

Problem Set #3 BioS 101 April 08 SOLUTIONS
 10 possible points of credit (1 point per question)

1. Find the URL of an NGO (Non-governmental organization) whose primary interest is in streams and rivers AND is based in IL or IN or WI. Put the name of the organization, the URL and the city they are located in here.

<http://prairierivers.org/> is one possible answer. There are others.

2. Pick a particular **forest preserve** in Cook, Dupage, Lake or Will Counties. Give the name of the preserve, a URL that gives info about it, and a tree species you expect to find in the preserve.

There are many possible answers.

3. Visit the website of UIC's James Woodworth Prairie. Find the list of plant species and find a species with PDF containing pictures of the species. Copy and Paste the picture of a plant you regard as attractive here.

The URL for the plant species list is <http://www.uic.edu/depts/bios/prairie/plantspecies.htm>

4. Ants are a type of social insect. Find out about the social organization of an ant species. Write a 100 word summary of the social organization of a particular ant species.

Again the possibilities are almost endless.

5. R_0 is the symbol for the net reproductive rate. Verbally describe what R_0 measures.

R_0 is the average number of offspring per new born or the average number of daughters per new born female. Both values would be the same if the sex ratio is 1:1 and survivorship were the same for both sexes. (Either way of expressing the concept is acceptable.)

6. Calculate the value of R_0 from the following life table: $R_0 = 2.26$

Age, X	Survivorship, l(x)	Fecundity, m(x)	L(x)m(x)
0	1.0	0	0
1	0.8	0	0
2	0.75	0.4	0.3
3	0.7	1.2	0.84
4	0.6	1.2	0.72
5	0.5	0.8	0.4
6	0.2	0	0
7	0		SUM = 2.26

7. If there are 180 rabbits in Grant Park in January 2001 and lambda, λ , = 1.3 yr⁻¹, how many rabbits do you expect in Grant Park in January 2005?

The appropriate formula is $N_{t+1} = \lambda \cdot N_t$ so $N_{2005} = 1.3 \cdot 1.3 \cdot 1.3 \cdot 1.3 \cdot 180 = 514$ rabbits

8. If $r = 0.031$ yr⁻¹, what is the equivalent value of lambda?

$e^r = \lambda$ so if $r = 0.031$ $\lambda = 1.031$

9. If *Paramecium caudatum* eats exactly the same food at *P. tetraurelia* but is 4 times bigger (biomass) and a given batch of food results in 1000 *P. tetraurelia* per ml when grown alone, how many *P. caudatum* would you expect in an equivalent batch of food?

If they eat the same food at the same efficiency we expect the biomass of *Paramecium* to be equal. Thus if that amount of food produces 1000 small cells it should produce 250 big cells.

10. Consider Figure 53.16. Two hypotheses are stated (the second is called a null hypothesis). In the experiment described ants are removed but spiders are not manipulated. The results described have a component of time, but neither hypothesis makes a statement about how long one should observe the system. Suppose you could manipulate the abundance of spiders, say double the abundance and completely remove them. Make a prediction about how the abundance of treehoppers would change with time after you removed both spiders and ants (based on the info in your book).

First, one is not measuring the benefit the ants putatively receive so that should NOT have been included in the hypothesis. The action taken was to remove ants from some plants and leave ants untouched on other plants. Other organisms, particularly spiders in this case, were not manipulated. The response variable is the number of treehoppers (stated as per plant but probably per unit length of branch). Why the graph says 'young treehoppers' is not clear. All of the above are problems not well addressed in the text.

My hypothesis: Removal of both ants (protectors) and spiders (predator) will result in an increased abundance of treehoppers per unit length of stem compared to the abundance of treehoppers in control conditions (normal levels of ants and spiders). The hypothesis is the prediction. The implicit assumption is that treehopper population would be lowest with predation and no protection, next lowest with predation and protection, and highest with no predation (because protection is never 100% effective).