

**Rangeland Plant Ecophysiology
EXAM 3, REWM 3500, Fall 2008**

Name:

Define the following terms. [2 points each]

1) *ecosystem*

2) *grazing morphotype*

3) *plant functional type*

4) *grazing avoidance*

5) *grazing tolerance*

6) *allelopathy*

7) *Haber Bosch process*

8) Define and distinguish each of the following types of organismal interactions and provide an example of a plant-plant interaction for each category: Amensalism, Commensalism, Parasitism. **[9 points]**

9) List two forms of reactive nitrogen found in the atmosphere, one oxidized form and one reduced form, and describe a key anthropogenic source for each. **[6 points]**

10) Explain clearly how the expansion of agricultural land devoted to growing leguminous crops (such as soybean used to make tofu) is linked to the growth of greenhouse gas concentrations in the atmosphere. **[8 points]**

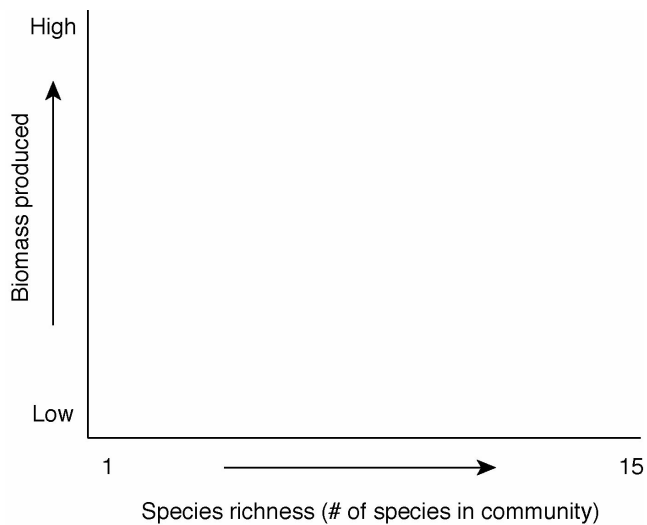
11) Describe two ways in which invasion by non-native plants can alter ecosystem processes or dynamics and give a clear and specific example for each. **[6 points]**

12) List and describe the three main hypotheses or causes that have been proposed to explain the ecological success of non-native plant invaders. **[6 points]**

13) It was thought for many years that the amount of reserve carbon (stored carbohydrates) in grasses was a good predictor of regrowth potential after defoliation. Provide an argument contrary to this notion. Briefly describe evidence supporting your argument. **[6 points]**

14) Mahall and Callaway in a very influential pair of papers published in 1991 and 1992 provided experimental evidence for direct communication between roots of creosote bush (*Larrea*) and bursage (*Ambrosia*) in the Mohave desert. Carefully describe their experiment documenting root-root interaction between these two shrubs and the evidence that allelopathy was playing a role. **[8 points]**

15) On the graph below, draw a curve for the relationship between biomass production and plant species richness (diversity). Underneath the graph, *name* and clearly *explain* the two hypotheses discussed in class proposed to account for this relationship. **[8 points]**



16) Rising levels of atmospheric CO₂ are likely to have direct and indirect impacts on functioning of semiarid rangeland ecosystems. First, what direct effects on stomatal conductance are anticipated? Second, what indirect effects on soil moisture content are likely to result from these stomatal conductance changes? Third, how are these changes likely to affect vulnerability of semiarid rangelands to invasion by weedy taprooted forbs and why? **[9 points]**

17) Recent trends (last 100 years) in precipitation over North America show that the amount of annual precipitation has increased, but the number of days per year with recorded precipitation has declined. In other words, the trend has been toward less frequent, but more intense precipitation events. Knapp et al. (2008) offer a conceptual model for how such changes are likely to impact the productivity of grassland ecosystems. Clearly explain this conceptual model and the predictions of how productivity may change in xeric (dry) and mesic (moist) grassland sites in North America. **[8 points]**

18) Based on the theory of competition developed by David Tilman, what process leads to competitive success in plants? You must describe this process in terms of resource competition and resource availability through time. You may wish to use a graph to help with your answer.
[6 points]

19) In your opinion, what was the single most important concept (not covered on today's exam) introduced this semester in REWM 3500? Why did you choose this concept? What is the direct application of this concept to management of rangeland, forest, or wildlife resources?
[6 points]