Guess who's coming to dinner

Engage:

   Today I am offering a reward for you to count all of the living (non-human and non-microscopic) organisms on the school campus. The requirements are that you have a scientifically accurate count and that your results need to include all areas not inside any buildings or sidewalks or other constructed structures or facilities. Areas of lawn and bare soil however are to be analyzed. It is your task to determine major animal types, the 3-8 major categories of plants in an area, and then make a scientific calculation of how many of each of those living non-microscopic organisms in the whole area. Plants like trees will be easy to count and characterize. Plants like grasses will be impossible to count in our time frame. It will be your task to produce a report that accurately measures the populations of living things in the area as accurately as possible.

1. How do wild life biologists count or estimate the population of deer in a large geographic area? _____

2. How would an ecologist accurately determine the number of trees in a forest?

_____

3. What kind of information about the organisms and their environment do people who study populations need to know to make an accurate determination of the population? _____

Explore:

General description of the study area

You will take 30 minutes to make a preliminary study of the plot to be studied today and fine tune your plans to prepare your report of the living things in the area. This preliminary study should collect data on the diversity (variety of different organisms; plant and animal species in the area), and density (how many per area) of the organisms. You will also need to take measurements to determine the total study area you will be analyzing. This preliminary report needs to include a sketch of the area with a description of the different types of habitat that you find present. Images from satellites and maps are also useful and can be obtained on the internet. **4. Take note of things like how much of the soil is visible, what are the 3-8 different types of plants present, how densely packed the plants are, what type of animals you see, or that may pass through the area in a given day, week, or year. Collect as much data in your lab notebook or a separate sheet of paper as you can in the short time you have to do it.**

Explain:

Quadrat sampling

The quadrat method originated with Frederick Edward Clements in 1898 and has been used as a method of estimating populations of organisms ever since. A quadrat is a frame of any shape that can be placed over vegetation so that cover can be estimated, plants counted or species listed. Quadrats are used to define sample areas within the larger study area. All of the living organisms present inside of the quadrat are counted, and if the areas sampled are representative of the area, enough samples are taken, and the total size of the area is known an estimate of the total population can be accurately made.

Three factors need to be considered in relation to the use of quadrats:

Distribution of plants or animals

Shape and size of the quadrat
Number of observations needed to obtain an adequate estimate of density.
The quadrats are randomly generated and the data for the whole class is pooled to get enough sample data for our estimates. The data from each quadrat are used to draw conclusions about the community of organisms in the entire area. For example if 5 $10m^2$ quadrats are surveyed and a total of 16 dandelions and 2 grasshoppers were recorded. The estimate for an area $100m^2$ would be 160 dandelions and 20 grasshoppers as the number of $10m^2$ quadrats in the entire area would be 100. The quadrat sampling paper is also helpful as a resource. (http://psychology.exeter.ac.uk/lundy/quadrat.htm)

5. What would be the total number of grass plants if the number for 5 $10m^2$ quadrats was 25 for the $100m^{2?}$ Total Grass plants for area _____

Elaborate:
Plant and animal genera types
As a class you will determine the 3-8 categories of plants to be counted.   Remember to educate everyone who will be doing counting about what constitutes each of the different plant categories you choose. Fill in the data table below or copy it into your notebook so you will be able to spend your time in the plot counting your quadrat(s). Be sure to include the description of your quadrat(s) in terms of the coverage and density of plants and animals and how your samples are similar or different than the whole area. Be sure to include plants that originate in your quadrat, but extend outside of it, and count every plant (grasses often have one root, but numerous stems, so move plants around to determine the number of actual plants not stems or leaves.) Be sure to include animals that are in your quadrat or that pass through (unlike plants they may wander through during your counting).

Data collection

   You will take your 1m^2 quadrat square and your data sheet(s) out to the area to do your counting of organisms (be sure to bring a writing utensil). To locate your randomly generated location on the plot use the random number sheet attached to locate your spot to count. Once you find your coordinates and have one person take your square and close their eyes and turn around then toss it over their head to the spot you will collect your data in. Once it lands do not move it. Take special care to count plants that originate inside the quadrat even if they grow outside of it. Make your observations about your data collection quadrat, and the entire area (called the stand).

6. Stand Data Table

Plant type	Total number plant type	Coverage or density
Total of all plants		

7. Animal Data Table

Animal type	Total number animal type	Density or distribution
Total of all animals		

8. Quadrat #1 description (plant cover or density, animal density or distribution)   Size____m^2
_____
_____
9. Most numerous plant and animal type_____
10. Weather conditions from the field_____
11. Weather station data _____

12. Quadrat #2 description (plant cover or density, animal density or distribution)   Size ____m^2
_____
_____
13. Most numerous plant and animal type_____
14. Weather conditions from the field_____
15. Weather station data _____

16. Class data Table

Group	Most numerous plant type	Number most numerous	Total number of plants	Most numerous animal type	Number most numerous animal	Total number of animals
Totals	------------	-------------		-------------	-------------	

17. Average for a single quadrat (divide by # Groups) _____**Plants**_____ **Animals**

18. Calculate the number of plants and animals in the whole area (multiply by the number of quadrats that are in the whole area by the average for the quadrats the class collected).
Plants _____   Animals_____

Conclusions
19. Based on the data collected by your group and the rest of the class, as well as your observations in the plot**. What are the most numerous plant types in decreasing order for the whole area?**

_____
What are the most numerous animal types in decreasing order for the whole area?

_____

20. If the plants that exist in the area are there because the soil and habitat supports them. **Was it acceptable to choose only the most numerous plant types to do the class analysis?** _____
(Justify you're reasoning with the data collected.)

21. **Based on the data collected what types of animals will best be suited to live in the plot?** _____
Is it acceptable that we only looked at the most numerous animal types in the class data? _____
(Justify you're reasoning with the data collected)

22. The plot we studied in this field lab activity is a public area that can and should be educational for the whole community. This could include local school children or people from the community or visitors from other communities. **Design three educational signs and support or refute (argue it should be open or closed) the choice to keep the area fenced without allowing the public to enter the area. (The best signs may be posted in the area)**

(Evaluate :)
Design an experiment to determine the population of elm trees in Great Falls. Utilize quadrat sampling in your design, and procedures for choosing quadrats to sample and techniques for collecting the data. Mention sampling issues or problems in cities.