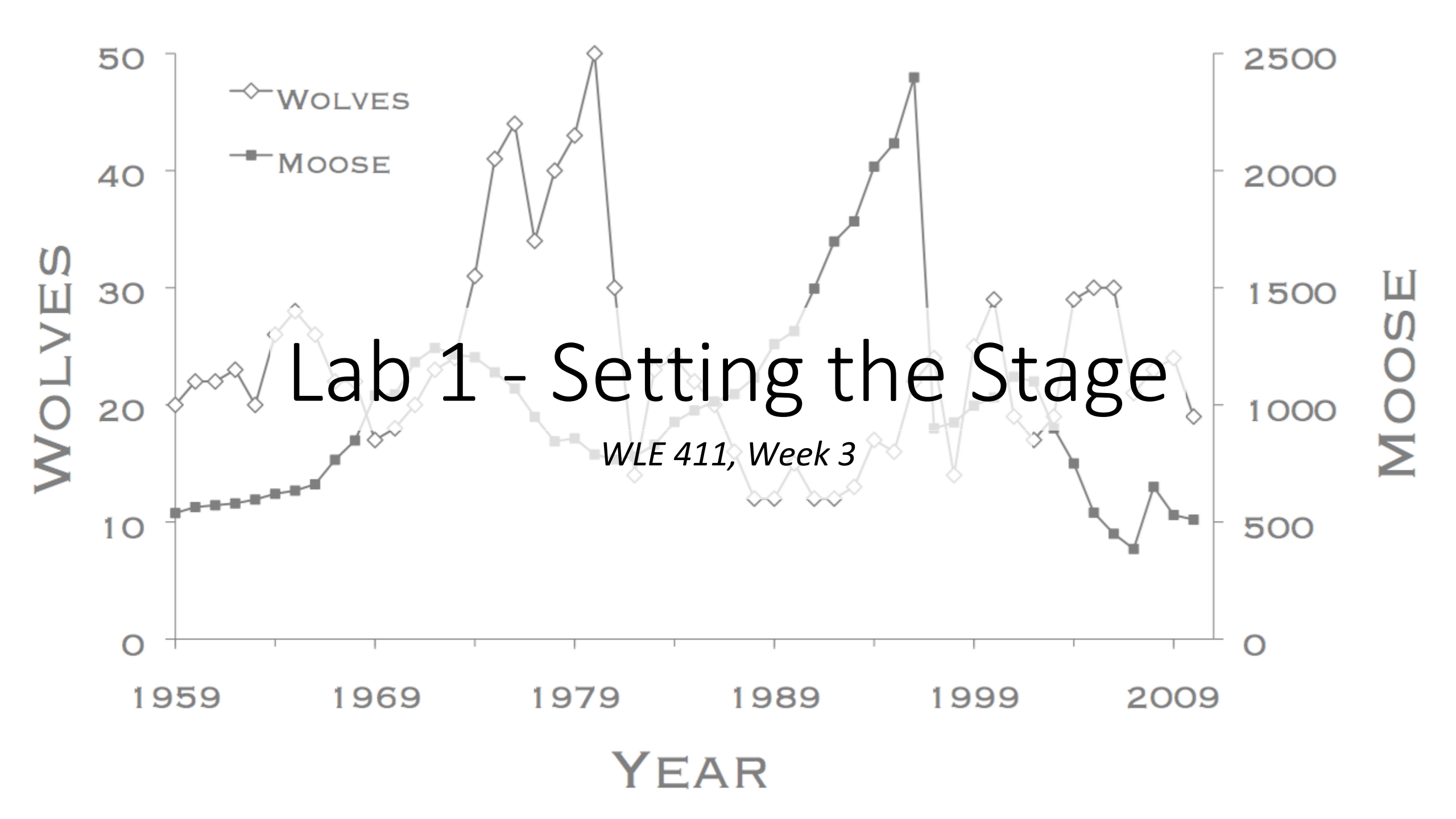
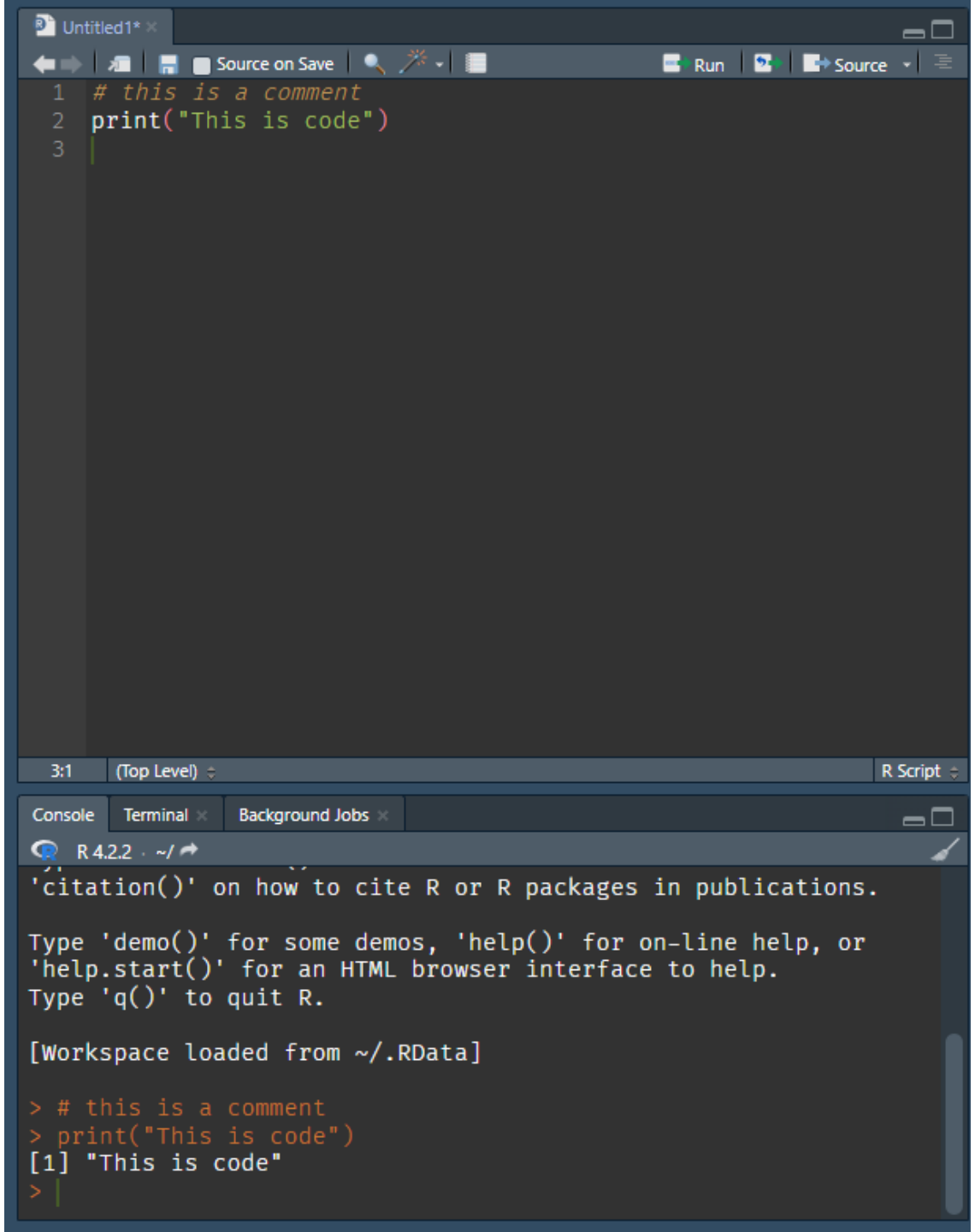


Lab 1 - Setting the Stage

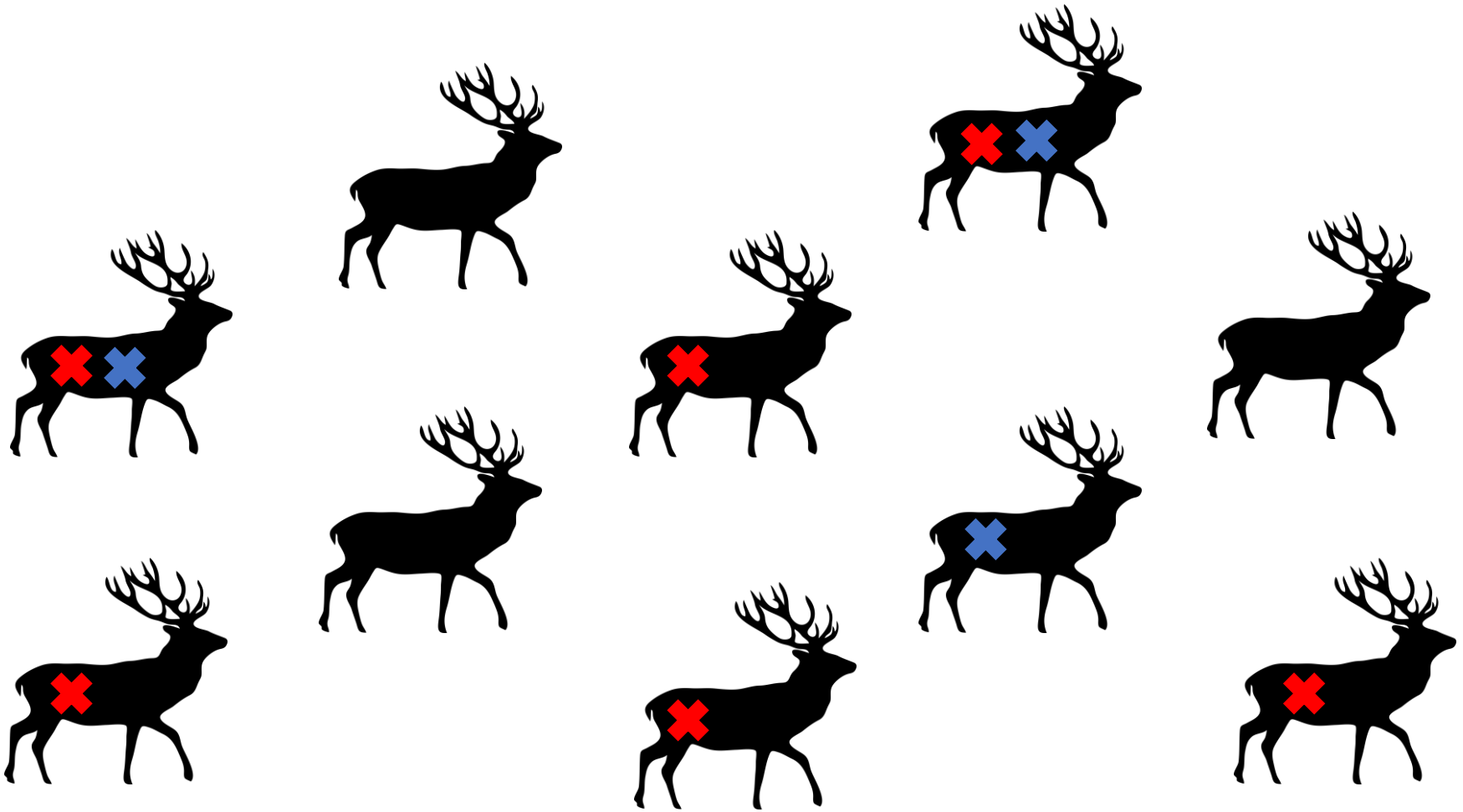
WLE 411, Week 3

Readings and deadlines

- Lab preface assignment due at the start of class
- Readings for this lab:
  - Chapter 1- Models
    - We'll be using our first model today!
  - Data organization in spreadsheets
    - Esp. important for importing data into R


Untitled1*
Source on Save
Run
Source
1 # this is a comment
2 print("This is code")
3
3:1
(Top Level)
R Script
Console
Terminal
Background Jobs
R 4.2.2 · ~/
'citation()' on how to cite R or R packages in publications.
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.
[Workspace loaded from ~/.RData]
> # this is a comment
> print("This is code")
[1] "This is code"
>

Population estimation using mark-recapture



Parameter to estimate:

N: Total # of animals

Parameters to measure:

M: # of animals marked on first occasion

C: # of animals marked on second occasion

m (blue & red): # of animals marked on both occasions

Lincoln-Peterson estimator

$$\frac{\widehat{N}}{M} = \frac{C}{m}$$

or

$$\frac{Total\ \#\ of\ animals}{\#\ of\ animals\ marked\ on\ first\ occasion} = \frac{\#\ of\ animals\ marked\ on\ second\ occasion}{\#\ of\ animals\ marked\ on\ both\ occassions}$$

What assumptions do we make?

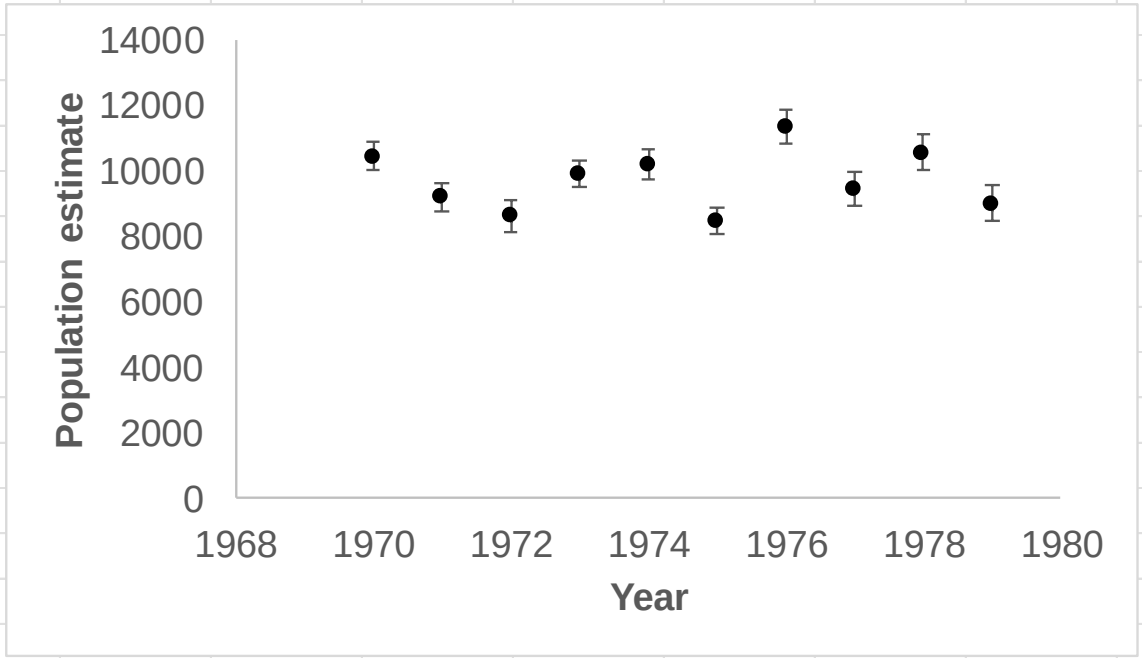
- Population closure
  - No individuals entering or exiting the population
  - To avoid violating, both capture sessions should be close together
- Equal probability of capture for all individuals
- Large sample sizes
  - If m is too small, then N is biased towards a very large number
  - Can be corrected using a new formula (*Equation 3*)

Using Excel

A	B	C
1	3	4
4	2	6
6	1	7
2	7	9

Using Excel

Year	Population estimate	Standard error
1970	10458	450
1971	9203	458
1972	8634	482
1973	9912	388
1974	10224	450
1975	8469	392
1976	11351	508
1977	9459	526
1978	10575	549
1979	9007	552



Statistics review

- Sample statistics
  - Sample mean ($\bar{x}$):
    - The mean value of observations in the sample
  - Standard deviation (SD, σ):
    - The expected difference between individual points and the sample mean
- Population statistics
  - Population mean (μ):
    - The “true” mean value
    - e.g. measure the antlers of every deer in the population
  - Standard error (SE):
    - The expected difference between the sample and population mean

Statistics review

- Population statistics
  - 95% confidence intervals:
    - An interval which should include the population mean 95% of the time
    - Lower boundary: $\bar{x} - 1.96*SE$
    - Upper boundary: $\bar{x} + 1.96*SE$

Calculating lambda (λ)

- Definition:
  - The discrete growth rate of a population
  - If $\lambda = 1$, population is stable
  - If $\lambda > 1$, population is rising
  - If $\lambda < 1$, population is declining

- Calculating λ across multiple years:
  - Check your lecture slides from Sep. 7th

Lab 1 - Setting the Stage

Erik Blomberg (edited by Matt Mensinger and Liam Berigan)

09/08/2023

Contents