Course Website

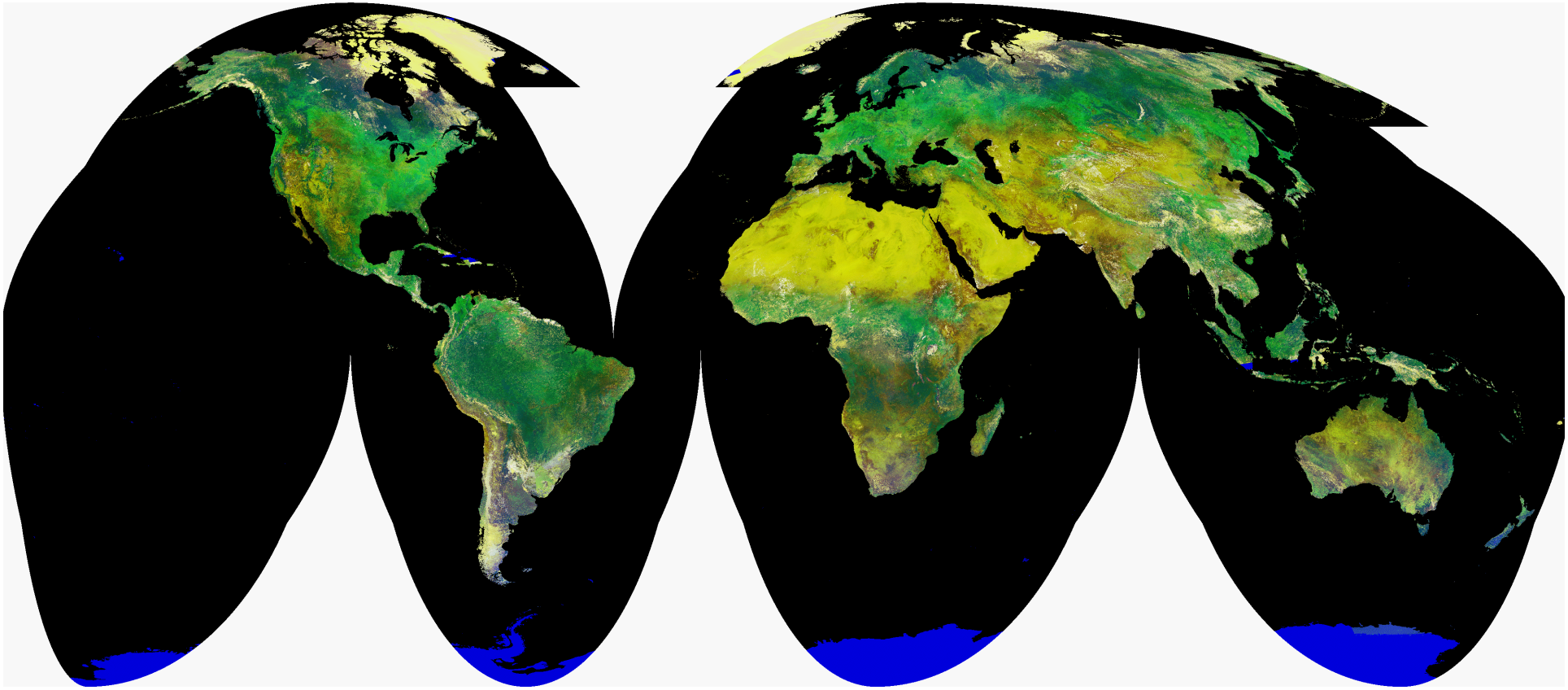
www.sfu.ca/biology/courses/bisc204

- All important course information will be posted to the above website
- Lecture notes (available prior to lecture), lecture slides (after), syllabus
- **This class DOES NOT use Canvas for class announcements**

Announcements

- First In-class assignment (mark-recapture) this THURSDAY (Sept. 12th)

- This week in tutorial:
  - Intro to Web of Science, Plagiarism
  - Intro to Literature Review assignment



Tropical Savannah

Serengeti NP

Temperate Grassland/Cold Desert

Potholes, E. WA

Boreal Forest

Whitehorse, Yukon

Tundra

Iqaliut, Nunavut

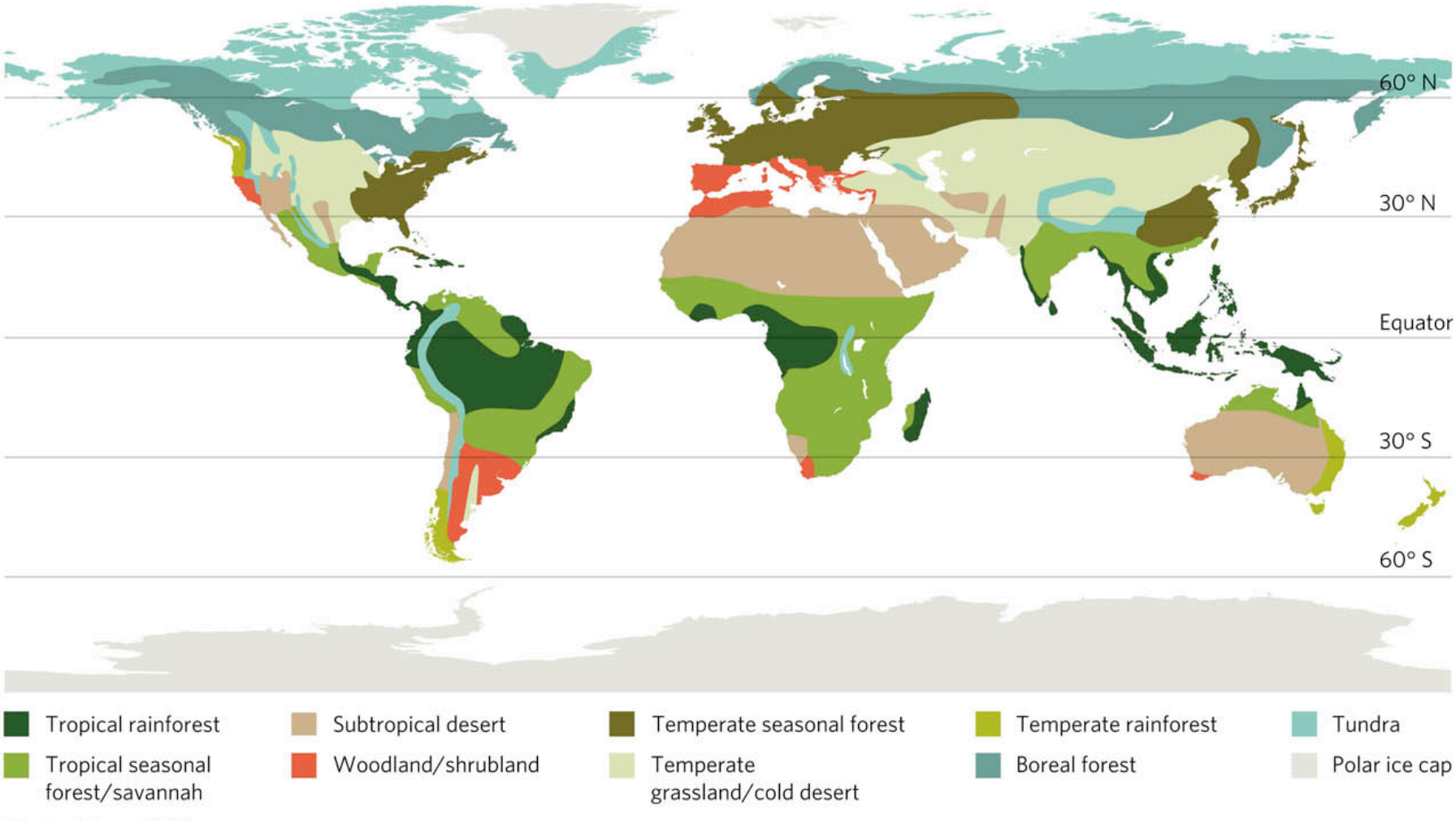
Tropical Rainforest

La Selva, Costa Rica

Temperate Seasonal Forest

New England

Major Biomes (n=9)

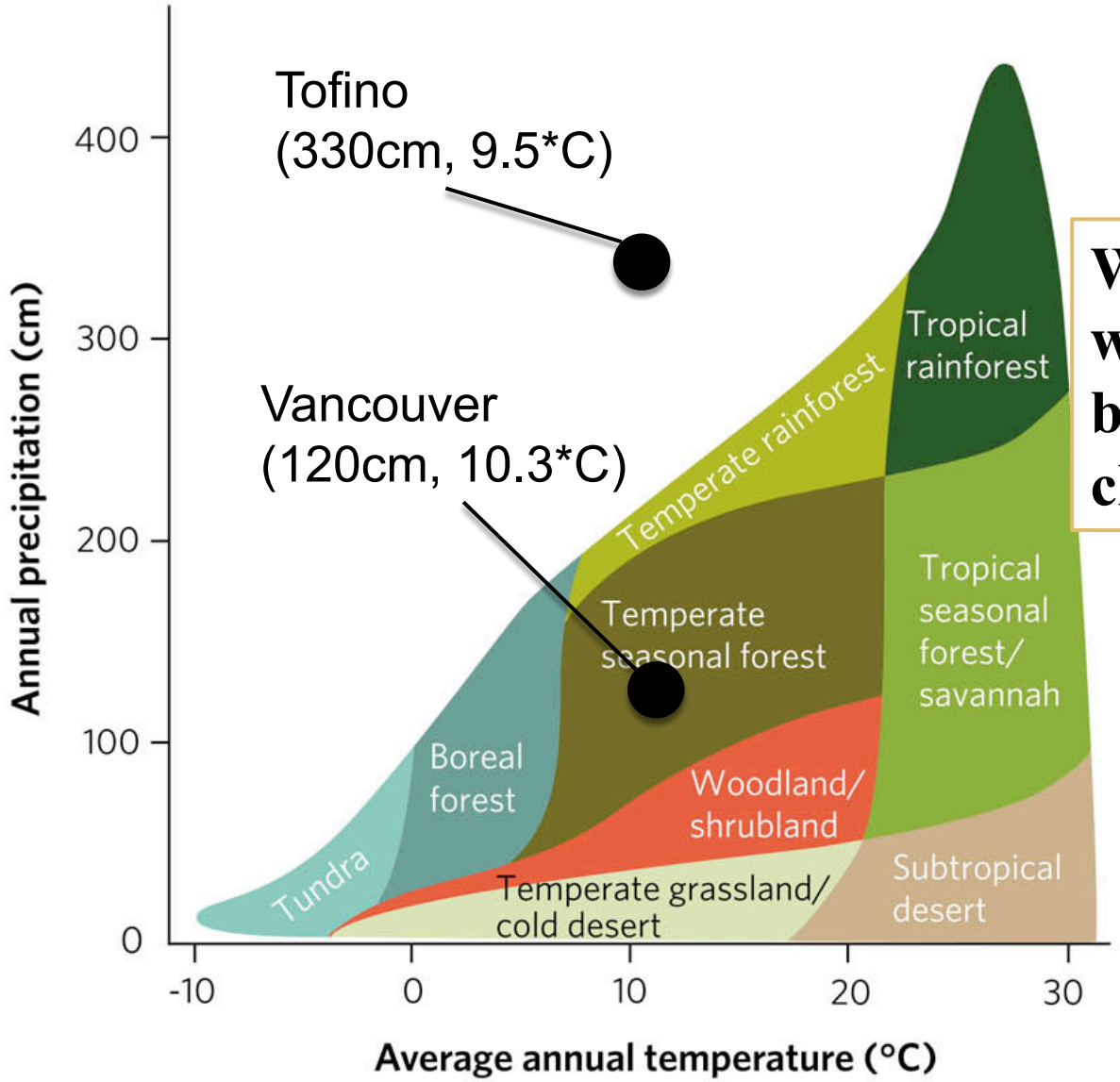


Characterizing broad ecological patterns

BIOMES

classifies geographic regions according to similarity in climate & dominant plant species

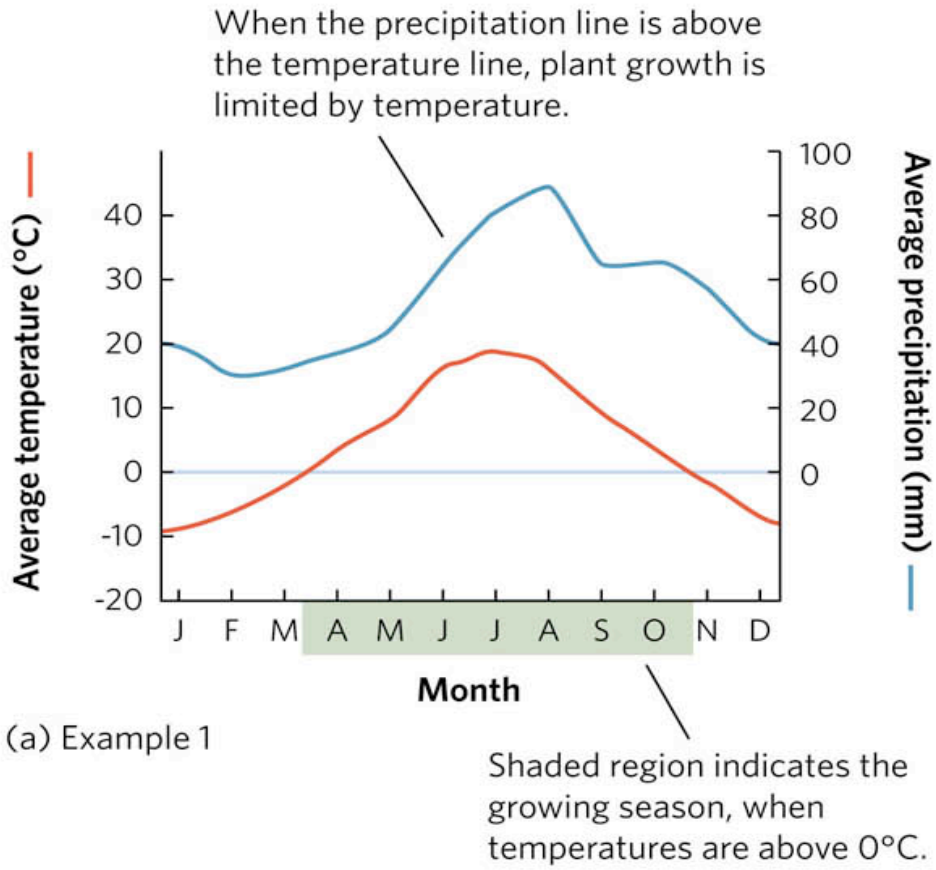
- similar climates tend to have organisms with similar adaptations (parallel/convergent evolution)
- Based 1° on terrestrial plant communities (temperature & precipitation as key factors)
- **Whittaker's** biome classification:
  - Average Temperature vs. Average Precipitation



What will happen to where particular biomes are found as climate changes?

Climate Diagrams

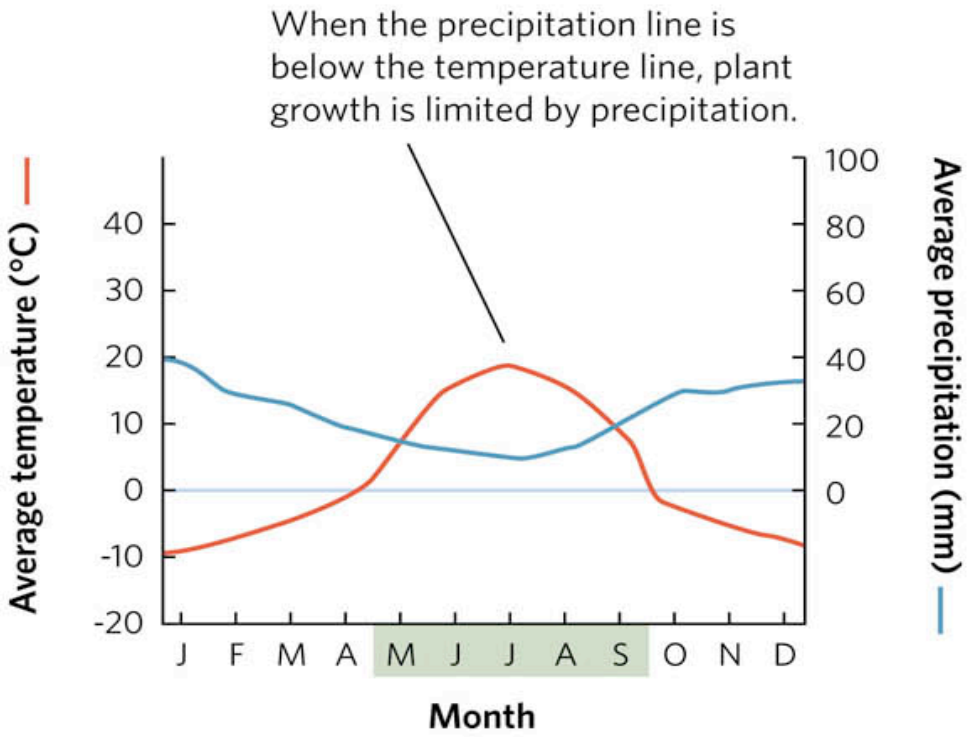
- **Climate diagrams:** plot average monthly temperature and precip
- **Growing season:** months that are warm enough to allow plant growth (i.e., temperatures > 0°C)



(a) Example 1

Climate Diagrams

- **Climate diagrams:** plot average monthly temperature and precip
- **Growing season:** months that are warm enough to allow plant growth (i.e., temperatures > 0°C)



(b) Example 2

Characterizing broad ecological patterns

BIOMES

Limitations?

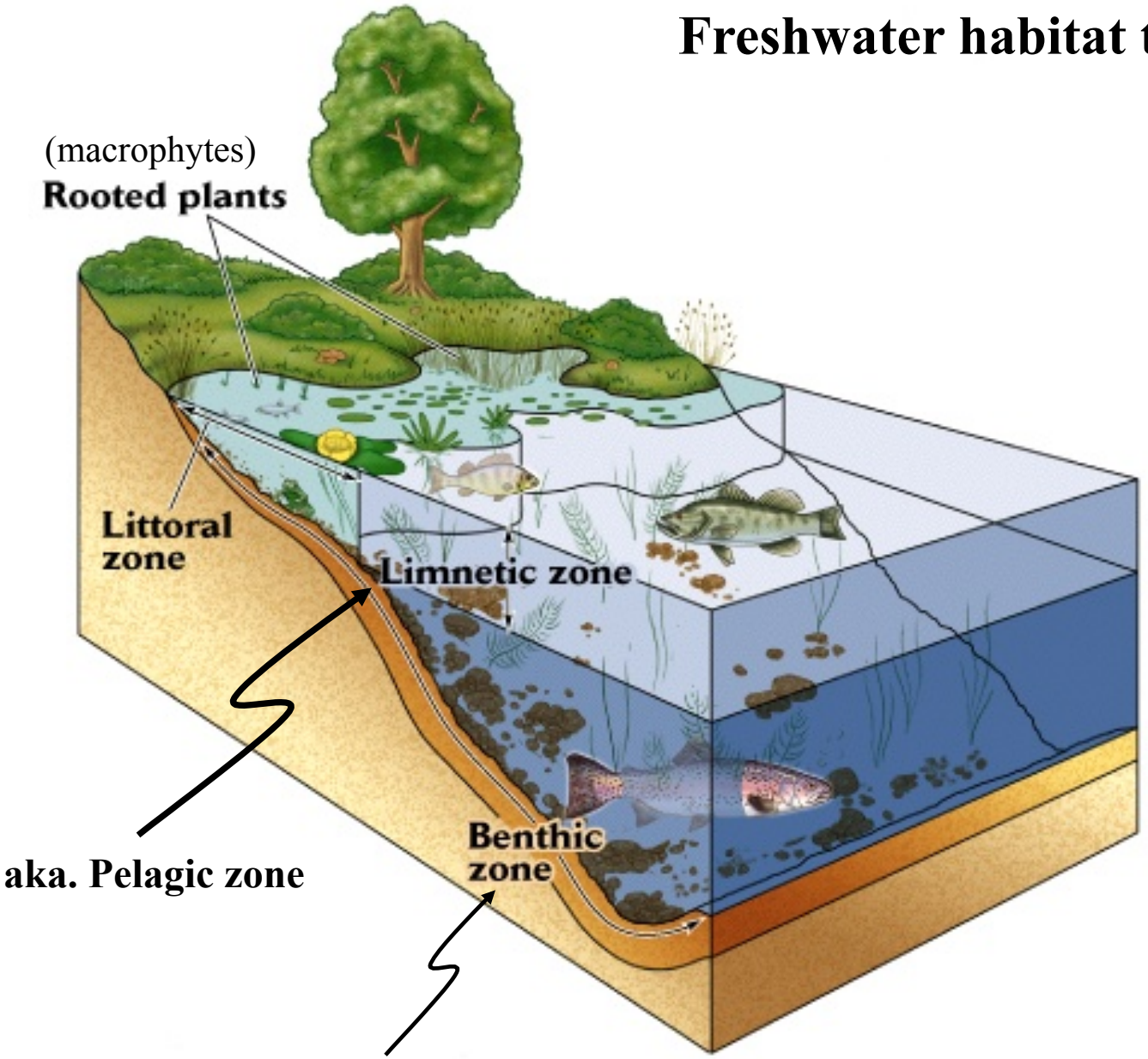
- What else might affect plant communities?

Soils, consumers, disturbance (fires), topography

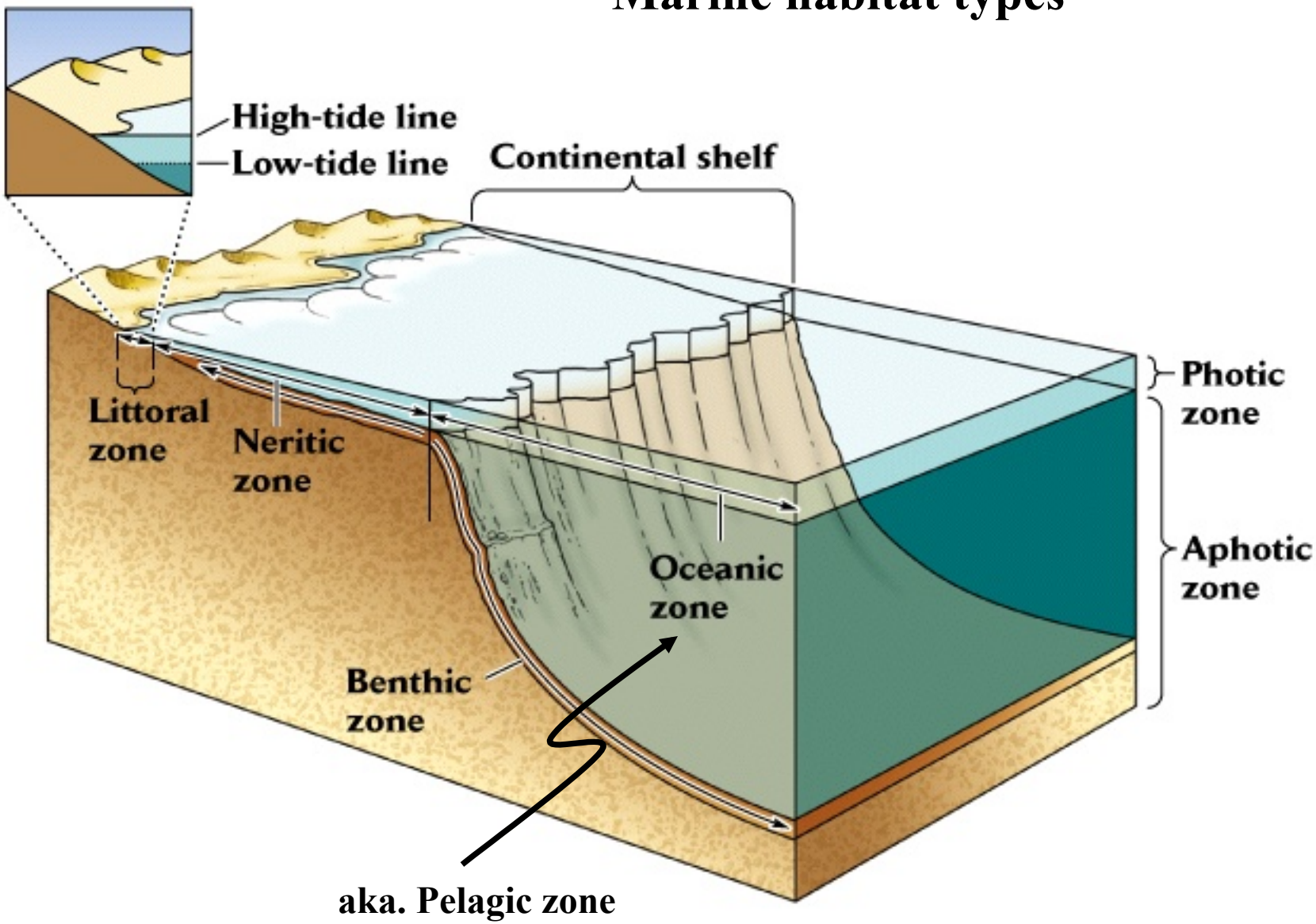
- Doesn't directly relate to Aquatic Ecosystems (algae/phytoplankton = dominant producers)

- Does describe major climate features important for both terrestrial and aquatic organisms alike

Freshwater habitat types



Marine habitat types



Analyzing ecology: mean & median

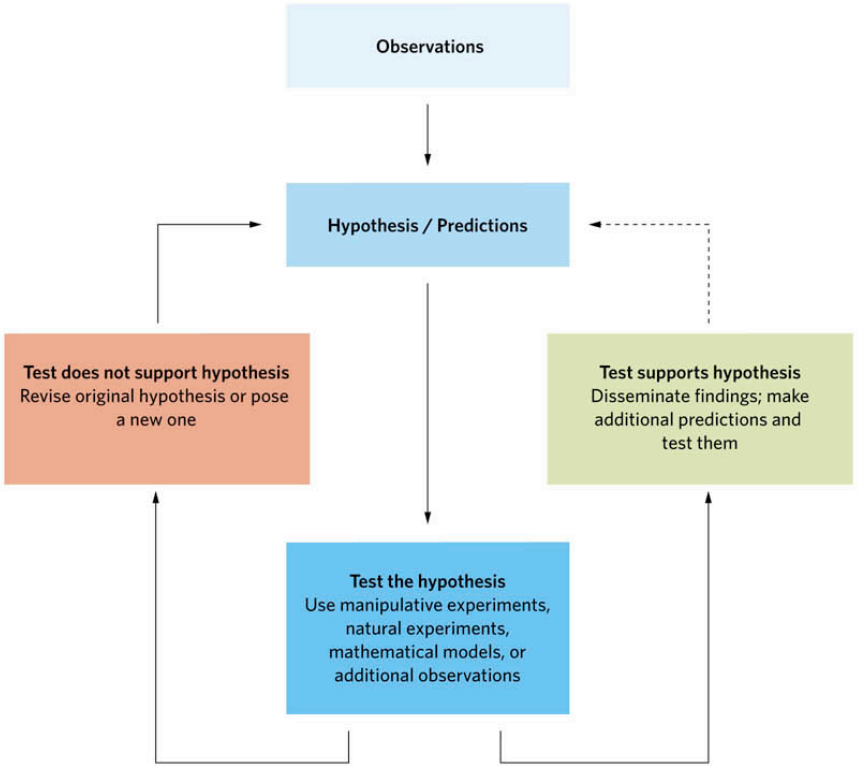
- ***MEAN*** (i.e., average) is the sum of all numbers, divided by the total number of data points
- ***MEDIAN*** (i.e., the middle number) provides a better estimate of the middle value when data are skewed (not bell-shaped)

Example

- Dataset: 95, 93, 90, 85, 81, 79, 75, 63, 42, 21
- **Mean** = (95+93+… 42+21)/10 = **72.4**
- **Median** = (mean (81, 79)) = **80**

Study Design

The scientific method



Chapter 1 Figure 01-16
Ecology: The Economy of Nature, Seventh Edition

- **Hypotheses:** proposed explanation for an observed phenomenon (usually based on previous theory or work)
- ***Proximate hypotheses*** *cause of immediate changes in individual phenotypes or interactions.*
- ***Ultimate hypotheses*** *address the fitness costs and benefits of a response.*
- A particular hypothesis can rarely be confirmed beyond a doubt.

Study Design

- The most important component of an ecological study….
- Is defining the the ***question***, and tailoring your methods to appropriately answer it
- The core principles of any quantitative study are *randomization* and *replication*

Types of Ecological Studies

- Experimental: *strongest inference*
- Comparative: weak inference
- Retrospective: *weak to medium inference*
- Adaptive Management: *weak inference*
- Modeling: *weak inference*

Experimental Studies

- Involve treatment(s) and controls
- Must have multiple replicates of each treatment/ control
  - To estimate the mean response and variation
  - This is NOT the same as "repeatability" or "repetition"...
- Requires randomization of subjects to treatment(s) and controls
- Responses to treatments allow you to understand the *mechanism* causing the change

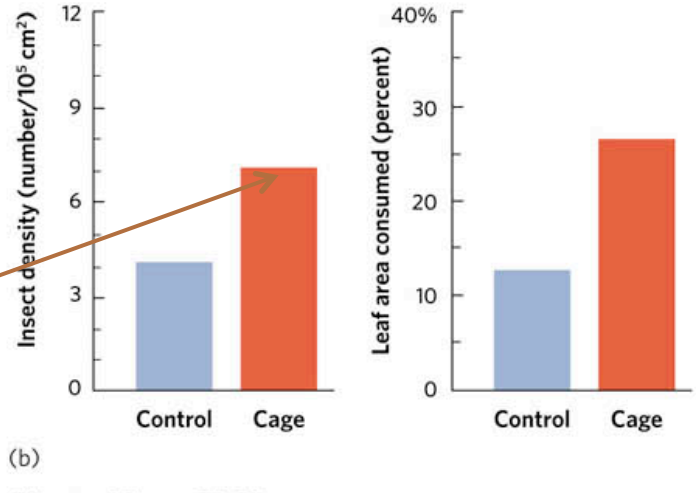
Experimental Studies

Example:

Do birds control the number of insects on oak trees?

Manipulate the presence or absence of birds by placing cages around oak trees.

Some trees were left uncaged as controls.



Missing error bars!

Experimental Studies

Factorial designs are common:

Factor 1: Temperature

Factor 2: Light

	T (high)	t (low)
L (high)		
l (low)		

How many treatments in this experiment?

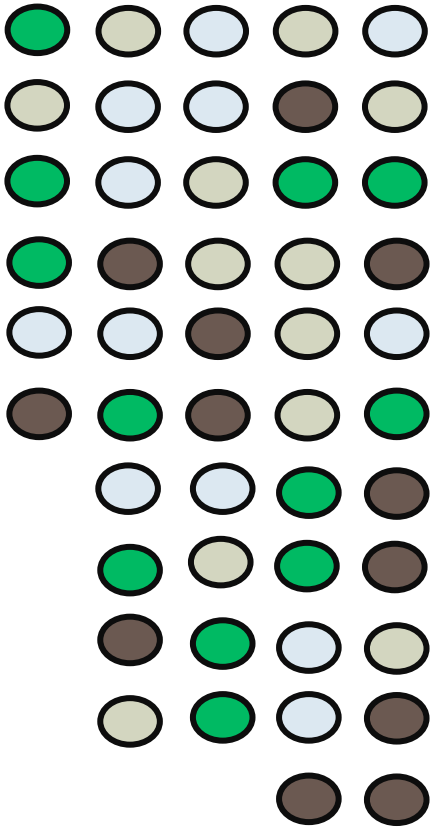
Controls?

What would you measure (AKA *response variable*)?

Each treatment must be **replicated** enough times to accurately estimate the mean response (and it's variability)

Experimental Studies

Factorial designs are common:



Experiment crossed:

Embryonic exposure (+UV, -UV)

Larval exposure (+UV, -UV)

Larval density (high, low)

2 x 2 x 2 Factorial design =

How many treatments?