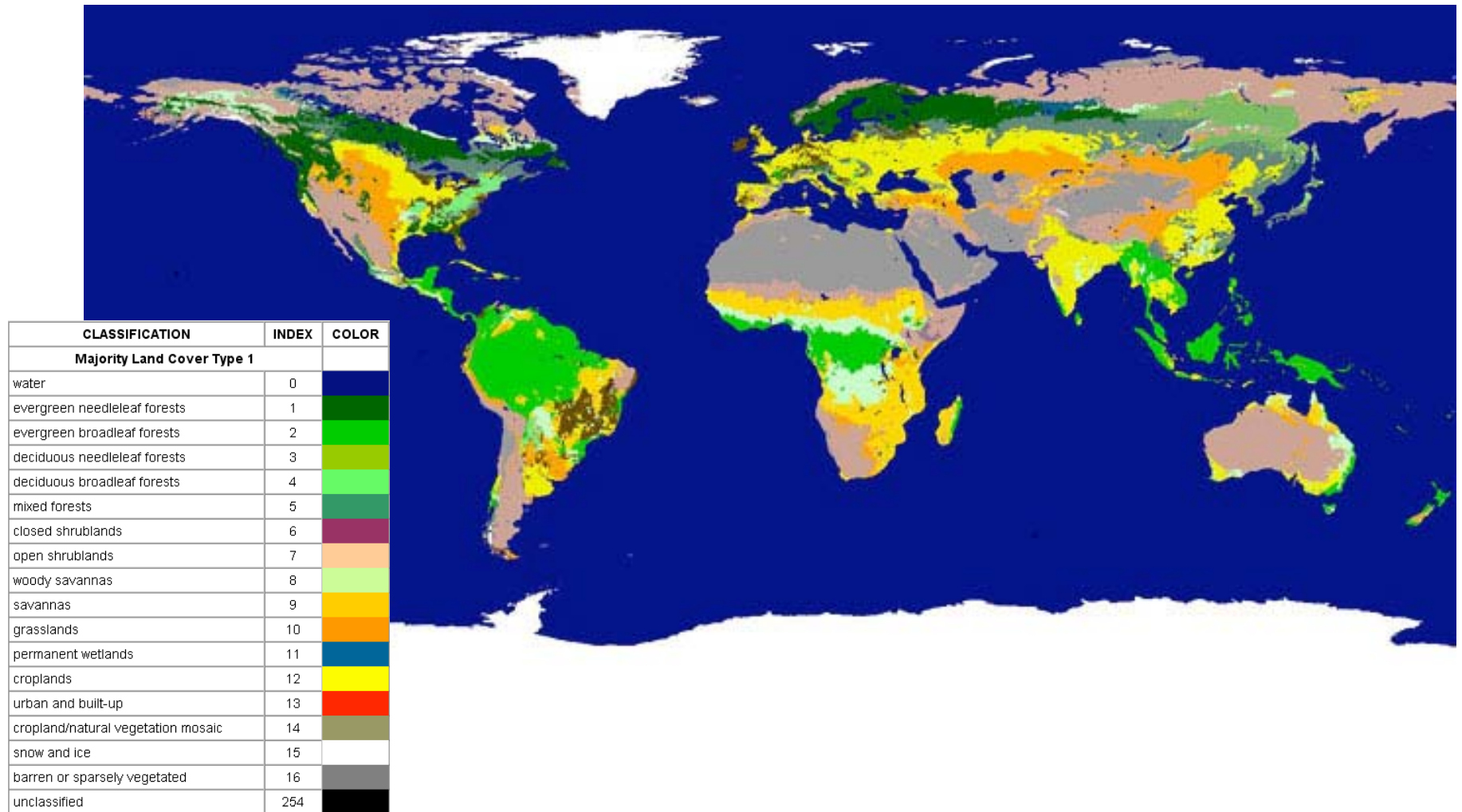


What is biogeography?

Patterns

MODIS Land Cover Type



What is biogeography?

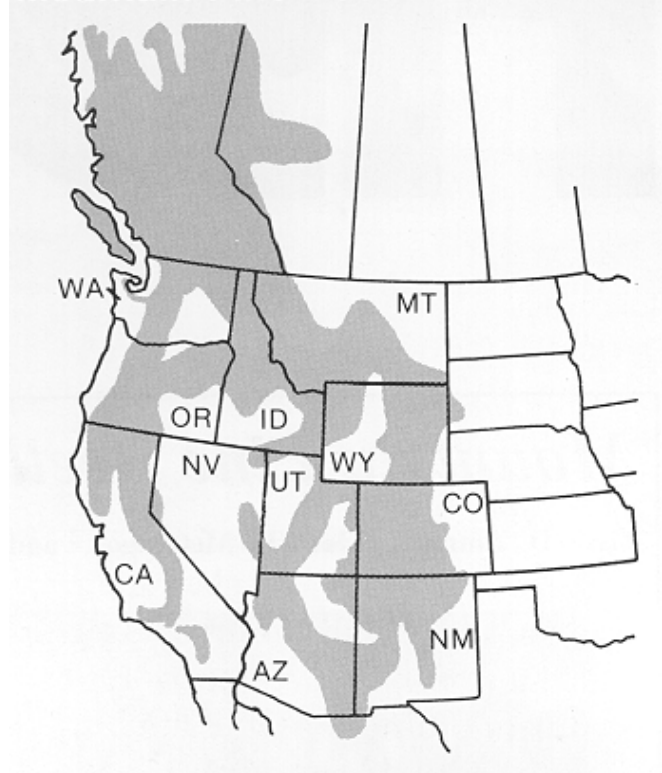
Patterns

Lodgepole pine



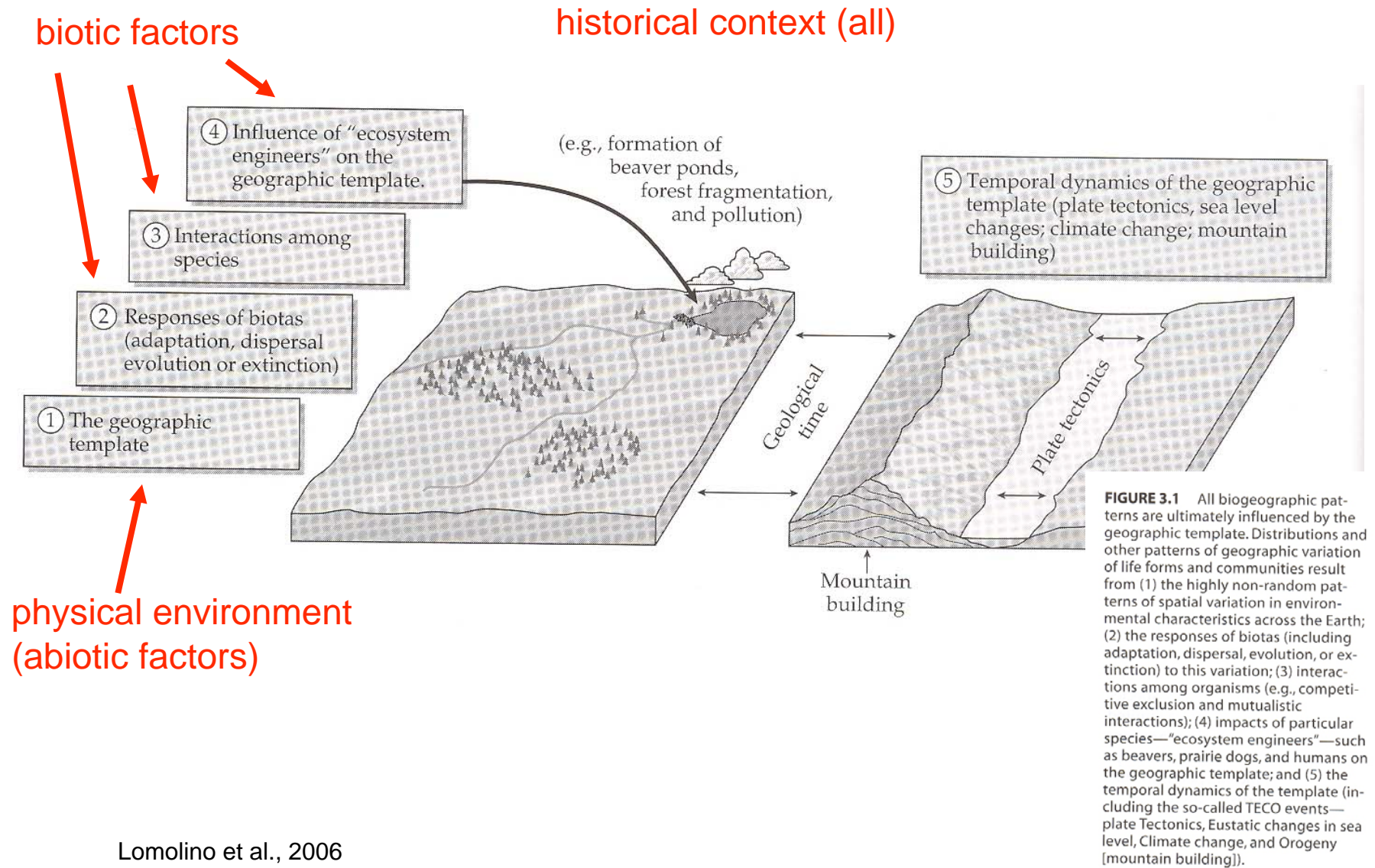
Little (1971); USGS

Mountain Pine Beetle



Amman (1990)

What is biogeography?



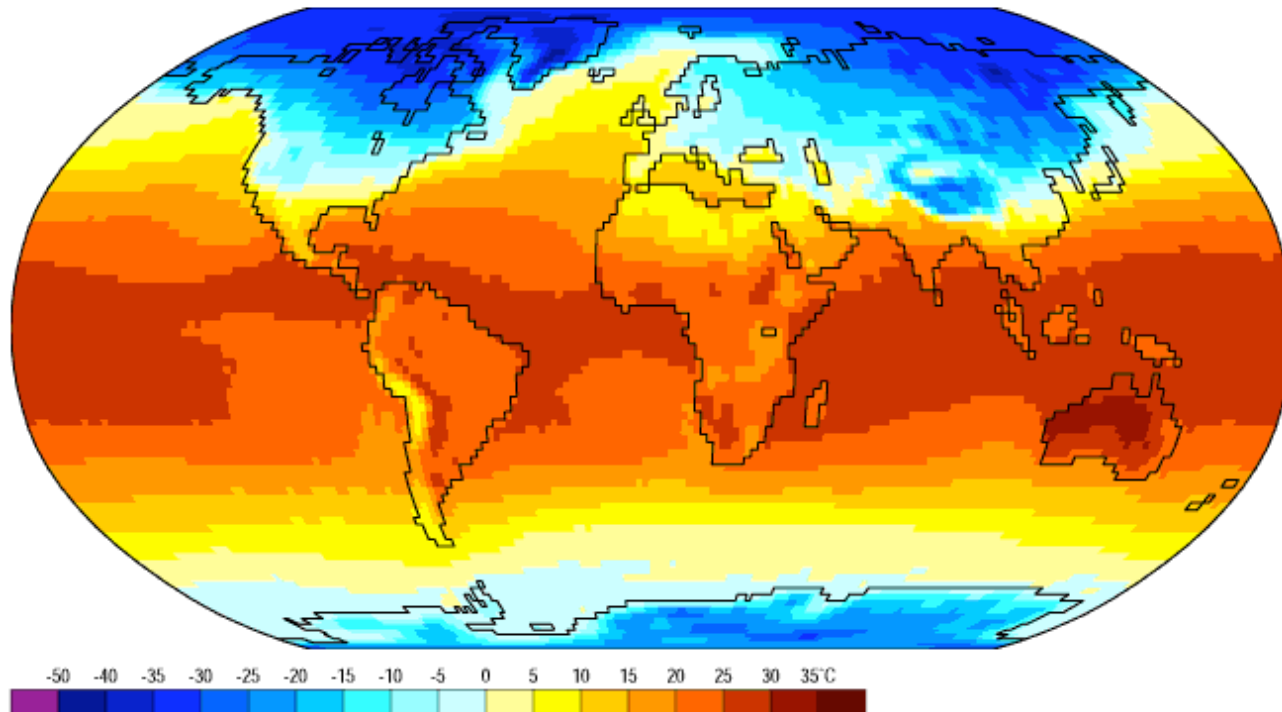
Lomolino et al., 2006

What is biogeography?

Process: Abiotic factors

Air Temperature

Jan

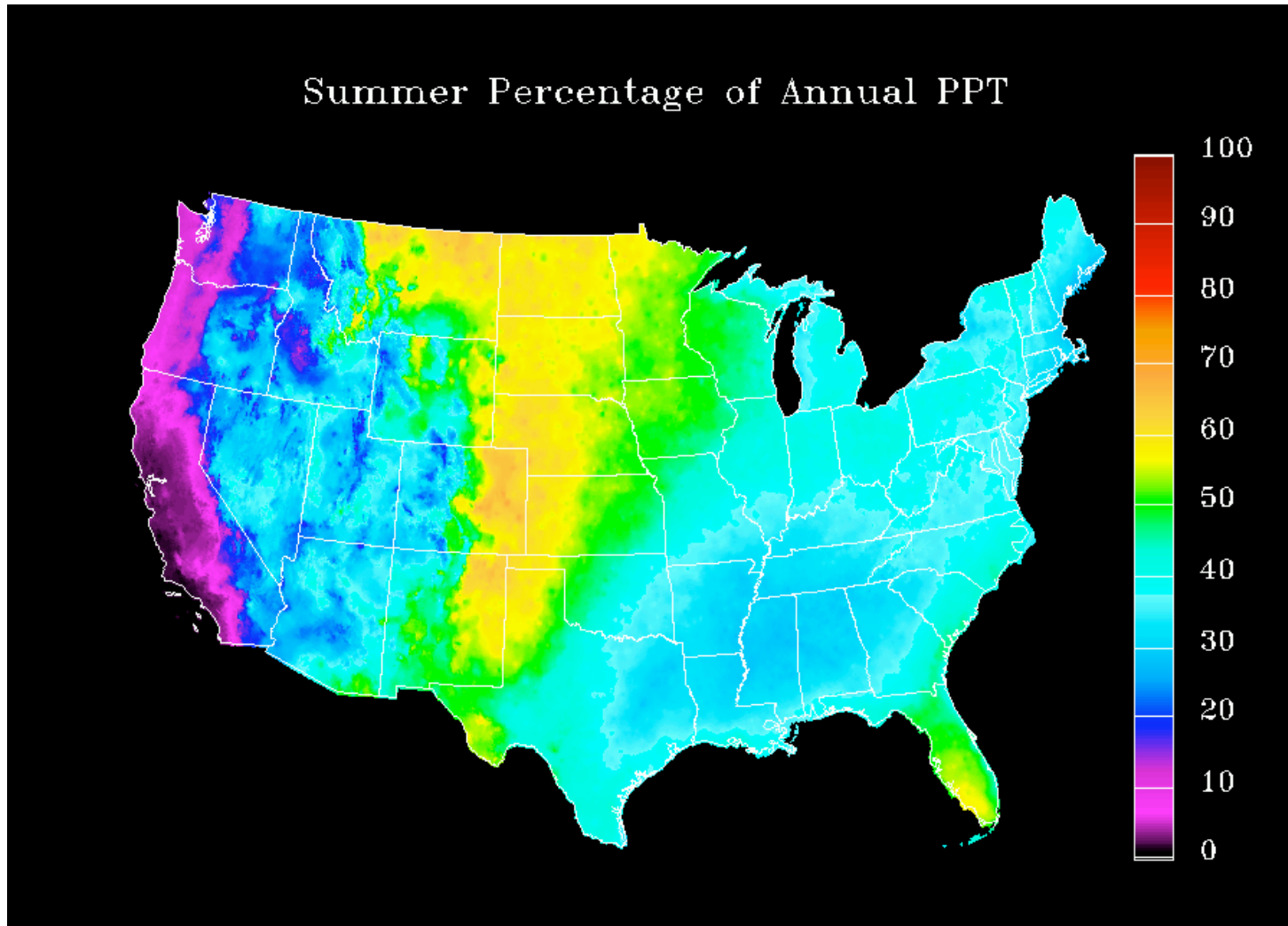


Data: NCEP/NCAR Reanalysis Project, 1959-1997 Climatologies

www.physicalgeography.net

What is biogeography?

Timing of precipitation: Summer = May-Sep



What is biogeography?

Process: Abiotic factors

Soil fertility



www.naturalbornhikers.com



What is biogeography?

Process: Abiotic factors

Disturbance type, severity, frequency



Sept 2005, Railroad Ridge, ID



Jan 2001, Tapajos, Brazil

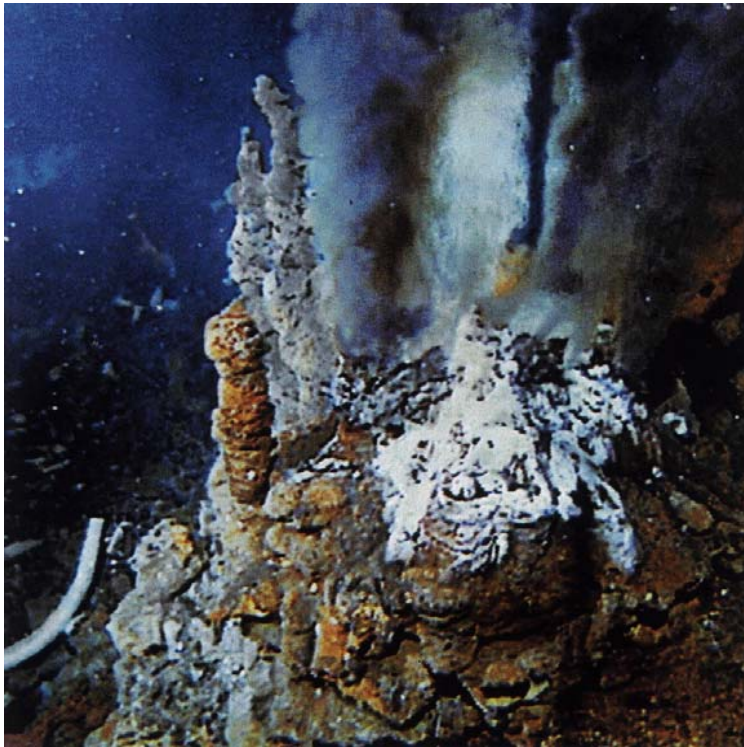


*Photo by K. Wattenmaker,
firepix.blm.gov*

What is biogeography?

Process: Abiotic factors

Physical environment



ocean-ridge.ldeo.columbia.edu/courses/subgeol/hot_springs



www.alpine-club.mb.ca

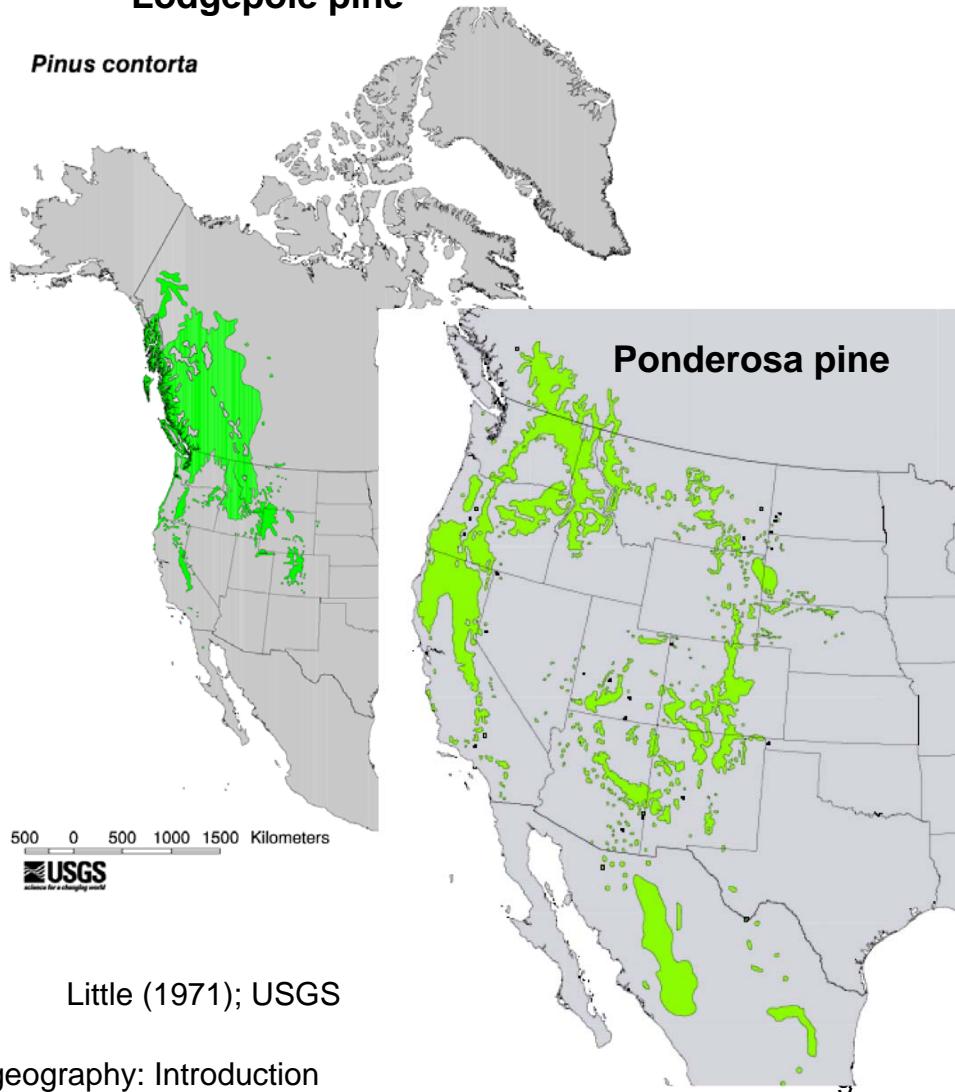
What is biogeography?

Process: Biotic factors

Food availability

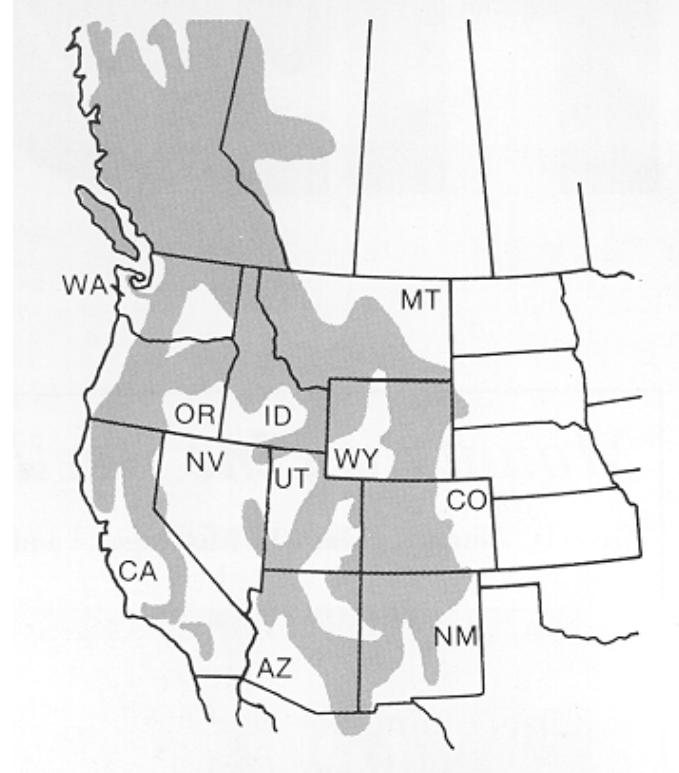
Lodgepole pine

Pinus contorta



Little (1971); USGS

Mountain Pine Beetle

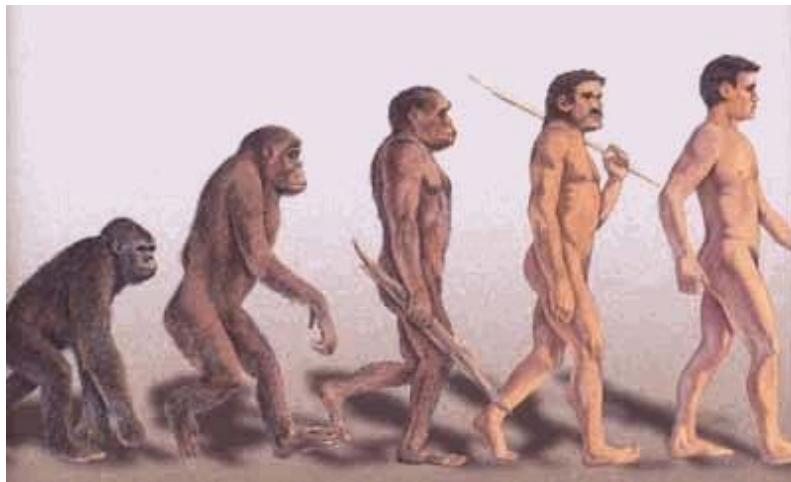


Amman (1990)

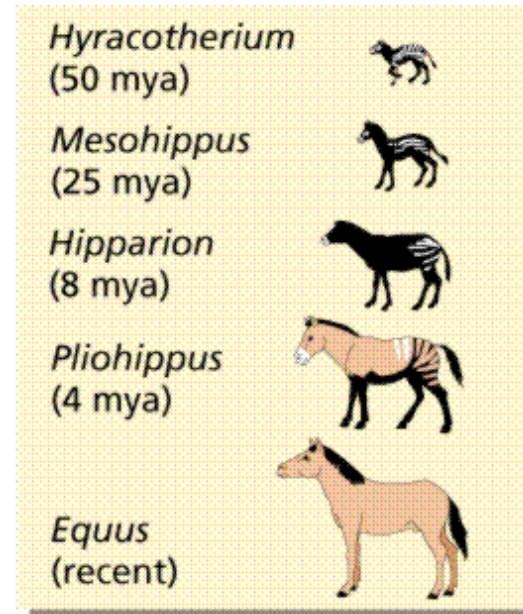
What is biogeography?

Process: Biotic factors

Evolution



www.futura-sciences.com



www.emc.maricopa.edu/faculty/farabee/biobk/BioBookEVOLII.html

What is biogeography?

Process: Biotic factors

Competition



hyenas.zoology.msu.edu/beamweb/images



www.izw-berlin.de/en/research/fg1/index.html?themen/thema_hyaene/projekt.html~rechts

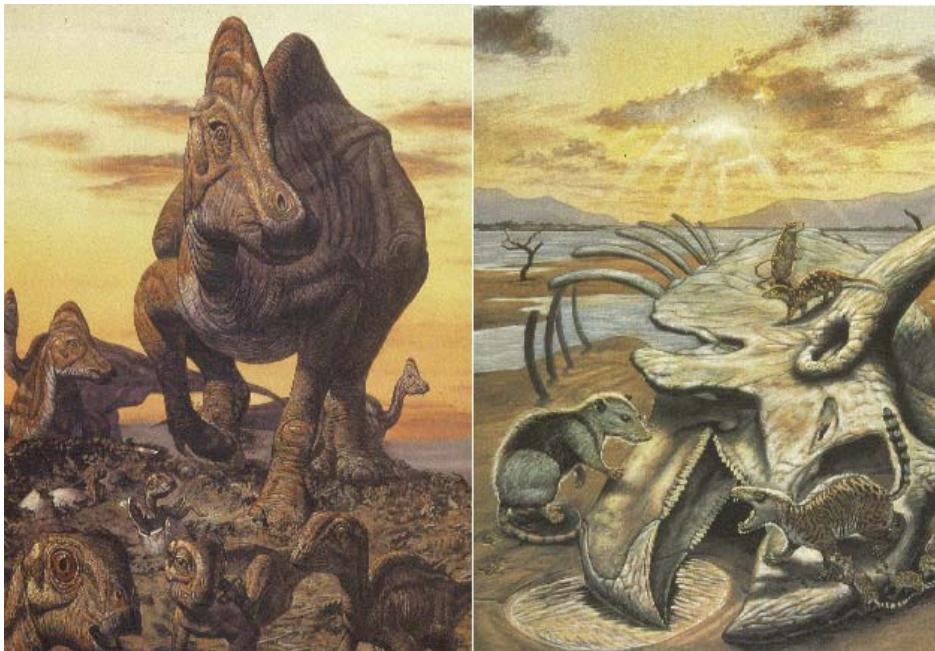


hyenas.zoology.msu.edu/images/crocuta

What is biogeography?

Process: Biotic factors

Extinction



we.vub.ac.be/~dglg/Web/Claeys/Chicxulub/



Edouard Poppig

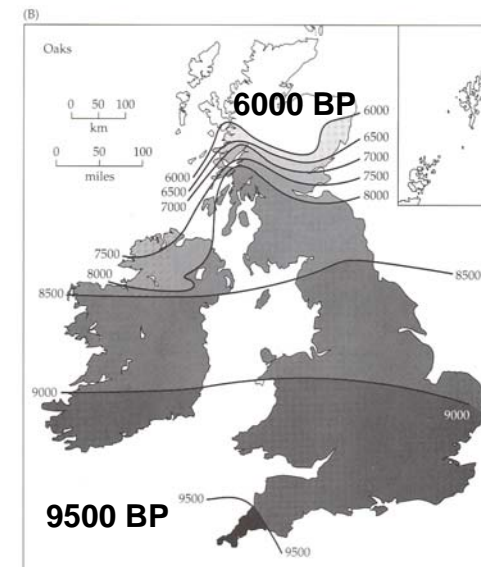
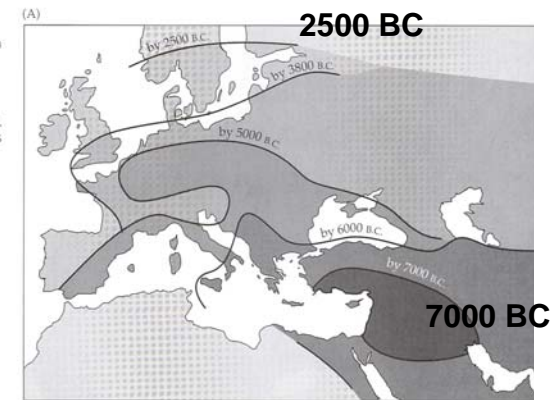
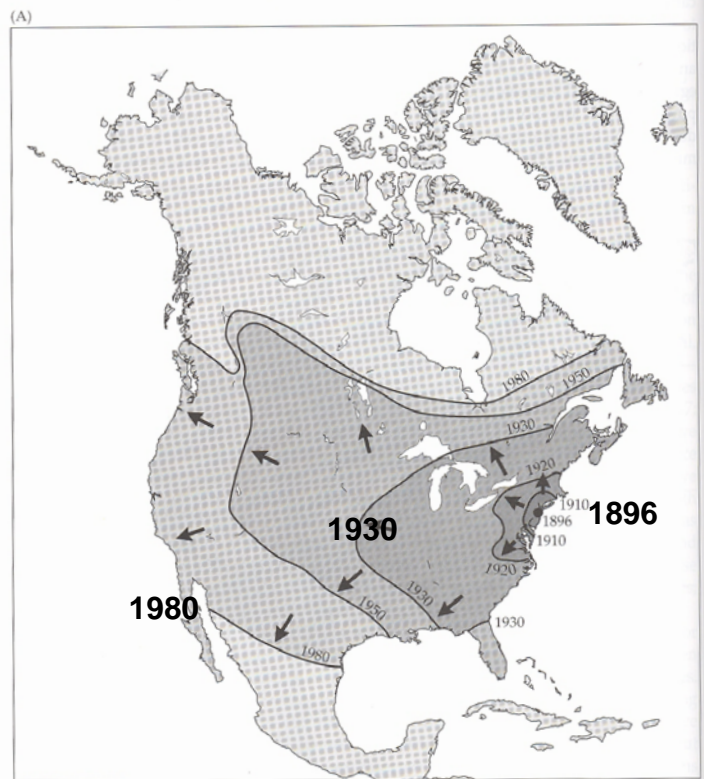
What is biogeography?

Process: History
Dispersal

Rapid: Introduction of European starling

Slow: Expansion of crops, oaks

FIGURE 6.4 Range expansion in selected plants. Maps show the spread of (A) "Fertile Crescent" crops across western Eurasia; (B) oaks (*Quercus* spp.) in Great Britain (numbers indicate years B.P.); (C) elm (*Ulmus* spp.) in Great Britain (numbers indicate years B.P.); (D) purple loosestrife (*Lythrum salicaria*) in North America. (A after Diamond 1997; B and C after Birks 1989; and D after Thompson et al. 1987.)



Lomolino et al., 2006

What is biogeography?

Process: History

Invasion

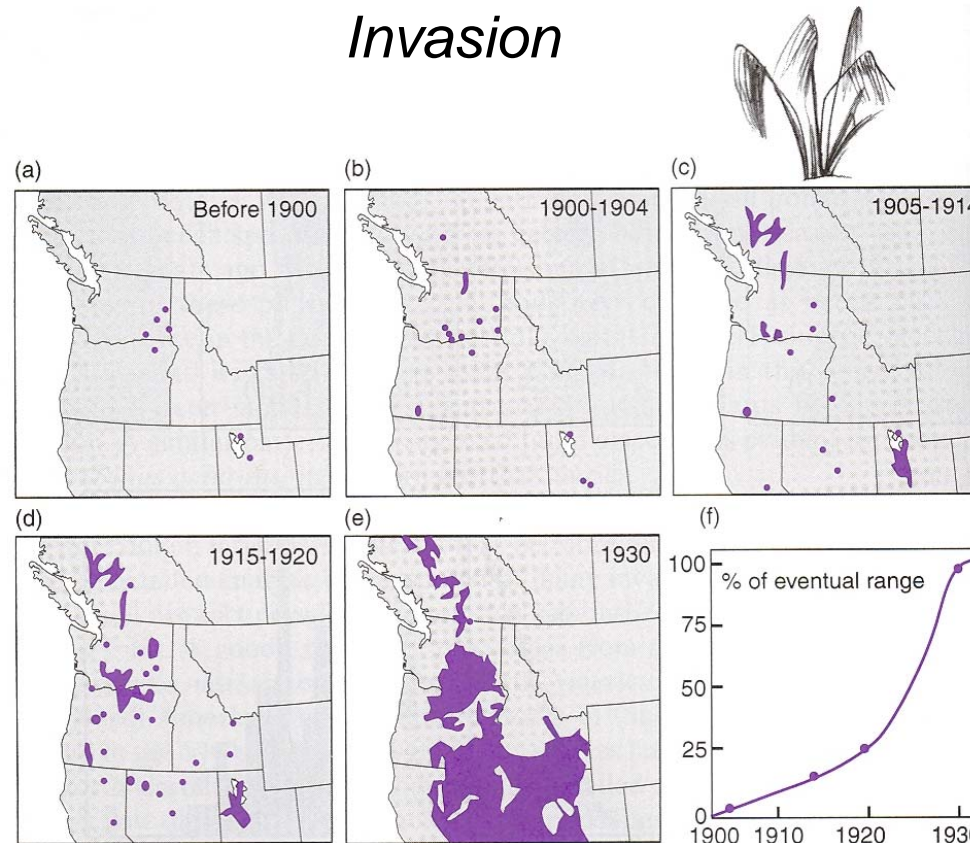


FIGURE 8.9 The logistic expansion of invading species spreading by either diffusion or jump dispersal as displayed by cheat grass (*Bromus tectorum*) expansion in western North America (after Mack, 1981; Shigesada and Kawasaki, 1997).

Cheatgrass

What is biogeography?

Process: History

Colonization

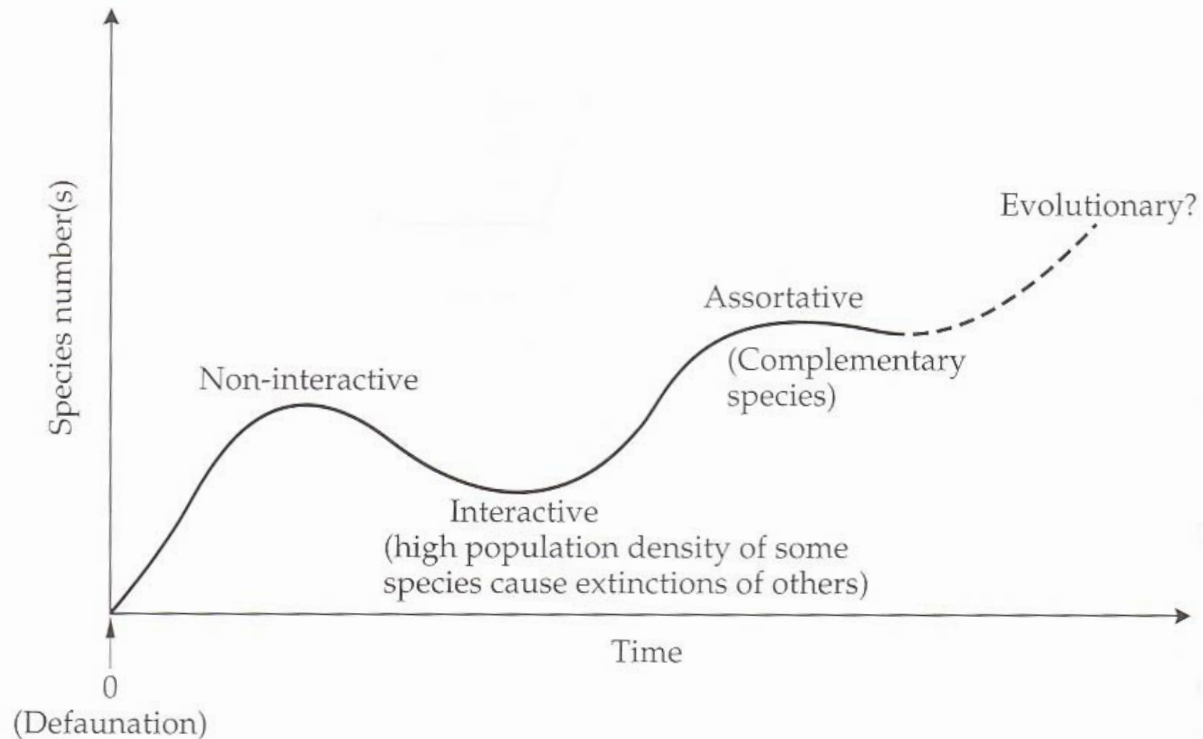


FIGURE 13.19 As an empty island accumulates species, its insular communities may pass through a series of equilibria reflecting demographic, ecological, and evolutionary processes. (After Simberloff and Wilson 1969, 1970.)

Lomolino et al., 2006

What is biogeography?

Changes to abiotic factors

Plate tectonics

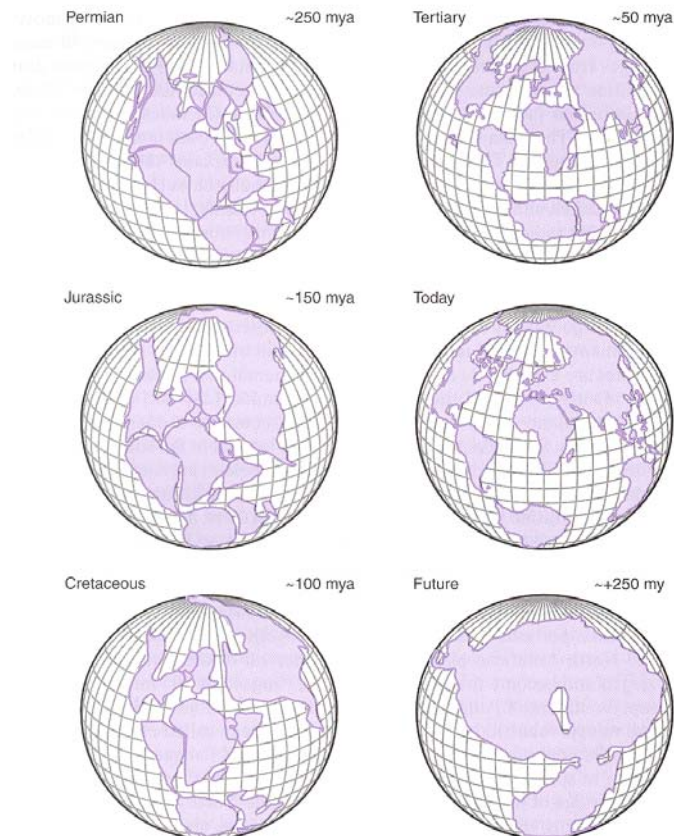
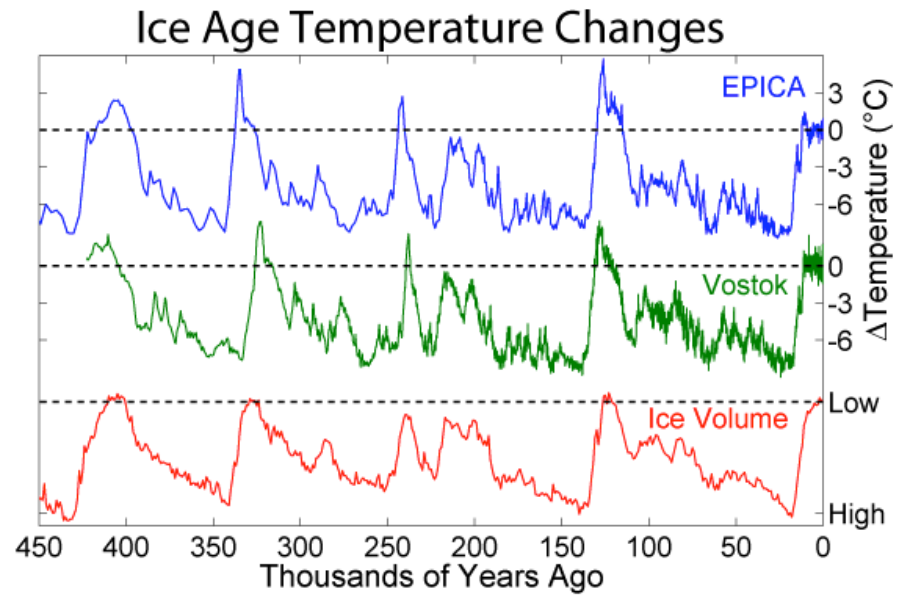


FIGURE 7.6 The movement of the major plates over the past 250 million years and 250 million years into the future (after Scotese and Baker, 1975; Scotese, 1988; PALEOMAP Web site <http://www.scotese.com/earth.htm>; Briggs, 1995).

Climate



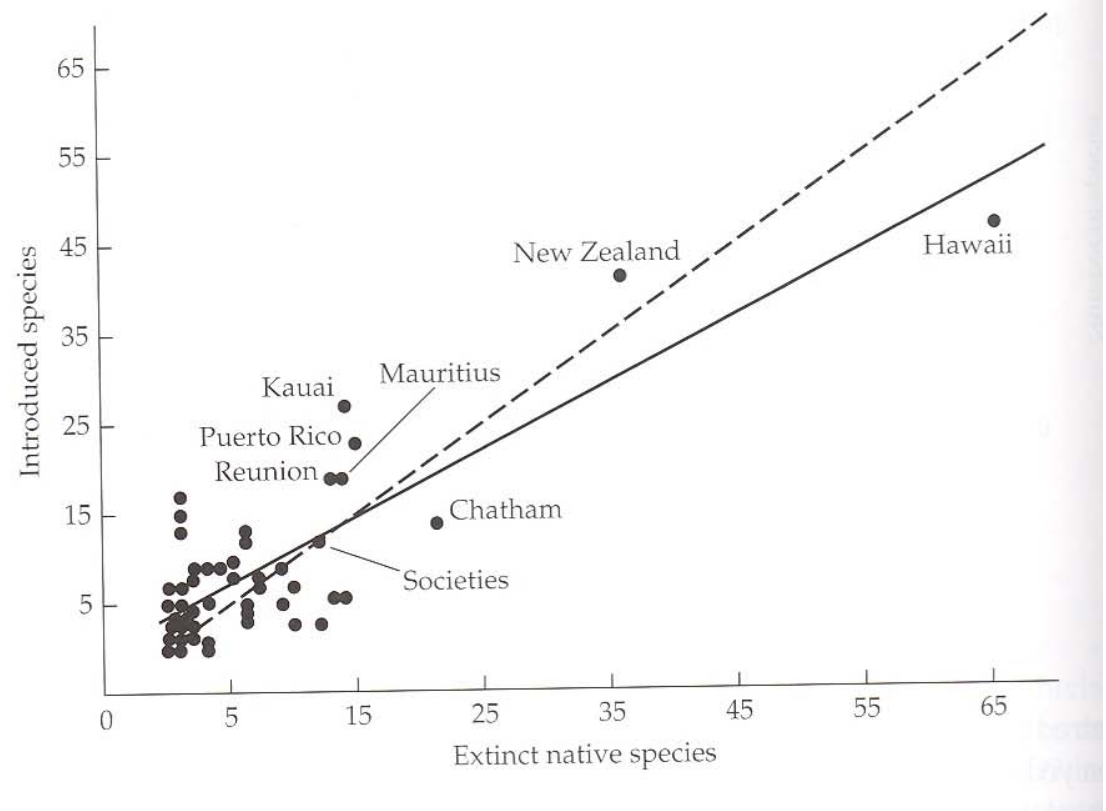
Slide from R. A. Rohde, www.globalwarmingart.com

What is biogeography?

Changes to biotic factors

Invasive exotic species

FIGURE 16.18 The relationship between the number of introduced bird species and the number of extinct native bird species for several insular and continental regions. Invasion success appears to increase with the number of native species already extinct. Dashed line is line of equality; solid line is regression line. (After Case 1996.)



Lomolino et al., 2006

What is biogeography?

Scales: Spatial

Plot



www.uku.fi/~niemi/abisko.html

Islands



www.okstate.edu/artsci/botany/bisc3034

Regional



Little (1971); USGS

Global



Brooks et al., *Science*, 2006

What is biogeography?

Scales: Temporal

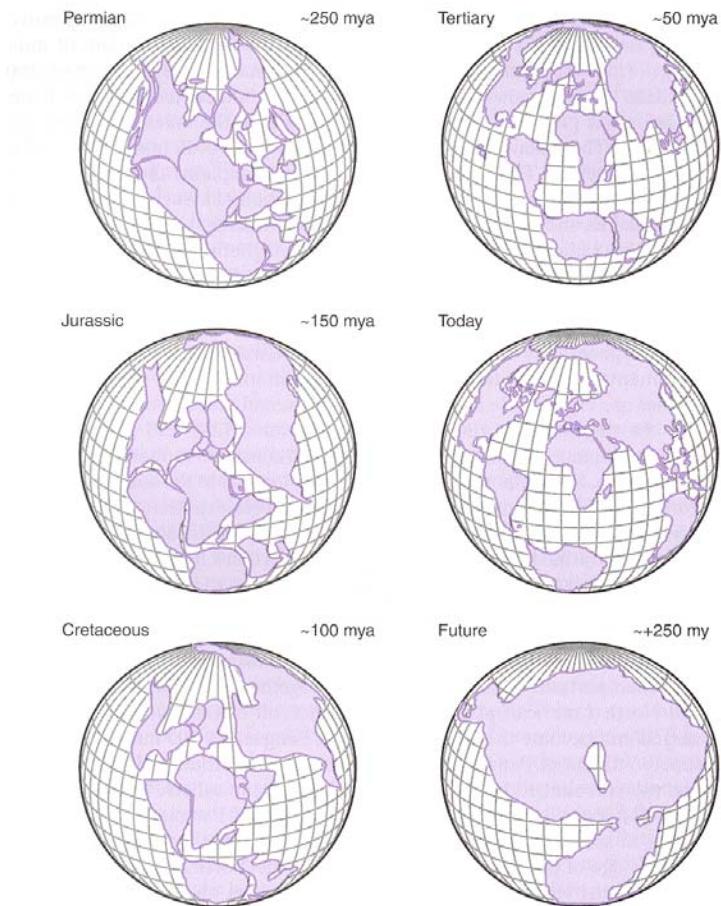


FIGURE 7.6 The movement of the major plates over the past 250 million years and 250 million years into the future (after Scotese and Baker, 1975; Scotese, 1988; PALEOMAP Web site <http://www.scotese.com/earth.htm>; Briggs, 1995).

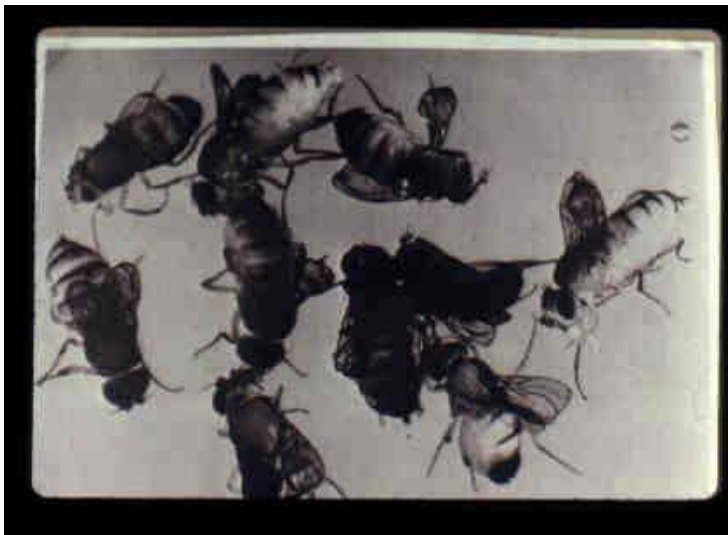
Geologic

What is biogeography?

Scales: Temporal

Evolutionary: depends on organism!

Fruit fly: 10 day life-cycle



home.primus.com.au/bonno/evolution4.htm

Bristlecone pine: 1000s of years



www.photo.net/ca/sierra

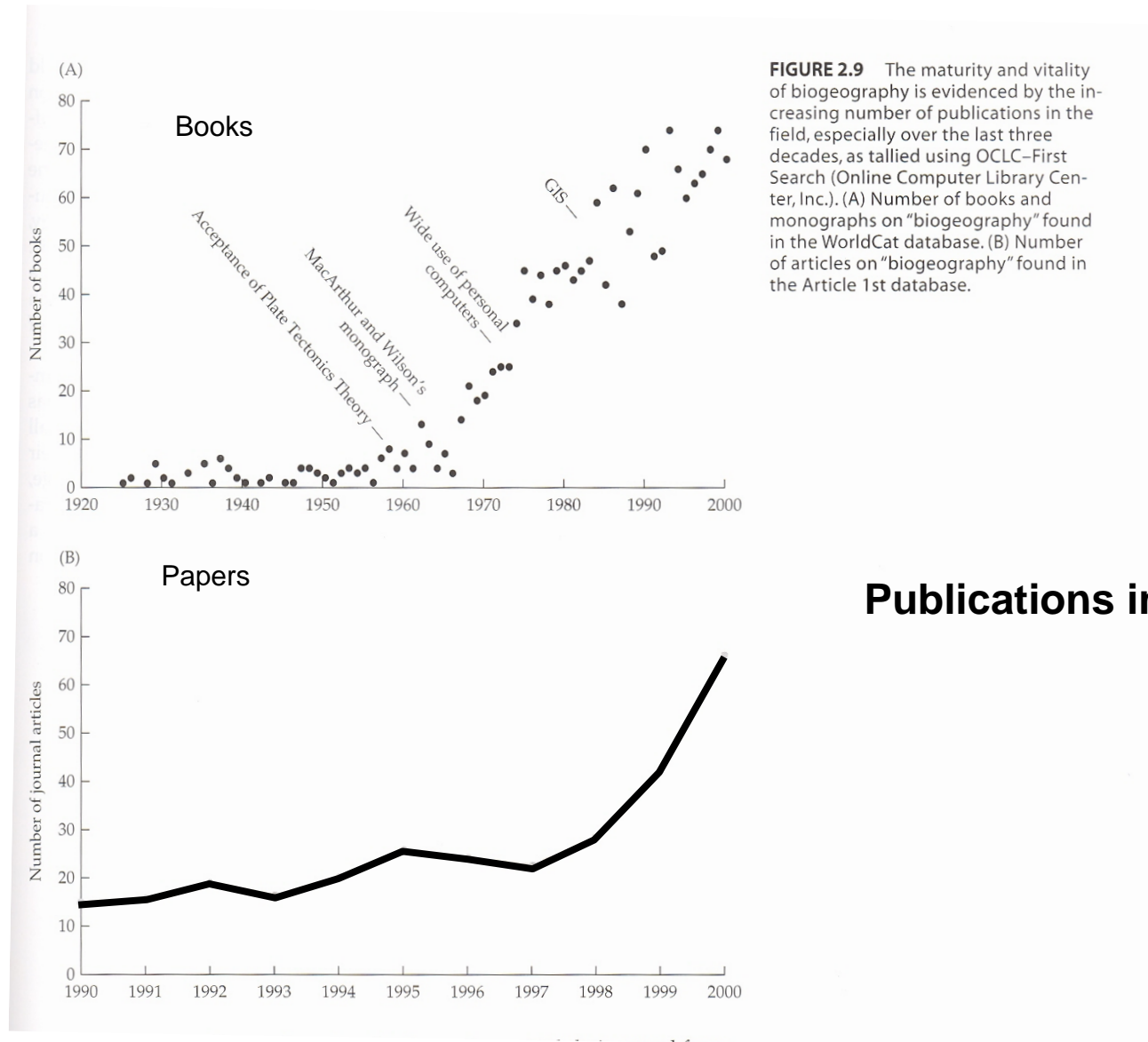
What is biogeography?

Scales: Temporal

Time scale of stresses/disturbances

- climate change and variability (e.g., droughts)
- fires/insect outbreaks
- invasive species
- human pressure (e.g., hunting)

What is biogeography?



Lomolino et al., 2006

What is biogeography?

Summary

Biogeography...

- encompasses a large number of fields
- includes a broad range of spatial and temporal scales
- addresses some combination of organism (“bio”) and space (“geography”)
- includes both basic and applied research