

ECOLOGY 301 - EXAM 1, Monday 5 October, 1998

I. Short Answer Questions (3-9 points each) DO ALL QUESTIONS

SAQ #1. Please state and briefly explain the three major objectives of this course (listed on page two of the syllabus).

state and explain objective 1 - (3 pts)

state and explain objective 2 - (3 pts)

state and explain objective 3 - (3 pts)

SAQ #2. Explain the strengths of a “top down” approach to understanding ecology. (6 pts)

SAQ #3. Explain the strengths of a “bottom up” approach to understanding ecology. (6 pts)

SAQ #4. Strong electromagnetic fields are always created surrounding high voltage power lines which often cut right through residential and urban areas. In the figure at right appears a vague but statistically significant relationship exists between household electromagnetic field strength (caused by a high voltage power line within about 100 m) and leukemia in children. What is your response to the newspaper reporter who said that this showed that high voltage power lines caused these cancers? What is the scientific validity of this conclusion? (6 pts)

SAQ #5. Briefly explain the difference between inductive and deductive reasoning. (6 pts)

SAQ #6. Please briefly explain four **totally different ways** in which maintaining high levels of biodiversity in nature might be important to ecosystem function and be directly beneficial our economy? (8 pts)

PLEASE SELECT ANY 2 Questions from the list below and answer them in the space provided. (Please make clear which question you are answering.)

choose from:

- a. According to Stiling, in what ways can Egypt’s Aswan Dam be viewed as “a monument to ecological ignorance”?
- b. According to analyses in Costanza et al (1997), the “ecosystem services” of the natural world are greatly undervalued. Stiling notes that “the majority of these services are currently outside of the market system” (these are called market externalities). What does this mean? What would happen to the prices of commodities if these services were included in the market?
- c. According to Stiling, why might it be that ecologists devote greater research activity to individual and population ecology yet profess that community and ecosystem level analyses are more important?
- d. Briefly explain Paul and Anne Ehrlich’s “rivet hypothesis” to describe the consequences of increasing biodiversity loss.
- e. On page 20, Stiling uses an example drawn from his own work on parasitism rates for two species of insects. Using large samples of data he found “statistically different” rates of parasitism for averages of 8.33% and 8.24%, but then he asked “But is it biologically meaningful?” What does Stiling mean by this?

SAQ #7 (7 pts)

SAQ #8 (7 pts)

PLEASE SELECT ANY 2 Questions from the list below and answer them in the space provided. (Please make clear which question you are answering.)

choose from:

- According to Stiling, one of the generalizations that emerges from food web studies is that cycles in food webs are rare. What are “cycles” (please use a diagram) and briefly explain why are they rare?
- What relationships might one predict for food chain lengths among communities for which the primary consumers are endothermic vertebrates versus when primary consumers are ectothermic invertebrates?
- What is an inverted biomass pyramid? Why doesn't this violate the laws of thermodynamics?
- Why is it essential to collect data on temporal variation (e.g., annual or seasonal) when constructing a food web?
- Why is detritus such a problem to constructing food webs?
- Please list and offer supportive evidence to show the major limitations to secondary productivity (i.e. by herbivores)?

SAQ #9

(7 pts)

SAQ #10

(7 pts)

I. Longer Answer Questions (15 points each) CHOOSE ANY 2 QUESTIONS and put a big “X” across the pages of the questions you do not want.

LAQ #1. This question will assess your understanding of “ecological ethics” as presented in the preface and introduction of Stiling’s text and in class.

According to Stiling, (p. xvi), “researchers are aware that change and fluctuation are pervasive in nature and that there are no moral imperatives to species. This can create tension among students seeking moral enlightenment from an ecology class as well as factual knowledge because many professors’ life philosophy is to teach the integrity of evidence and rigorous logic, not a life philosophy of ecology as a quasi religion with moral positions.”

- Explain why Stiling argues that the fact of “change and fluctuation” in nature means that species have no “moral imperative” for their existence. (5 pts)
- According to anthropologists studying Easter Island, Polynesians colonized the island by about 400 AD, but by 1500 AD, they had thoroughly deforested and degraded the landscape. Further write Stiling, “once the population exceeded the carrying capacity of the island, warfare was rampant, as were chronic cannibalism and slavery” (p. 2).

Q - What does this text imply about whether scientific disciplines should or should not include morality and moral positions? (5 pts)

- Stiling lists some of the effects of humans upon our world today including acid rain, global atmospheric imbalances in CO₂ and N, pesticide residues, extinctions, etc. and notes that “Now, more than ever, there is strong impetus to understand how natural systems work, how humans change those systems, and how in the future we can reverse these changes” (p. 3).

Q - What does this text imply about whether scientific disciplines should or should not include morality and moral positions? (5 pts)

LAQ #2. This question will assess your understanding of “multiple causality.”

- (a). Please explain the concept of “multiple causality” in very general terms without using any specific examples. (4 pts)
- (b). In the example in class of the car not starting, numerous hypotheses were raised to explain the phenomenon. Why exactly isn’t this an example of “multiple causality?” (4 pts)
- (c). Please explain why it is so difficult to apply the standard hypothetico-deductive process discussed in class to research questions in evolutionary ecology because of the problem of “multiple causality.” (4 pts)

LAQ #3. This question will assess your understanding of inquiry methods in ecology.

- (a). Please list the principal strengths and weaknesses of **controlled laboratory experiments** to understand ecological phenomena. (please avoid unnecessary repetition)
 strengths: weaknesses: (5 pts)
- (b). Please list the principal strengths and weaknesses of **controlled field experiments** to understand ecological phenomena. (please avoid unnecessary repetition)
 strengths: weaknesses: (5 pts)
- (c). Please list the principal strengths and weaknesses of **“natural experiments”** to understand ecological phenomena. (please avoid unnecessary repetition)
 strengths: weaknesses: (5 pts)

LAQ #4. Please state what are the two principal objectives of individual ecology.

- state objective 1 - (4 pts)
 - state objective 2 - (4 pts)
- Please briefly explain why the decision of an optimally foraging State Trooper should be a “wait-ambush” foraging mode, and explain how this anecdote applies to the general question of optimal behavior/ optimal body design for wait-ambush vs. widely-foraging animals. (7 pts)

LAQ #5. This question will assess your understanding of the strengths and weaknesses of using “compartment diagrams” (i.e. flow diagrams of little boxes and little arrows to map the network of connections) to study ecosystems.

- (a). What are some of the interesting and critically important ecological and evolutionary questions that can be addressed using compartment diagrams? {Hint: this question presumes that simply making a systems model is not enough and instead asks what questions can you answer using your new model?} (4 pts)
- (b). Please list and briefly explain three of the major challenges, problems, flaws, limitations, etc., of using compartment diagrams to study ecosystem level ecology?
 challenge 1 - (4 pts)
 challenge 2 - (4 pts)
 challenge 3 - (3 pts)

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