

Population ecology assignment: Population growth

Due at 4 PM on Mon 3 Feb

1. A population of elk in Alberta was studied in the year 2018, and estimated to have 600 individuals, with an approximate per-capita instantaneous birth rate of 0.1/yr and per-capita instantaneous death rate of 0.16/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 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. What are 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 initial population size is 10 and the average number of successful offspring per female is 3.2; in the “green fly” population, the initial population size is 50 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 flies 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.