Name: _____ Date:_____

Lichens as Bioindicators

We've already talked a great deal about lichens and why they are important to the environment. For example; they can indicate the health of the environment and the chemicals that may be present in the atmosphere. You should also be familiar with Image J and how to set a scale and measure length, width and area. Now we're going to take the pictures we took from our lichen collection last week and find out what types of lichens we have as well as the *percent cover* of each type on the branch.

Objectives

- To use Image J to set a scale, find length, width and area.
- Learn the relative percent cover of lichen species found around the school.
- Discover more about the tolerance levels of different species of lichens.

PART I. WHAT TYPES OF LICHENS DO YOU HAVE?

Q1. Say you only find very highly tolerant species of lichens on your branch… what do you think that means?

_____
_____
_____
_____

Q2. What type of lichens do you think you're going to find on your branch? High tolerance lichens? Low tolerance lichens? Why?

_____
_____
_____
_____

1. Open the pictures of your branch in Image J by opening Image J and then clicking **File, Open** and then selecting the pictures off of your desktop or flash drive.
Identify the types of lichens on your branch by the picture:
http://gis.nacse.org/lichenair/?page=photos
http://www.fs.fed.us/r6/aq/lichen/images.htm#Aleims (also shows tolerance)
*You may also use the identification keys and book

Make a list in the space below of the different types of lichens you have on your branch **as well as** their listed tolerance. **Use common AND scientific names!** Draw a small picture to aid you later when you use this information again.

Q3. How many different types of lichens are on your branch? What do you think influences the type and amount of lichens present? Why?

_____
_____
_____
_____
_____
_____

Q4. Was your prediction of the tolerance level of lichens present accurate? Why or why not?

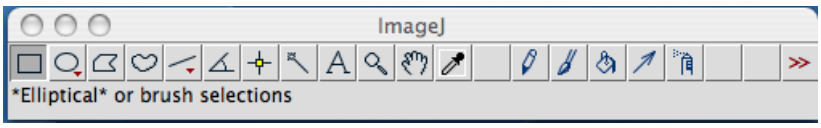
_____
_____
_____
_____
_____
_____

CHECK POINT!!!!
You need my initials to continue!!
_____

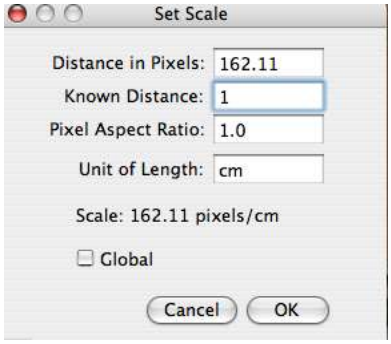
PART II. FINDING PERCENT COVER OF YOUR LICHENS

Now let's take a look at what percentage of the branch each of these types is covering by using Image J! (you will find the pictures you need on your flash drive, make sure to save them to the desktop before analyzing them).

1. **Make sure your pictures are opened in Image J or else this wont work!!!**

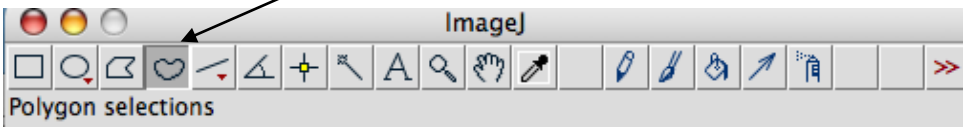


2. Start by setting your scale by selecting the line tool and clicking and dragging the length of one cm on the ruler in the picture, then click **Analyze** and then **Set Scale**. A box will pop up like the one below, make sure that you put the **known distance as 1** and the **global** box is not checked and click ok. Now your scale should be set.



NOTE: Your "distance in Pixels" may not match mine, which is fine. The computer will just make a measurement to set that a certain number of pixels equals one centimeter.

3. Now that your scale has been set you can find the area of your different types of lichens. You can do this by selecting the area tool in the toolbox. Now trace around your entire branch making sure to include the area of the lichens projecting off of the branch. When you are done you can click **analyze**, then **measure** and a little box will pop up and tell you the area.

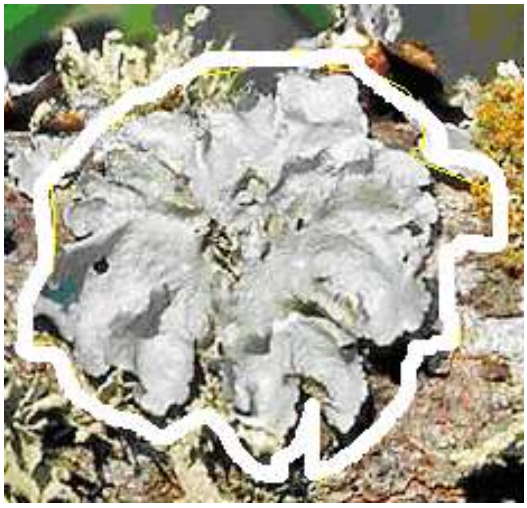


4. You can now begin finding the area of your different types of lichens! (**Hint:** Make sure that if the same species appears on the branch multiple times that you find the area of each one and add them together). **MAKE SURE TO TRACE AROUND THEM CAREFULLY! SEE EXAMPLE ON NEXT PAGE.**

Q5. What is the **total** area of the branch?

_____ cm

BAD **GOOD**



5. Record your data in the table below. You may not need to fill out each space. **The first box is filled out as if the student found 5 <u>individual plants</u> of the same type.**
HINT: Percent cover can be found by dividing the total area of the species on the branch (column 5 in the table) by the total area of the branch and lichens (question #5) then multiplying by 100. **EXAMPLE: (81.5/600.2)x100= 13.57%**

	Area (cm^2)				
Species	**Plant 1**	**Plant 2**	**Additional Plants**	**Total**	**Percent Cover**
EXAMPLE: Usnea *fillipendula* (fishbone lichen)	21.2	10.3	12+24.67+13.33= 50	81.5	13.57%

Q6. What two species of lichen on the branch had the highest percent cover?

_____

Q7. What is the percent cover of these two species? _____

Q8. Use the space below to compare and contrast the 3 most abundant species (order highest percent cover to lowest, of the three). It may be useful to set up your own table of similarities and differences. You must have at last 3 categories (example; one could be tolerance level).

Q9. What does your data tell you about the environment the lichens were living in?

_____

_____

_____

_____

Please give me your worksheet before you leave so you can get a grade!