



# Lecture 1

Introduction to population ecology

WILD3810 (Spring 2019)

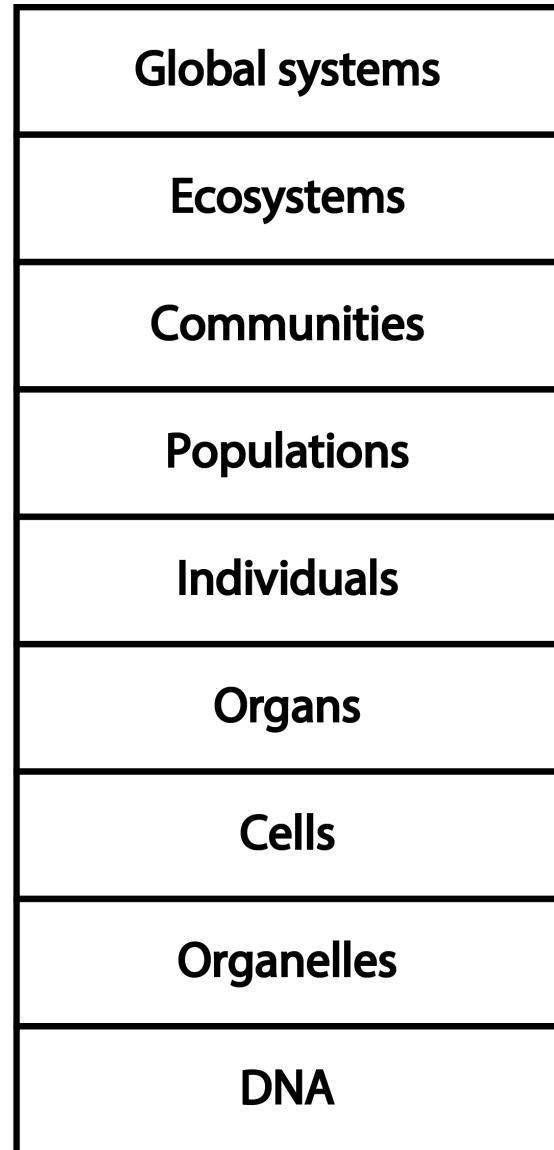
# Readings

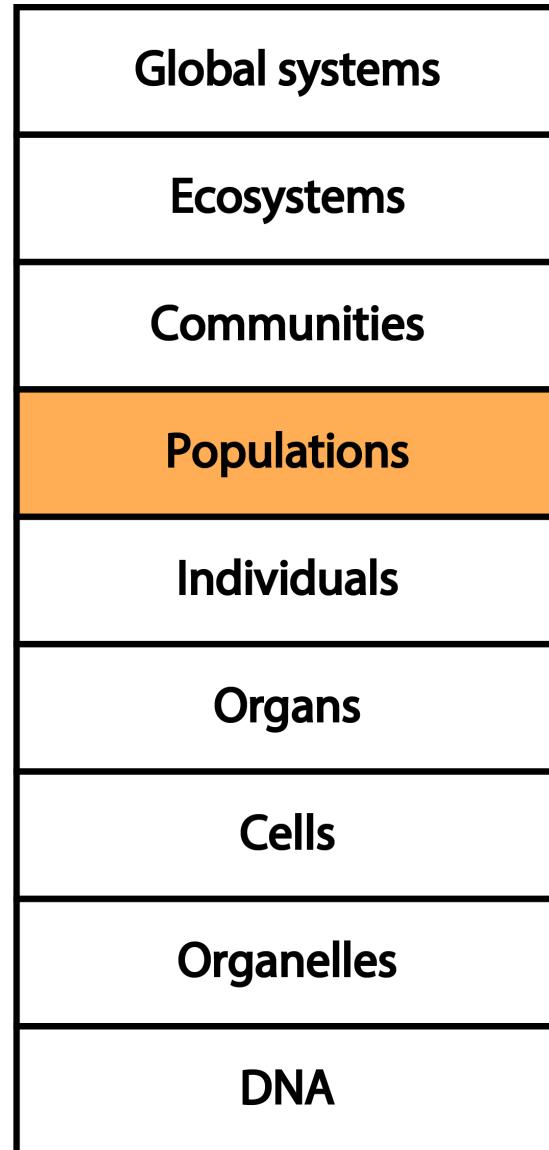
Mills 3-12

Powell & Gale 6-10

# What is population ecology?

Population ecology is the study of the distribution of individuals in a population over time and space





# Population ecology forms the basis for modern natural resource management

- Conservation



# Population ecology forms the basis for modern natural resource management

- Conservation
- Management



# Population ecology forms the basis for modern natural resource management

- Conservation
- Management
- Population control



# Definitions

# Population

A group of organisms of the same species occupying a particular space at a particular time

# Interactions

A common concept in all definitions of a population is some potential for *interactions* among individuals

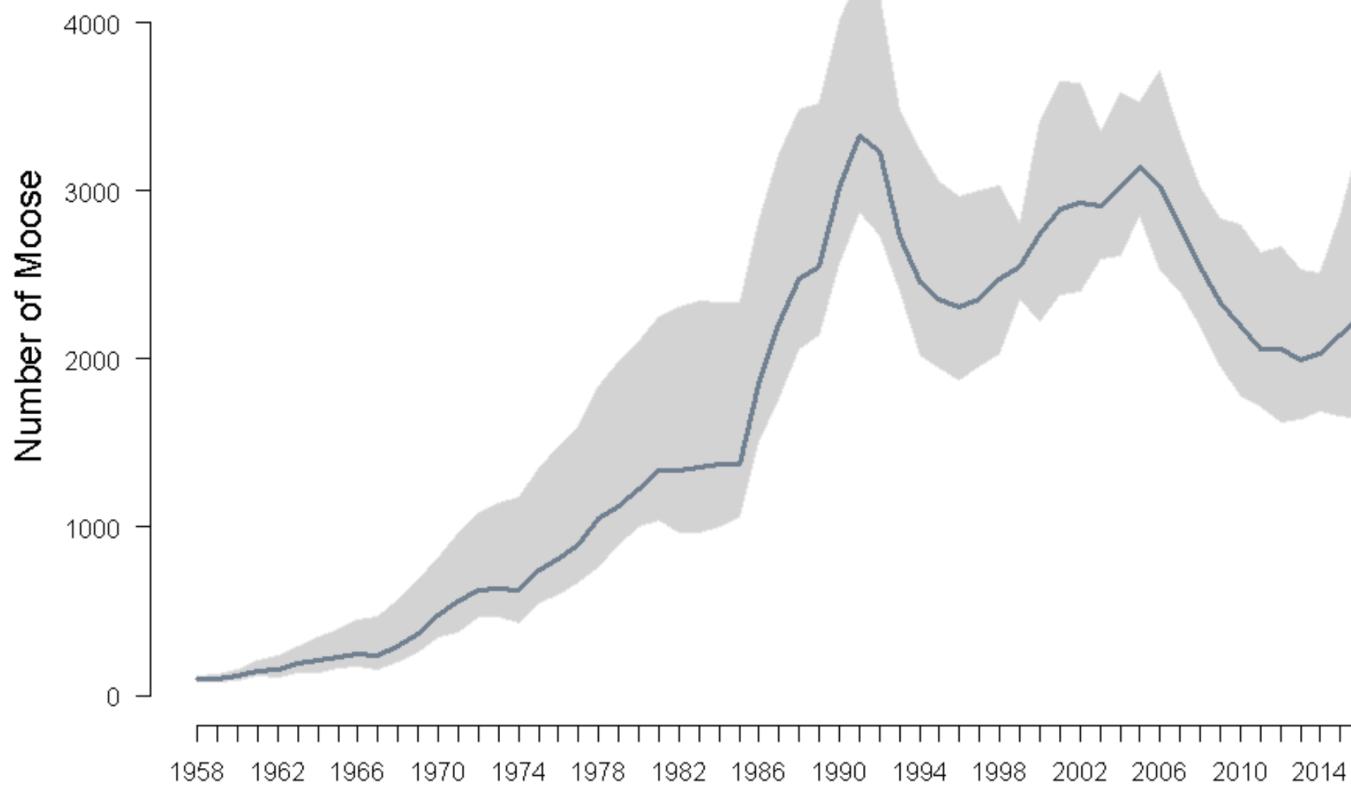
- interactions can be direct (fighting for territories, reproducing) or indirect (food depletion)
- some definitions refer to reproduction - what about non-reproductive periods of the life cycle?

# Abundance (population size)

| the number of individual organisms in a population at a particular time

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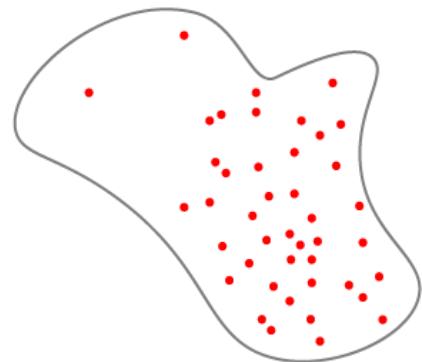
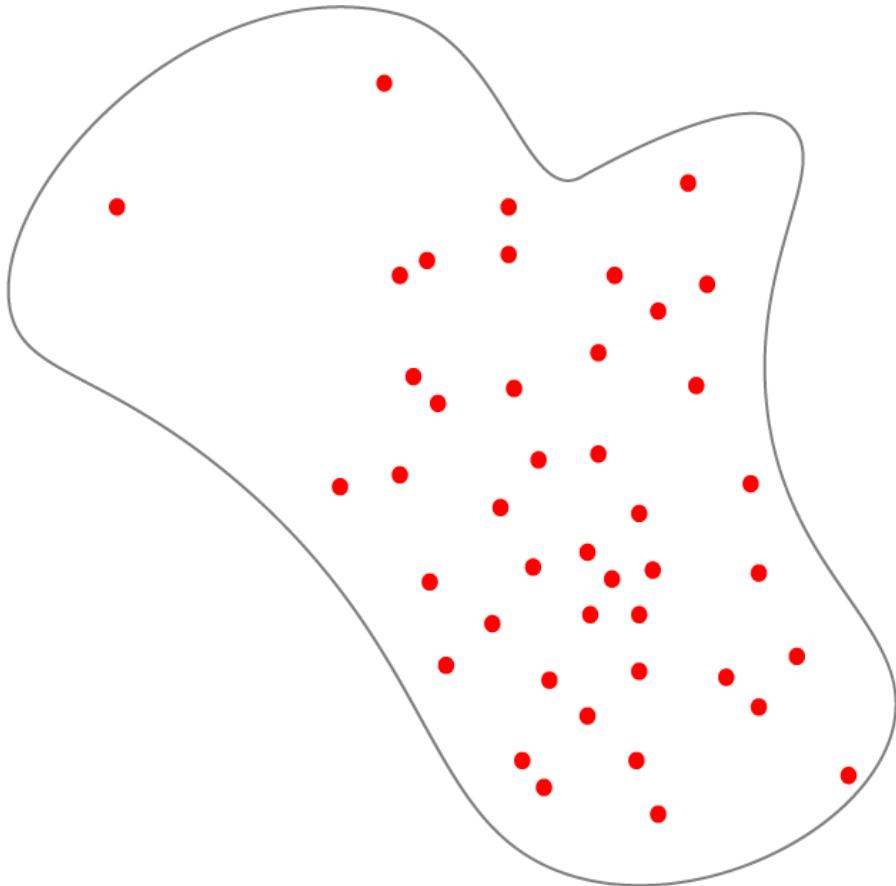


# Density

the number of individuals relative to a critical resources (i.e., space)

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the number of individuals relative to a critical resources (i.e., space)<sup>2</sup>



Why are you interested in population ecology?

# Questions that population ecologists ask:

- *Why is this species found here and not there?*
- *Are there more of this species than there used to be? Why?*
- *How many individuals of this species can be harvested each year?*
- *Will climate change cause this species to increase or decrease?*

# Models of populations

Answering these questions **requires** models

Models link **observations** to **processes**

Models are tools that allow us to learn about the real world

- By necessity, models are simplifications of reality

By the end of the course, you will be a  
modeler!

# The modeling process<sup>3</sup>

# The modeling process

## 1) Define the problem

- How many individuals will be in our population next year?

# The modeling process

- 1) Define the problem
- 2) Identify the important variables
  - population size this year ( $N_t$ )<sup>4</sup>
  - number of births ( $B_t$ )
  - number of deaths ( $D_t$ )
  - number of immigrants ( $I_t$ )
  - number of emigrants ( $E_t$ )

# The modeling process

- 1) Define the problem
- 2) Identify the important variables
- 3) Create the model

$$N_{t+1} = N_t + B_t + I_t - D_t - E_t$$

# The modeling process

- 1) Define the problem
- 2) Identify the important variables
- 3) Create the model
- 4) Solve the model

- Count the individuals!
- Estimate birth/death rate
- Measure movement

# The modeling process

- 1) Define the problem
- 2) Identify the important variables
- 3) Create the model
- 4) Solve the model
- 5) Interpret the results
  - Do the results make sense?<sup>5</sup>

# Abundance

# Abundance

Each definition of a population refers to it being a collection of individuals

We denote the total number of individuals in a population as  $N$

$N$  is the **State Variable** of a population

