Homework 8:

Working with two species of organisms which compete with each other, track the size of the populations of each over 50 generations using these starting conditions:

Carrying Capacity for both populations (*K*) = 800
Intrinsic growth rate for both populations (*r*) = 0.6
Alpha for both species (α_{12} and α_{21}) = 0.75

Use these sets of initial population sizes: (5 runs)

	N_1	N_2
Run 1	*100*	*100*
Run 2	*200*	*50*
Run 3	*50*	*200*
Run 4	*900*	*400*
Run 5	*400*	*900*

1. **Examine the parameters and predict the outcome(s) of the five runs ***before*** running the model. Draw a graph (by hand) with the competition lines (between the K's and the K/α's) and sketch what you think the final graph will look like.**

2. **Run the model and print out a graph of the results.**

3. **How did your prediction fit with the results?**

In 1991, a paper was published in *Science* speculating on the possible competition of two species of mosquitoes, one of which has recently been introduced to the U.S. Use the data from Table 1 and Fig. 2 of that paper to attempt to recreate Fig. 1 in the article. Use these sets of initial population sizes: (5 runs).

	N1	N2
Run 1	100	100
Run 2	10	10
Run 3	10	100
Run 4	100	10
Run 5	50	10

4. **What is the most likely result of the two species competing in treehole habitats? In old tires? Attach printouts of the graphs. List out the parameters you used to obtain them.**

5. **What are the public health implications of the above simulations? Read the paper and decide how you would reduce spread of disease from these mosquitoes most cost-effectively.**

6. **What population growth model underlies this competition model?**

7. **Is sunlight a resource or a condition?**

References

Livdahl, T.P. and M.S. Willey. 1991. Prospects for invasion: competition between *Aedes albopictus* and native *Aedes triseriatus*. *Science*. 253:189-191.

Homework 9:

1. Using data from the table to the right, set up a spreadsheet to calculate Simpson's index and the Shannon-Weaver index. You do not need to include the species names at this point. Turn in copies of the spreadsheet showing all formulas and values.

Species	Number
1 Gammaridae	10
2 Corydalidae	42
3 *Eristalis brousi*	46
4 Calopteryx aequabilis	19
5 *Neureclipsis crepusceularis*	33
6 *Odontomyia cincta*	1
7 *Choroterpes basalis*	8
8 *Argia tibialis*	6
9 *Leptophlebia* sp.	2
10 *Chironomus decorus* grp.	2

You can run the WinMac program to check the Shannon-Weiner index value.

2. For birds, which is more important in species diversity – a diversity of foliage types or overall productivity? Examine the data in the table below (which corresponds to Figure 23.3) with that presented in Figure 23.5 on page 443. Don't just "eyeball" the data!

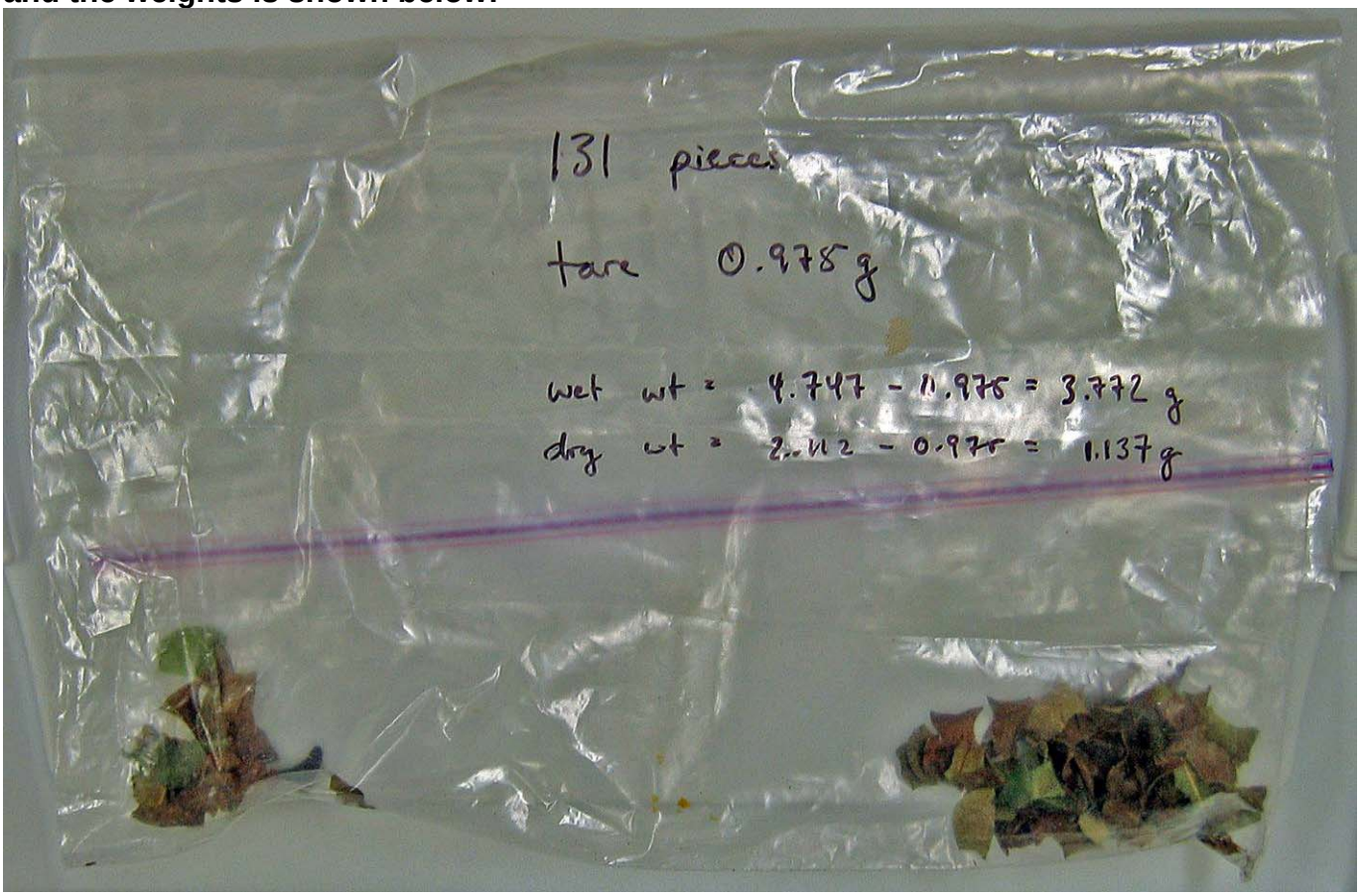
Here is the data in spreadsheet form:

	Productivity - (g m^{-2} yr^{-1})	Number of Bird Species
Desert	70	14
Grassland	500	6
Shrubland	600	14
Coniferous Forest	800	17
Upland Deciduous Forest	1000	21
Marsh	2000	6

3. In 2005, students from Marietta College conducted a study at the La Selva Biological Station in Costa Rica. They observed leafcutter ants harvesting from a tree at night. They observed the ants over a 5 minute period counting the number of leaves the ants were returning to the nest. Then came the tricky part – they

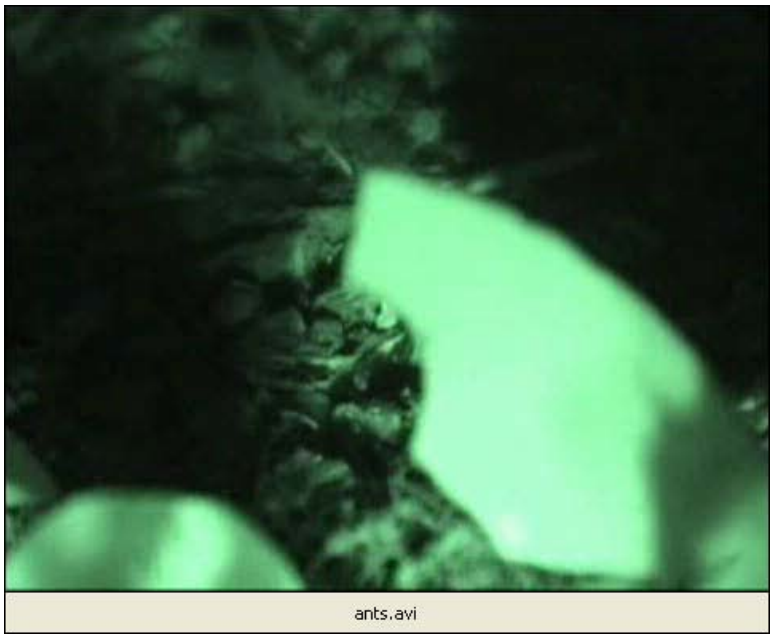
attempted to collect the next hundred or so leaves the ants brought by. By getting ALL of the leaves, they hoped to get a representative sample.

The sample was weighed; dried, and weighed again. A photo of the actual sample and the weights is shown below:



A video of the ants over a 5 minute period is shown below (and in the file ants.avi).

Tree



Nest

Click on the photo to play the video. In the video, the nest is to the right hand side of the screen.

Using these resources, determine:

A. **The total wet weight of the leaves moved.**
B. **The number of grams of carbon (production) represented by those leaves.**
C. **The minimum number of ants in the nest (assume an ant would not have time to return to the nest, drop its leaf, return to the tree, get another leaf, and come back to the camera in the 5 minute period).**
D. **The total weight of those ants.**
E. **How fast ants move.**
F. **Assuming all of the leaves came from a tree which occupied 2 square meters of rainforest floor, what percent of the yearly production is removed by the ants assuming they feed on that tree for one day a month?**

Your answer should take the reader through all of the calculations, assumptions, and sources of data used to answer these questions.

Study Questions – Do ***Not*** turn in; these may appear on tests.

4. Explain why distant small, distant islands would have a lower number of species as compared to large, close islands.

5. What characteristics of pioneer species make them so attractive to humans as field crops?

6. What do the characteristics of pioneer species as field crops say about the long-term sustainability of agriculture based on these species?

Homework 10:

1. A state endangered dragonfly, *Gomphus externus* has been found at N40.1702^{o} W81.8557^{o}. You are tasked with assessing threats to the population at this site.

    A. Produce a map showing all direct water quality impacts upstream from the site including:

        1. Brownfields.
        2. Hazardous waste producers
        3. Hazardous waste handlers
        4. Toxic Releases
        5. Superfund sites
        6. Discharges to water
        7. Aerial discharges within 25 miles.

    B. Find out what habitat and water quality parameters larvae of the species require, as well as the habitat requirements of the adults.
    C. Examine the watershed for possibly troublesome land use patterns. Note these on the map.
    D. Find out what you can about current water quality in the watershed.
    E. Find out where else in Ohio this species is found and thus how important this population is to the overall survival of the species in Ohio.
    F. Write a 1-4 page summary including, among other things, the Worldwide, North American and Ohio distribution of the species, historical trends of the species in Ohio, reasons why it is endangered, etc. Using the data in A-E summarize the threats to the new population. Propose a reasonable, specific recovery plan for the species. Your bibliography should include at least 5 sources, not all of which are from the web. You can access distributional data for Ohio in the database Surveypub.mdb located in the Odonata directory on the Biology volume of the server (K: Drive). Use the Survey5 table. Include a photo of the species in your report.