Rangeland Plant Ecophysiology **Name:**
EXAM 3, REWM 3500, Fall 2007

Multiple choice. Circle the letter corresponding to the single <u>most</u> correct answer for each of the following. [2 points each]

1) Which one of the following represents an important type of interference competition?

a) mutualism
b) parasitism
c) facilitation
d) amensalism
e) allelopathy

2) The interaction between an epiphyte and its host tree might best be defined as:

a) predation
b) commensalism
c) facilitation
d) competition
e) parasitism

3) The xylem-tapping mistletoe extracts water and nutrients directly from the tissues of its host plant. This type of interaction might best be defined as:

a) facilitation
b) parasitism
c) commensalism
d) mutualism
e) neutral

4) Seedlings of *Agave deserti* are more likely to establish under the canopy of the grass *Hilaria* in the Sonoran desert due to the ameliorative effects of *Hilaria* on soil and air temperature. This type of interaction might best be defined as:

a) neutral
b) amensalism
c) facilitation
d) competition
e) parasitism

5) One teragram (Tg) is 10^{12} grams. The natural background rate of nitrogen fixation from the atmosphere at a global level is approximately:

a) 0.011 Tg of N per year
b) 0.11 Tg N per year
c) 11 Tg N per year
d) 110 Tg N per year
e) 1,100 Tg N per year

6) The current rate of anthropogenic nitrogen fixation from the atmosphere at a global level is approximately:

a) 16 Tg N per year
b) 160 Tg N per year
c) 1,600 Tg N per year
d) 160,000 Tg N per year
e) 1,600,000 Tg N per year

7) Which of the following is NOT a major contributor of anthropogenic nitrogen fixation at a global level?

a) Hydroelectric power plants
b) The Haber-Bosch process
c) Planting of leguminous crops like soybean
d) Coal burning power plants
e) Gasoline engine exhaust from automobiles

8) Today's atmospheric CO_2 concentration is 380 parts per million (ppm). Atmospheric CO_2 concentration has risen by about _____ since the beginning of the industrial revolution in 1850.

a) 5 ppm
b) 20 ppm
c) 50 ppm
d) 100 ppm
e) 200 ppm

9) Many grasses accumulate silica in their leaves to deter grazing animals. Silica precipitates in plant leaves forming structures called:

a) bulliform cells
b) vascular bundles
c) bundle sheaths
d) fibers
e) opal phytoliths

10) From Dr. Kniss' lecture on global change and weeds, you learned that a "chemical found in an organism that is not normally produced or expected to be produced" is:

a) an auxin
b) an allelopathic compound
c) an antibiotic
d) a xenobiotic
e) a bioinhibitor

Define the following terms. [3 points each]

11) *ecosystem*

12) *grazing morphotype*

13) *weed*

14) *grazing avoidance*

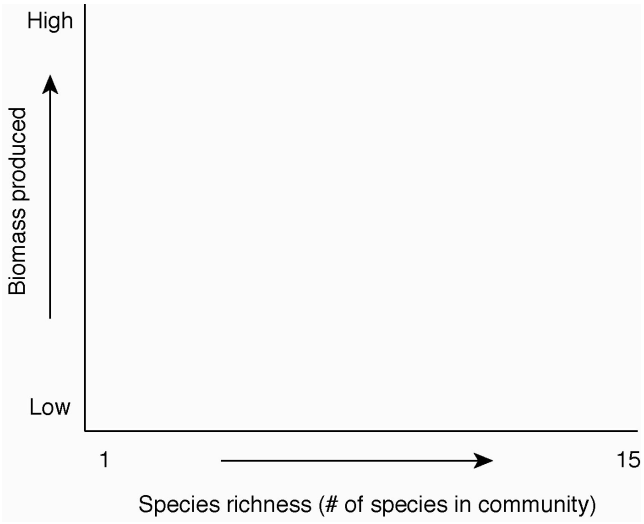
15) *grazing tolerance*

16) 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]**

17) Grasses are capable of replacing leaf tissue lost to herbivores by increasing the activity of three different types of meristems. Name these three meristems and rank their importance for rapid replacement of leaf tissue (1 = most important/rapid, 3 = least important/rapid). **[6 points]**

18) 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. **[10 points]**

19) 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. **[10 points]**



20) Rising levels of atmospheric CO_2 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]**

21) What evidence was presented in lecture to suggest that ecosystems in arid and semiarid regions are likely to be MORE sensitive to the changes in precipitation resulting from global warming than ecosystems in wetter areas? Clearly describe this evidence. **[8 points]**

22) 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. **[8 points]**

23) 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? **[8 points]**