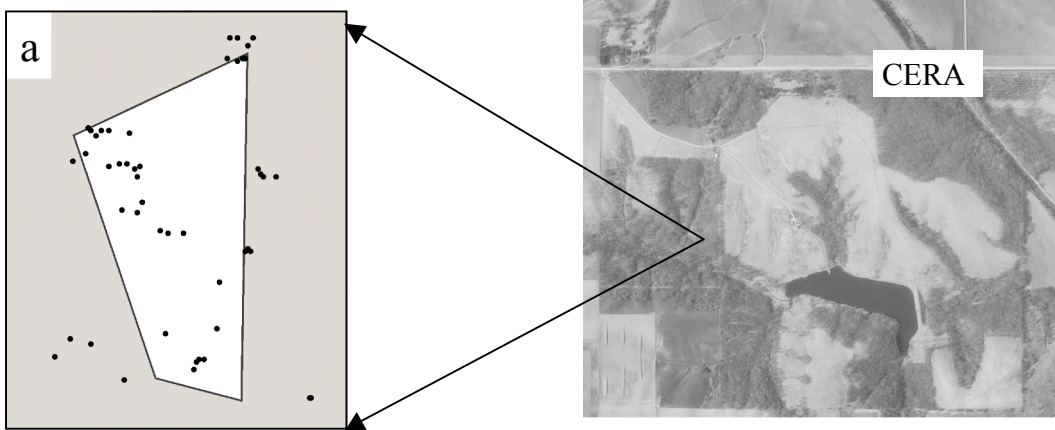


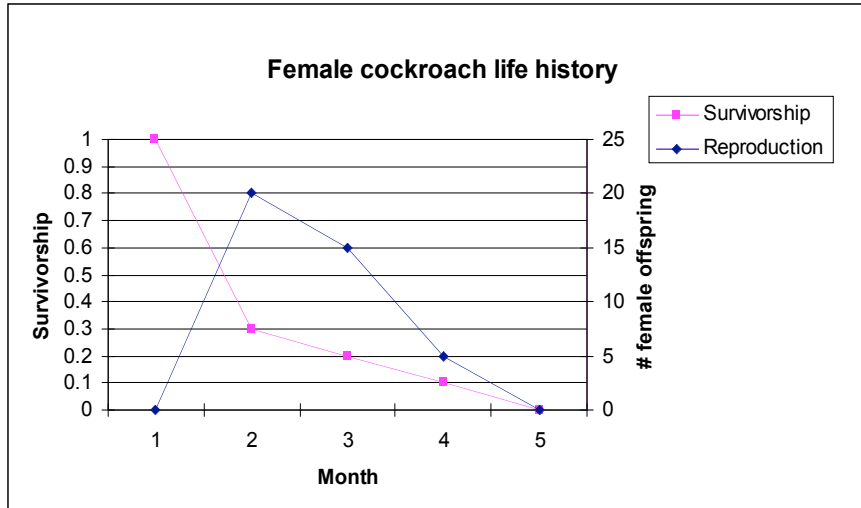
Please put your name on the back.

Quizling III
Bio 252 -- April 16, 2004

1. *Formica montana* is a mound-building ant species found at the Conard Environmental Research Area (CERA). In November 2003, Georgia Hart '04 mapped the spatial distribution of mounds of this species in the oak savannah using a Global Positioning System (GPS). [The map of mound locations below to the left shows each mound as a dot; the polygon of 5956 sq-m is shown for scale]. Based on these data, Georgia calculated a Clarke-Evans dispersion index, R , which was significantly less than 1. Describe two distinct hypotheses for this spatial distribution of ant mounds. (10 points)



2. The following figure illustrates the survivorship and fecundity schedules of a cohort of asexual (female) cockroaches I released 6 months ago in my office (as eggs).



(a) Calculate this population's net reproductive rate. (5 pts.)

(b) Calculate the generation time of this population. (5 pts.)

(c) Calculate the per capita rate of increase of this population. (5 pts.)

(d) If I started with 100 eggs, what would the population size be in 8 months? (5 pts.)

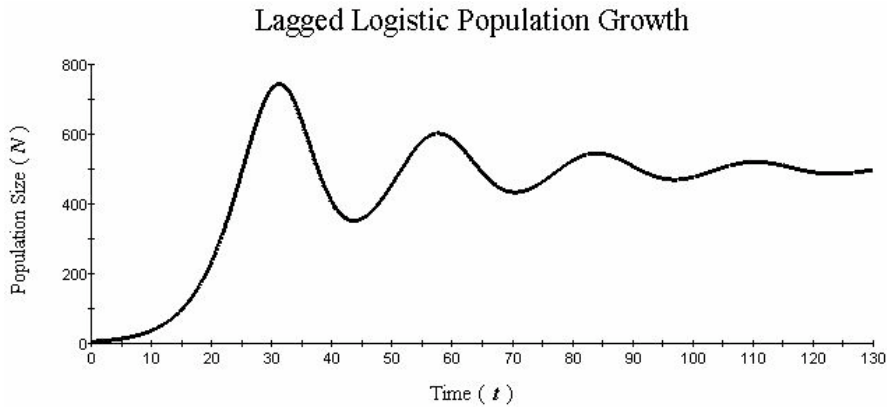
3. The Soares' et al. study of the effects of the organic pesticide DCA on *Daphnia magna* growth illustrated a negative relationship between concentrations of dissolved DCA and r , as measured by clonal (asexual) population growth.

(a) In which life table parameters would the effect of this environmental variable most likely be seen? Explain your answer. (6 pts.)

(b) The investigators also found that variation in r was associated with differences in clone genotype. If these genotypes initially coexisted in equal proportions in a single population (e.g., in one lake), how would you predict genotype frequencies would change over time? Explain your answer, including your assumptions. (7 pts.)

4. On the axes below draw lines or curves illustrating the approximate relationships between the variables shown for (a) an exponential growth model (solid line) and (b) a logistic growth model (dashed line). (12 points)

5. The following figure shows population dynamics under conditions where $N_0 = 5$, $K = 500$, $r = 0.2$ and $T = 6$.



Describe how and why the dynamics would change if

(a) K is increased (5 pts.)

(b) r is increased (5 pts.)

(c) T is increased (5 pts.)

6. Draw the approximate population trajectories for each starting point (dots) on each of the following graphs. The dashed line is the N_1 isocline and the solid line the N_2 isocline. (15 pts.)

7. Iowa is a geographic meeting place for a number of species that are primarily distributed in the “Big Woods” (i.e., east of Iowa) or the “Prairie” (west of Iowa). Consider the case of two insect pollinated species that co-occur at CERA, where they show a difference in flowering phenology, i.e., they bloom over different but slightly overlapping time periods. Describe one or more studies that collectively would test the hypothesis that this difference in flowering time is an example of *character displacement*. (15 pts.)

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Name _____

Box # _____