

### Elements of good experimental design

- Controls
  - Control and treatment groups be the same except for the treatment applied
- Replication
  - Several independent tests
  - Accounts for natural variation
  - Responses that are more variable (or smaller) require more replication
- Known initial conditions
  - Confirm subjects are similar before starting treatments
- Realism
  - Conditions and scale of the test should be similar to those experienced in the environment under consideration

*("Investigating the Evidence #13" in the book)*

- ### Explanations for limits to distribution
- Hasn't got there (dispersal limited)
  - Has got there but doesn't survive and reproduce
    - Abiotic reasons
    - Biotic reasons

- ### Review Session
- Wednesday Feb 18
  - 1-2 PM
  - ASEC 187
  - Possible adjustments to study sheet
  - Remember - No class Tuesday! (President's day)

## Chapter 10 – Population Dynamics

Life histories, survivorship, birth rates, life tables

## Levels of Ecology

- Biosphere
- Ecosystem- nutrient cycling, energy flow
- Community- species composition, evenness, trophic structure
- Population- sex ratio, age structure, pop growth
- Individual – behavior, physiology



Figure 2.8  
Thinking about the levels of ecology of organisms, including organisms, populations, communities, ecosystems, biomes, and the biosphere.

http://68.90.81.6/ScienceTAKS/ECOLOGY\_files/imag001.jpg

## Population Ecology

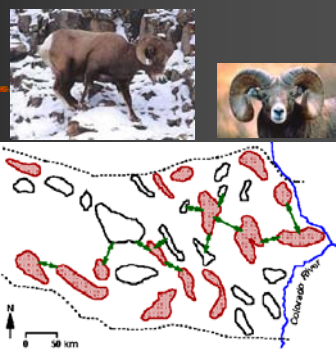
- POPULATION: A group of individuals of a single species inhabiting a specific area
- Have emergent attributes, such as
  - Density
  - Sex ratio
  - Age structure
- Change in population size is a function of
  - Additions
    - Births (B)
    - Immigration (I)
  - Subtractions
    - Deaths (D)
    - Emigration (E)

$$\Delta N = B + I - D - E$$

http://pages.cs.wisc.edu/~wenger/images/bonanza2k.school.jpg

## Populations are often subdivided

Shaded areas indicate mountain ranges with resident populations, arrows indicate documented intermountain movements, dotted lines show fenced highways

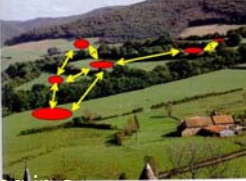


**Mountain Sheep (*Ovis canadensis*) in Southern California**

http://www.shiptv.org/NatureWorks/highernsheep.htm

## Metapopulations

- Many natural populations are divided into sub-populations, each occurring in a different patch of habitat.
- Metapopulation – population of populations
- Small (or distant) habitat patches have fewer individuals, and will therefore go extinct more often

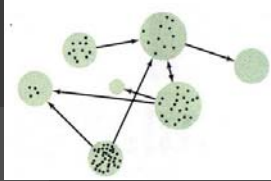


http://www.bio.uni-potsdam.de/professoren/vegetationoekologie-naturschutz/aktivitaeten/PlantMetPop.jpg

## Metapopulations

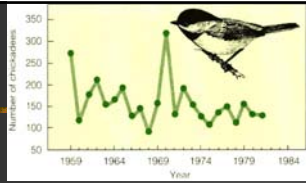
- N subpopulations grows through colonizations
- N subpopulations shrinks through extinctions
- Maintenance of the metapopulation depends on the balance of extinctions (e) and colonizations (c)
  - If e=c, then stable
  - If c is high, acts like one populations
  - If c is low, no rescue for declining populations, and hard to survive extinctions

**Conservation implication** – may need to save more than one population or site to save the species



http://www.biology.ksu.edu/webfile/centromer/ecology/Spatial%20dynamics%20handout\_files/frames.html#slide4

# Population Dynamics



- What is population dynamics?
- What contributes to population dynamics?



# BSMD program 'survivorship'

	Month	#	%	N out of 1000
apply	0	537	100.0	1000
interview	2	190	35.0	350
accepted	5	35	6.5	65
md	77	25	4.6	46

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