Population ecology assignment: Population growth

Due at 4 PM on Fri 27 Jan

1. A population of elk in Alberta was studied in the year 2015, and estimated to have 120 individuals, with an approximate per-capita instantaneous birth rate of $= 0.12/\,\mathrm{yr}$ and per-capita instantaneous death rate of $0.2/\,\mathrm{yr}$.

a. Write a continuous-time model equation explaining how this population changes through time, assuming that the birth rate and death rate remain constant. What is the estimated instantaneous rate of change r?

b. How long should it take before the expected size of this population drops below 50? Write the solution for your equation; do an algebraic calculation with units; and work out the answer with a calculator or calculator program.

c. What could be some possible reasons for this population's decline?

2. Two competing fly populations are introduced to McMaster campus. They each breed once a year, and adults die after breeding. In "blue fly" population, the population size is 16 in 2010 and the average number of successful offspring per female is 2.8; in the "green fly" population, the population size is 40 in 2015 and the average number of successful offspring per female is 2.4. The sex ratio is 1:1 in each species.

a. How would you model these populations, and what parameters would you use for each species?

b. Write an equation, and calculate the number of bugs expected in each population after 10 years.

c. For *one* of the species, make a table showing the number of successful offspring and successful females for each year. You may use pen and paper, a spreadsheet program, or some other method.

d. Make a graph with labeled axes showing the number of individuals for your species through time. Explain in words what choice you made in scaling the axes, and what your graph shows.