



Lecture 1

Introduction to population ecology

WILD3810 (Spring 2019)

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Readings

Mills 3-12

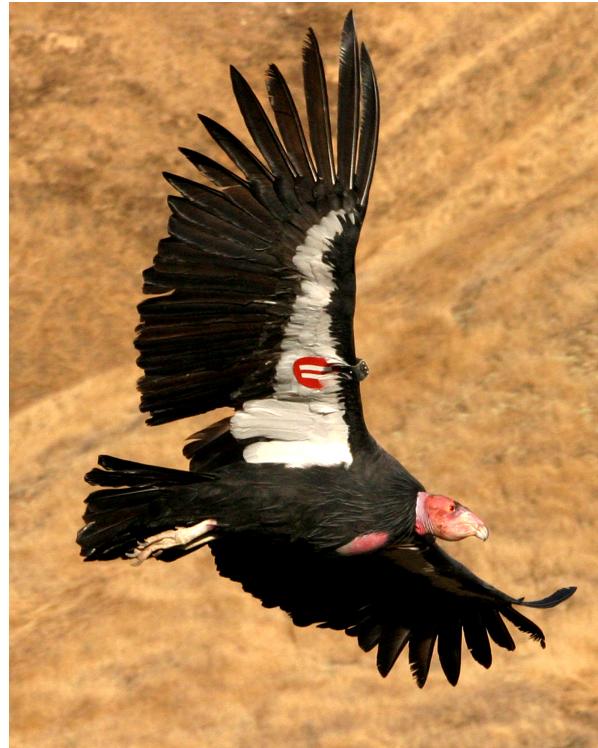
Powell & Gale 6-10

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



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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



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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

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- interactions can be direct (fighting for territories, reproducing) or indirect (food depletion)

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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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the number of individual organisms in a population at a particular time¹

Density

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

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Why are you interested in
population ecology?

Questions that population ecologists ask:

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- *Why is this species found here and not there?*

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- *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

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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!

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The modeling process ³

The modeling process

1) Define the problem

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The modeling process

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

The modeling process

- 1) Define the problem
- 2) Identify the important variables

The modeling process

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- 2) Identify the important variables
 - population size this year (N_t)⁴

The modeling process

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 - population size this year (N_t)⁴
 - number of births (B_t)

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- population size this year (N_t)⁴
- number of births (B_t)
- number of deaths (D_t)

The modeling process

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2) Identify the important variables

- population size this year (N_t)⁴
- number of births (B_t)
- number of deaths (D_t)
- number of immigrants (I_t)

The modeling process

1) Define the problem

2) Identify the important variables

- population size this year (N_t)⁴
- 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

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 - Count the individuals!

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 - Count the individuals!
 - Estimate birth/death rate

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

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?⁵

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

