Rangeland Plant Ecophysiology **Name:**
EXAM 3, REWM 3500, Fall 2012

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

1) The reduction in canopy leaf area with foliar herbivory typically causes canopy photosynthesis to decline. However, the reduction in canopy photosynthesis often is not proportional to the amount of leaf area lost to the herbivore because of:

a) preferential loss of new leaves rather than old leaves
b) a change in the microclimate of remaining leaves
c) the compensatory photosynthetic responses of remaining leaves
d) none of the above
e) all of the above

2) 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

3) Grazing tolerance mechanisms are those that:

a) reduce the probability or severity that a plant is grazed
b) allow for persistence with grazing, either by avoidance or resistance
c) dampen the large-scale ecosystem effects of grazing
d) increase a plant's capacity to recover from the loss of foliage
e) alter the microclimate feedbacks on a grazed plant

4) Grazing avoidance mechanisms are those that:

a) reduce the probability or severity that a plant is grazed
b) allow for persistence with grazing, either by grazing tolerance or resistance
c) dampen the large-scale ecosystem effects of grazing
d) increase a plant's capacity to recover from the loss of foliage
e) alter the microclimate feedbacks on a grazed plant

5) Bilbrough and Richards (1993) reported that when shoot tissue was removed from sagebrush plants, biomass production was:

a) equal to that in non-defoliated plants, demonstrating complete compensation
b) lower than that in non-defoliated plants, demonstrating overcompensation
c) equal to that in non-defoliated plants, demonstrating undercompensation
d) higher than that in non-defoliated plants, demonstrating overcompensation
e) lower than that in non-defoliated plants, demonstrating undercompensation

6) Interaction between two species in a community resulting in no change in growth or fitness of one species and reduced growth or fitness in the other is termed:

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

7) The interaction between seedlings of the giant cactus saguaro and leguminous trees like palo verde in the Sonoran Desert is one of:

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

8) Mistletoe plants that extract water, nutrients and all their required carbon directly from the tissues of their host plants are known as:

a) holo-parasites
b) nurse plants
c) mutualists
d) predators
e) hemi-parasites

9) From a paper by Hooper et al. (2005) we know with high certainty that:

a) species' functional traits influence ecosystem processes
b) some ecosystem processes are insensitive to the loss of a species because of functional redundancy among species
c) some species play only a small role in ecosystems
d) all of the above
e) none of the above

10) From the McDowell et al. 2008 paper on tree die-off, you learned that anisohydric plants are those that:

a) reduce stomatal conductance during dry periods to maintain a high and constant leaf water potential
b) come into energy equilibrium with soil water on a nightly basis
c) are most susceptible among all plants to mortality caused by carbon starvation
d) allow leaf respiration rates to increase over time as soil dries
e) are less likely to die of carbon starvation during drought compared to isohydric plants

11) From the Morgan et al. 2011 paper on grassland responses to global change, you learned that biomass enhancement ratio, defined as the biomass of elevated CO_2 treatment plots divided by that of control plots, was:

a) highest when nitrogen fertilizer was added to plots
b) lowest in years when plants were clipped to simulate grazing
c) not responsive to changes in annual precipitation
d) lowest in years when soil water potential was lowest
e) highest in years when soil water potential was lowest

12) The Briggs et al. 2005 paper on shrub encroachment presented findings showing that:

a) a 4-year fire return interval enhanced shrub establishment compared with annual burning
b) annual fire enhanced shrub establishment compared to less frequent burning
c) nitrogen addition greatly increased regrowth of burned shrubs
d) grazing suppressed shrub expansion into grassland

Short answer

13) List three grazing tolerance mechanisms in grasses. **[6 points]**

14) List three grazing avoidance mechanisms in grasses. **[6 points]**

15) 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 assertion and present evidence supporting your argument. **[8 points]**

16) 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]**

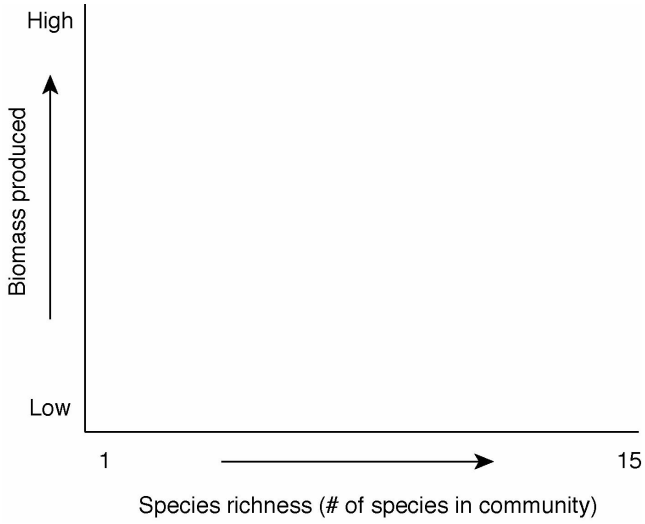
17) Based on the theory of competition developed by David Tilman, what process leads to competitive success in plants? You must describe this process in terms of resource competition and resource availability through time. You may wish to use a graph to help with your answer. **[10 points]**

18) Clearly describe the three main hypotheses offered in the McDowell et al. 2008 article that explain drought-induced tree die-off. **[8 points]**

19) Clearly describe and differentiate between the role biotic resistance plays at the introduction stage versus the population growth/spread stage of plant invasions. **[8 points]**

20) The paper by Morgan et al. 2011 reported that C4 grass biomass was stimulated more than that of C3 grasses by the combined treatments of elevated CO_2 and experimental warming. What mechanisms were proposed to account for this? **[8 points]**

21) 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 to account for this relationship. **[10 points]**



22) 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]**