Population ecology assignment: Population growth

Due at noon on Mon 8 Feb

1. (6 points in total) A population of elk in Alberta was studied in the year 2016, and estimated to have 500 individuals, with an approximate per-capita instantaneous birth rate of 0.1/yr and per-capita instantaneous death rate of 0.13/yr.

a. (2 points) 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. (3 points) How long should it take before the expected size of this population drops below 100? Write the solution for your equation; do an algebraic calculation with units; and work out the answer with a calculator or calculator program.

c. (1 point) What are some possible reasons for this population's decline?

2. (10 points in total) 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 initial population size is 10 and the average number of successful offspring per female is 3; in the "green fly" population, the initial population size is 100 and the average number of successful offspring per female is 2.4. The sex ratio is 1:1 in each species.

a. (3 points) How would you model these populations, and what parameters would you use for each species?

b. (2 points) Write an equation, and calculate the number of flies expected in each population after 10 years.

c. (2 points) 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. (3 points) 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. Feel free to use a graphing program, or to draw and scan.