Exam 2 **BIOL 3325/5325: Plant Ecology** **30 October 2007**

Name: _____

Fill in the Blank (*each blank is worth 2 points; this section totals 20 points*)

1. The relationship between a tall tree with a large canopy and a small wildflower growing directly beneath it can best be described as _____.

2. _____ selection occurs when individuals with low values of a particular phenotypic trait have higher fitness than individuals with intermediate or high values of that trait.

3. The relative apportionment of individuals among species in a community is _____.

4. When a plant population has a synchronous production of a large seed crop it is said to be _____.

5. The process by which seedlings of one species compete and eventually become less numerous because some die is known as _____.

6. A _____ is a group of populations in a landscape linked by migration and extinction.

7. A long-lived, evergreen species that grows slowly would be considered to be _____-selected according to Grime's triangular model.

8. The seasonal timing of growth and reproductive events of a plant population is known as _____.

9. One example of a non-equilibrium model of plant competition would be the _____ model.

10. _____ considered a plant community to be a "superorganism," with all species strongly interacting with each other.

Short Answer

11. Define/describe: (3 each)

a) biological species concept

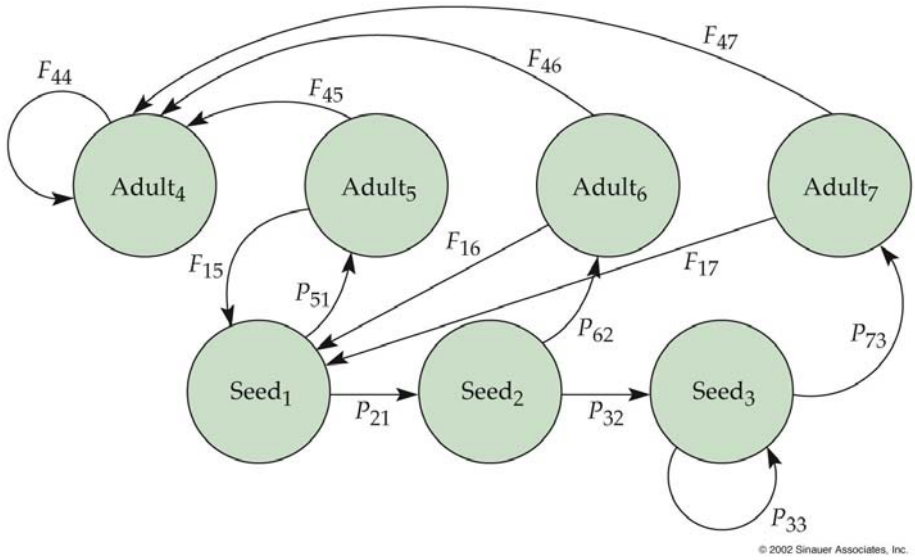
b) allelopathy

c) facilitation

d) ecotype

e) iteroparous

f) phytometer

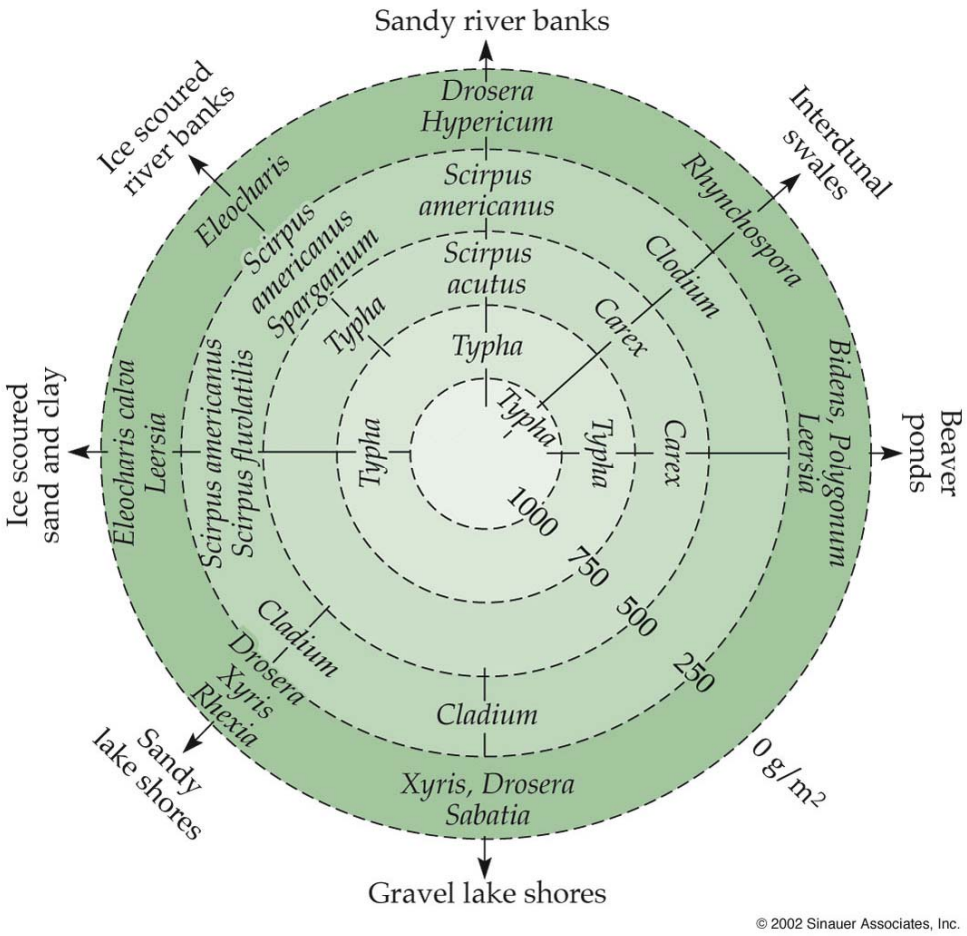


12. The life cycle graph above is for *Collinsia verna* (Blue-eyed Mary, Campanulaceae), an annual plant with an age-structured seed bank.

a) Give the equation you would use to calculate the number of seeds in age class 3 at time t+1. (3)

$n_3(t+1) =$

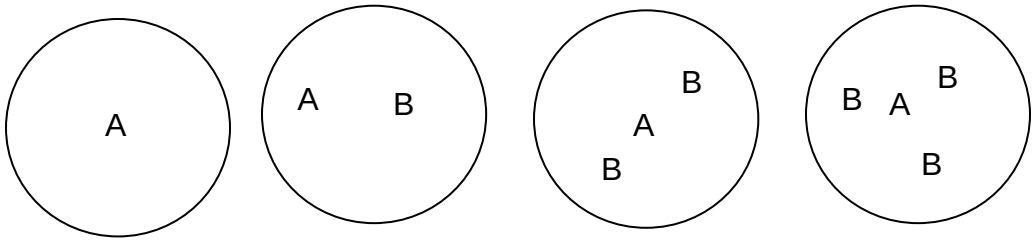
b) You have studied one population of this species for five years and are now able to put numbers to the transition probabilities in the life cycle graph. What assumptions would you have to make to use those numbers and this graph to calculate the population size at time t+50? (3)



13. The figure above is from Keddy (1990).

a) According to this centrifugal model of community organization, what are the characteristics of an environment in which competition is important? (3)

b) Where on the diagram would you expect competition to be the most important in regulating community structure? (2)



14. Each circle in the diagram above represents a pot, and the letters represent individual plants of two species (A and B). Assume all treatments are adequately replicated.

a) What kind of experimental design is this? (2)

b) What types of interactions can be studied using this design? (2)

15. Briefly describe what the results presented on the previous page from Rogers & Siemann (2004) mean as far as how the two ecotypes responded to root damage, and whether or not this response was influenced by nutrient addition. (5)

Short Essay *(Use complete sentences in your answer. Answers should be approximately 2-3 paragraphs in length.)*

16. Choosing either the Rogers & Siemann (2004) paper or the Center et al. (2005) paper, write a brief synopsis of the objective of the study and what the authors found. Then outline a hypothesis for what you would do next to further investigate the ecological questions they were examining. As in the first exam, clearly state the hypothesis you would test, briefly outline the methods you would use/the experiment(s) you would conduct, and describe the kind of results you would need to find to accept your hypothesis. (22 points)

17. Choose ONE of the following to answer. If you answer more than one, you will receive no credit for this question. (20 points)

a) You are given an assignment to sample plant species diversity in three different prairie communities in North Texas. Describe your approach to this task, including how you could determine the size of your sample plot, how you would determine the location of your sample plots, what time of year you would sample, and other issues. What kind of data would you need to collect to determine diversity? How would you report your results in a paper or report so they could be compared with measurements of diversity in other communities or at other times?

b) Describe the "ideal" characteristics of seed production (size and number) for a hypothetical plant. Why might we expect a trade-off to exist between seed size and number? Is there an optimal combination of these two traits found across species growing in natural habitats? Include in your answer how maternal and seed fitness are involved.

c) Annual species and long-lived, semelparous species often co-exist in deserts. Describe these two very different life history strategies. What adaptations allow the persistence of both life histories in such a severe environment? Include in your answer the types of adaptations that are generally required by plants to survive in desert environments, and how they may relate to these two life history strategies.

d) Describe the process of polyploidy in plants. Discuss how odd and even polyploid individuals may continue to produce offspring and how the occurrence of polyploid individuals within a population might eventually lead to sympatric speciation.

e) Describe MacArthur's concept of r- and K- selection. Include in your answer how these ideas relate to population growth, predictions of the characteristics selected for by both types of selection, and how useful these predictions are for understanding different life histories among plant species.