in your sample. Count the number of **each type** of plant observed. Give this data to team coordinator. Observe, describe and sketch the all the different types of plants in the sample. You may want to use your magnifying glass and ruler to help with the description (for example: ground cover 15cm tall with red flowers 10 cm wide). Draw the **most numerous** plant in your sample. Draw the **least numerous** plant in your sample. Draw the **largest plant** in your sample. Draw the **smallest plant** in your sample. You do not need to give the name of the plants.

Animal Inventory Specialist (1 per team) – Count and record the number of **different types** of animals in your sample. Count the number of **each type** of animal observed. You may need to look for evidence of animals (for example: ant hills, bird droppings, footprints, eaten leaves) that may not be present. Give this data to team coordinator. Observe, describe and sketch the all the different types of animals in your sample. You may want to use your magnifying glass and ruler to help with the description (for example:

lizard 15cm long with black stripe). Draw the **most numerous** animal in your sample. Draw the **least numerous** animal in your sample. Draw the **largest animal** in your sample. Draw the **smallest animal** in your sample. You do not need to give the name of the animals.

Survey Engineer – Establishes study site by setting up the transect or quadrant for each habitat to be sampled. Records length and direction of transect. Once quadrant or transect have been set up draw a sketch of the quadrants or transect including biotic factors observed. You may ask other team members to help you set up transects.

Step 3: Gather your research tools, Team Directions and clipboards. Move to your first habitat.

Step 4: Let's Do Science!!!

Step 5: Regroup to analyze data, create graphs and present findings to others.

Step 6: Post activity assessment.

Things to Remember While in the Field

- ✓ Think safety; be careful when handling tools, plants or animals.
- ✓ Clean up after yourselves do not leave tools, papers, etc. lying around.
- ✓ Keep your data organized, you will be responsible for sharing it with other teams.
- ✓ Feel free to ask questions

Quadrant Survey Team Directions

Once all team members are in place at the first habitat to survey you may begin. Keep in mind that you want to take samples from one habitat at a time. You will be surveying two different habitats.

Research Tools:

5 hand lenses
5 15cm rulers
1 $1m^2$ quadrant
5 clipboards
Graph paper
Drawing Paper
Pens/Pencils

Step 1: Survey engineer randomly selects a spot to stand in and throws quadrant to a random location **within** the habitat of study. The quadrant may land in a part of the habitat that is variable. That's OK! Try to avoid sampling from the edge of two different habitats.

Step 2: Each team member collects appropriate data.

Step 3: Repeat Steps 1 & 2 three more times. Just remember to throw the quadrant to a new random location within the habitat from where data has just been collected.

Step 4: Move onto habitat 2

Step 5: Repeat steps 1-3.

For each habitat you will have collected data from 4 samples. In this case, each sample may be called a 'replication'. Replication is a scientific way a saying a repeated measurement. Why do you think replication may be important when taking measurements or collecting data?

Transect Survey Team Directions

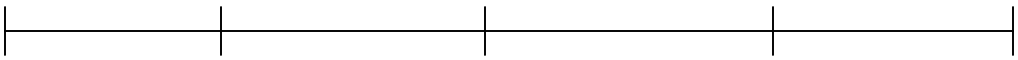
Once all team members are in place at the first habitat to survey you may begin. Keep in mind that you want to take samples from one habitat at a time. You will be surveying two different habitats.

Research Tools:

5 hand lenses
5 15cm rulers
1 Field measuring tape
5 clipboards
Graph paper
Drawing Paper
Pens/Pencils
Orange Flags

Step 1: Survey engineer randomly selects starting point to run first transect through. Place 1 orange flag at this point and mark it 0 meters. Extend the field measuring tape 20 meters. At the 20-meter point place another orange flag marked 20 meters. Mark off every 5 meter point along the transect from 0-20 meters with an orange flag. Measure 1 meter away from both sides of each 5-meter flag and mark those points with an orange flag.

For example:



Step 2: Each team member collects appropriate data. Collect data at each 5-meter flag and out 1 meter on either side of the flags.

Step 3: Repeat Steps 1 & 2 two more times. Just remember to lie the new transect randomly within the habitat away from where data has just been collected.

Step 4: Move onto habitat 2

Step 5: Repeat steps 1-3.

For each habitat you will have collected data from 3 samples. In this case, each sample may be called a 'replication'. Replication is a scientific way a saying a repeated measurement. Why do you think replication may be important when taking measurements or collecting data?

Biodiversity Critical Thinking Exercise

Define Biodiversity

Explain in your own words. In other words biodiversity means….

Give an analogy for biodiversity. An analogy is an agreement or similarity in some respect between things that are otherwise different. The following statement is an example of an analogy: "Freezing wind against my face is like thousands of tiny needles piercing my skin".

Provide an illustration of biodiversity in the space below. An illustration can be a drawing, cartoon, graph or other visual display.