Population Ecology Problems ANSWERS (Grid in Answers)

I was working on my population ecology unit this week, and wrote the following questions. I hope they are helpful. (I also hope I didn't make any errors!)

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 treefrogs 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 r_{max}= 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?

Answers:

1) r is increasing. r=0.045

2) 172 frogs

3) b= .155

dN/dt= (b-d)N

(1134-1492)/1 = (b- 0.395) 1492

so b= 0.155.

4a) 8.5 turkeys/acre

4b) 110 turkeys/ year

4c) 890 turkeys

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 r_{max}= 80 dandelions/month, predict dN/dt if these dandelions would grow exponentially.

Equation to use, exponential growth: $dN/dt = r_{max} N$

dN/dt= 80 x 40= 3200

6. Imagine the dandelions mentioned in #5 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?

Equation to use, logistic growth: dN/dt= r max N (K-N/K)

dN/dt= 80 x 40 (70-40/70)

dN/dt= 3200 (30/70)

dN/dt= 1371