Final Exam **Plant Ecology** **10 December 2003**

Name: ____________________________

Fill in the Blank (*each blank is worth 2 points; this section totals 22 points*)

1. ________________________ is the production of chemicals by one plant to suppress the growth or reproduction of another plant.

2. Competition is considered __________________ when individuals are affected by it, but effects may not be seen at the population or community level because other factors have a greater impact at those scales.

3. __________________________ are plant parasites that have no chlorophyll and thus must rely entirely on the host for resources.

4. Single-celled plant hairs that may deter herbivory by insects are known as ____________________.

5. The plant compounds that serve purposes OTHER than those necessary for basic plant function are known as ____________________________ compounds.

6. The number of species found per some unit area (often per m^2) is known as ____________________.

7. ___________________ succession occurs after a catastrophic event when all organisms, propagules, and soil are removed from a particular location (e.g., glacier retreat).

8. Carbon dioxide is returned to the atmosphere from the soil when soil fungi and bacteria conduct ____________________________.

9. _______________________________ is the use of plants to remove toxins from soil.

10. An error occurring during __________________________ can generate a diploid gamete that may combine with another gamete to form a polyploid adult.

11. Introducing an herbivore or pathogen to control a population of an undesirable plant species is specifically known as _________________________________.

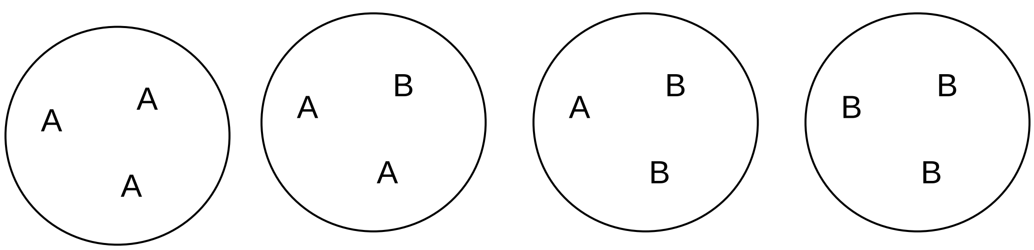
Short Answer

12. Define (2 points each):

a) compensation (as related to herbivory)

b) constitutive defense

c) endemic species



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

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

b) What information is gained by this design as opposed to simply growing one individual of A in a pot with one individual of B? (4)

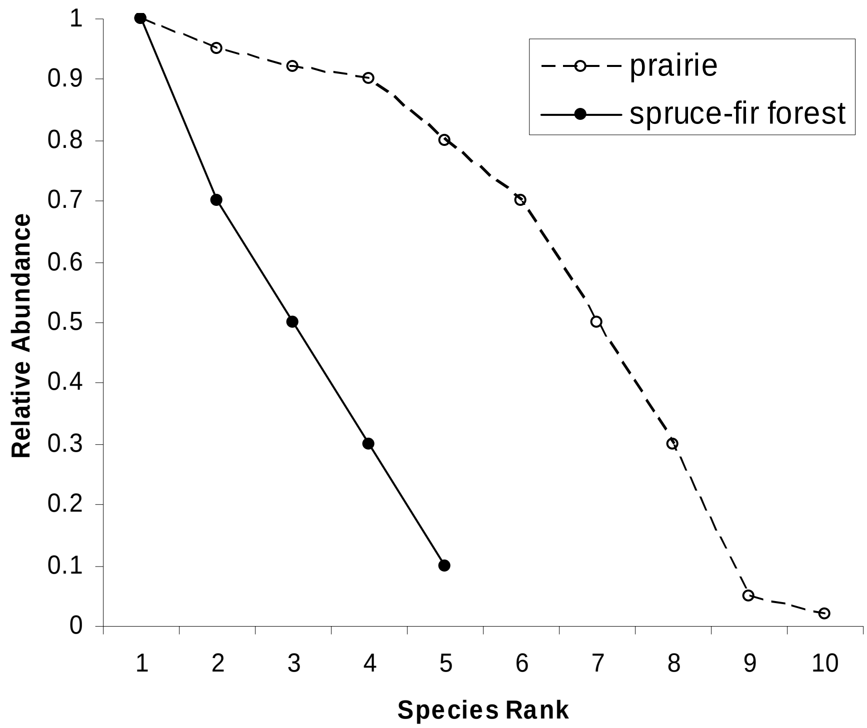
c) What population-level processes can be studied using this design? (3)

14. Briefly describe Tilman's R* concept of resource-based competition. Define R* and relate it to the "winner" in a competitive situation between two species. Is this an equilibrium or a non-equilibrium model? (4)

15. A study described in Pennings and Callaway (2002) documented that dwarf mistletoe could force transpiration to occur in its host tree. Why would a parasitic plant benefit from doing this? (2)

16. Describe top-down vs. bottom-up regulation of plant populations. (4)

17. Describe one way in which a plant may defend itself against attack by a pathogen. (2)



18. Use this hypothetical rank-abundance diagram (also known as a dominance-diversity curve) to answer the following questions:

a) What is the richness of each community? (2)

b) Which community has greater evenness? (2)

c) Which community is more diverse? How do you know that by looking at the diagram? (4)

19. Give three reasons why a particular species may become invasive when it establishes in a new area. (3)

Essay *(Each answer is worth 20 points.)*

20. On the suggestion of Dr. Gough, you visit the Ft. Worth Nature Center and Refuge next spring and hike the trails that pass through the tallgrass prairie community. As you walk, you make several observations of patterns in the prairie community. First, you notice that a native prairie grass seems to only occur in close proximity to a native legume species. Second, small mammals seem to be abundant and very active in the prairie based on their numerous trails. Third, diversity of the prairie community appears to be greatest at the edges of woodlands, and decreases as you move away from the trees.

UNDERGRADUATES: Write a hypothesis that you can test based on one of these observations. Briefly outline the methods you would use, and describe the kind of results you would need to accept your hypothesis.

GRADUATE STUDENTS: Follow the instructions for the undergraduates. Then, assume you do not find support for your hypothesis. Write a second hypothesis that logically follows as the next step in deciphering this pattern, outline the methods you would use, and describe the results you would need to accept this second hypothesis.

21. Answer one (and only one) of the following questions:

a) Compare and contrast the relationship between herbivores and their host plants and plant parasites and their host plants. Include in your answer the effects on the host plant as well as on the plant community and ecosystem.

b) You have recently been hired by the Army Corps of Engineers Lewisville Aquatic Ecosystem Research Facility to help control the spread of the invasive fern species giant Salvinia (*Salvinia molesta*). This floating fern appears to reproduce solely clonally and is rapidly spreading through reservoirs in North Central Texas. Your boss wants you to investigate possible biological control approaches. Describe how you would tackle this assignment, what issues you need to keep in mind when determining your approach to this issue, and potential pitfalls.

c) We discussed in lecture several ways in which plants can defend themselves against herbivores. Describe at least three of these defenses. If plants successfully employ these defenses, how do herbivores survive? Give two examples of situations in which plants and their herbivores have coevolved so that both populations persist.

d) Diversity can be measured at many scales. A number of hypotheses have been put forth to explain the latitudinal diversity pattern that plant diversity is highest towards the Equator and lowest toward the poles. Discuss two of these hypotheses. Also discuss the continental gradient in diversity with tree species diversity greatest in Asia, somewhat lower in North America, and lowest in Europe even at the same latitude with the same climate.

Happy Holidays!

Remember to Promote the Importance of Plants!