Population Ecology practice calculations by Anna Lovrien (summer 2012)

Formulas provided by College Board Appendix A formula sheet

**Rate** dY/dt

**Population Growth** dN/dt=B-D

**Exponential Growth dN/dt = r max N**

**Logistic Growth dN/dt = r max N (K-N/K)**

dY= amount of change

*t* = time

B = birth rate

D = death rate

*N* = population size

*K* = carrying capacity

*r* max = maximum per capita growth rate of population

Other useful information:

rmax= b-d

dN=final population number (N)- initial population number (N)

in dN/dt=rmaxN remember rmax is also b-d (exponential growth formula) and N is the initial N not final

in dN/dt=rmaxN (K-N/N)

1. A population of 265 swans are introduced to Circle Lake.  The population’s birth rate is 0.341 swans/year, and the death rate is 0.296 swans/year.  What is the rate of population growth, and is it increasing or decreasing?

2.       There are 190 grey tree frogs in a swamp.  If r= -0.093 frogs/ year, predict the population size next year.

3. A population of 1,492 Baltimore Orioles is introduced to an area of Nerstrand woods.  Over the next year, the Orioles show a death rate of 0.395 while the population drops to 1,134.  What’s the birth rate for this population?  Is this proving to be a suitable habitat?

4. 780 turkeys live in Merriam township, which is 92 acres in size.  The birth rate is 0.472 turkeys/ year.  The death rate is 0.331 turkeys/ year.

a.       What is the population density?

b.       What is dN/dt?

c.       Predict N after one year, assuming dN/dt stays constant.

5.       One dandelion plant can produce many seeds, leading to a high growth rate for dandelion populations.  If a population of dandelions is currently 40 individuals, and rmax= 80 dandelions/month, predict dN/dt if these dandelions would grow exponentially.

6.       Imagine the dandelions mentioned in #12 cannot grow exponentially, due to lack of space.  The carrying capacity for their patch of lawn is 70 dandelions.  What is their dN/dt in this logistic growth situation?