Environmental Science 362-302 Name_____

EXAMINATION #2

[Note: You are given several choices for questions to answer. If you answer more than the required number, I will only grade as many as you were supposed to answer -- any additional answers will not be graded.]

Part I: Identification. Briefly define 5 of 6 (4 points each for a total of 20 points)

1.1 Xeromorphic adaptation

1.2 K-strategist

1.3 Diffusion

1.4 Stephan-Boltzman Equation

1.5 Type I survivorship

1.6 Cole's Paradox

Part II. Short Answers. Answer 7 of 9 (6 points each for a total of 42 points).

2.1 Sage bushes in the soft chapperal of southern California are surrounded by bare ground. What two radically different classes of species interactions have been proposed to explain this pattern? Explain how each mechanism works.

2.2 While stocking bluegills in a small lake in southern Brown County, Wisconsin DNR fisheries bioloigsts accidently overturn their truck, dumping all the fingerlings into the lake. Assuming that predation and interspecific competition take place among these fish, and that no more stocking occurs, graphically show me your prediction of average bass size in this lake as a function of fish denisty over time. Why do you expect this to occur?

2.3 You are hired to survey a remote region of Mexico for medicinally important plants. Based on potential herbivore grazing levels, what sorts of plants would you prioritize for sampling and why?

2.4 Explain, using words or pictures, how populations can continue to grow if Ro=1.

2.5 Why do plants which are the best net-photosynthesizers in shade often become the poorest net-photosynthesizers in full sun?

2.6 Give examples of how tropical trees have modified each of the major determinants of energy flux to achieve relative temperature homeostasis.

2.7 Using a Resource-Ratio model, diagram the competative interactions between a C3 and C4 species which are able to stablely coexist. Then diagram and predict the results of this interaction following an the increase in atmospheric CO2.

2.8 Graphically show, using modified Lotka-Volterra predator-prey models why wolves should never cause the extinction of deer populations.

2.9 What reasons might Grime suggest to account for the fact that plants living in wet Sphagnum bogs often exhibit the same adaptations as xeromorphic species (e.g., leathery leaves, slow maximum growth rates)

Part III. Problem sets.

3.1 You observe a cohort of 350 female perch until all individuals were dead six years later. You find that 212 perch, on average, were alive during the first year of life, with 67 in the second year, 55 in the third, 38 in the fourth, 16 in the fifth, and 3 in the sixth. Fill in the life table, determining the mortality rates and age-specific life expectancy values. (8 pts)

Age	qx	ex	_____	_____	_____	_____	_____

3.2 In a companion study, you also studied the reproduction within this cohort. You observed that the average number of female offspring produced per female during the first year was 0.01, in the second year 1.67, in the third year 2.25, in the fourth year 2.75, in the fifth year 3.00, and in the sixth year 2.8. What is the mean generation time and doubling time for the population? (9 points)

How does the proceedure you have just used to estimate doubling time differ from the method learned during the first month of class? What are the relative strengths and weaknesses of these two methods? Which do you prefer? Why? (6 pts)

Part IV. Short Essay. Answer 1 of 2 (15 points).

4.1 The Freija and Frigga Fritillary butterflies are restricted in Wisconsin to acidic peatlands in the northern third of the state. However, they are only found in less then 20% of potential sites in this landscape, with sites of occurrence being grouped into clusters appoximately 20 miles in width. Suggest at least three hypotheses to account for this distribution pattern, and experiments that could be conducted to test between them.

4.2 One of the primary goals of park managers is to allow for the coexistence of various species. Suggest various ways, given the models and approaches presented in class, which would encourage such coexistence.