**Bio 320 Ecology Fall 2008 Problem Set 1**

**Published 31 August 08, Due in Class: Wednesday, 10 September 08**

1. At time $t_1$ you capture, *mark* and release 60 individuals. At time $t_2$ you *capture* 144 individuals; 24 of them are marked (= *recaptures*). What is your estimate of **population size**?

2. On day 1 you capture, *mark* and release 78 house sparrows. Two days later you capture both marked and unmarked birds; the number *marked* is 26. You estimate a *population size* of 195 individuals. How many **unmarked** birds were captured on day 2?

3. You trap, *mark* and release 35 field mice. Three days later you trap both marked and unmarked mice; 34 individuals are *unmarked*. You estimate a *population size* of 140 individuals. How many **recaptures** were included in the second sample?

4. N(t) is population size at time t; time is continuous. Briefly define dN(t)/dt; then define (1/N) dN(t)/dt. Note that these definitions should apply to any continuous-time model of population growth, not just exponential growth.

5. A population grows *exponentially* from an *initial population* size (i.e., at time 0) of 10 individuals. The *intrinsic rate of increase* is 0.1. What is the **population size** at time 10?

6. Population size changes according to $dN/dt = r N_t$. The population *declines* exponentially from an *initial population* size of $N_0$. At what **time** will the population size declined to ½ its initial value? What condition on the intrinsic rate makes your answer positive?