

## Syllabus, Geology 144

1. The major questions of historical ecology: what can we learn about modern ecosystems from the past, and vice versa? How do ancient ecosystems inform conservation strategies?
2. Brief summary of modern processes and principles of ecology: competition, predation, trophic levels, production, consumption, mutualism, feedbacks.
3. The nature of the fossil record: stratigraphic and preservational biases, sampling artifacts, time-averaging, completeness of the record
4. A deep-time perspective
  - a. Herbivory on land and in the sea, as seen from herbivores' and plants' viewpoints
  - b. Bioturbation
  - c. Bioerosion
  - d. Predation
  - e. Production
  - f. The plankton and the benthos
  - g. Land and sea
  - h. Nutrient cycles, including effects of biomineralization and effects of life on geological processes
  - i. Oxygen and carbon dioxide: history and consequences of change
5. The history and effects of climatic change: temperature, diversity, productivity, the control of climate by life.
6. The history, causes, and consequences of extinction
  - a. Measuring extinction
  - b. Patterns of extinction
  - c. Selectivity of extinction
  - d. Bottom-up and top-down causes
  - e. Consequences of extinction
  - f. Recovery
7. Causes and consequences of invasion: incumbency and the ecology of habitat size
  - a. Islands, continents, and competition
  - b. Examples of biotic interchange
  - c. How barriers come and go
8. Current problems in the light of history
  - a. Ocean acidification
  - b. Climatic warming
  - c. Habitat fragmentation

d. Globalization of ecosystems

9. Major ecological trends

- a. Increased diversity, especially on land
- b. Increased three-dimensional complexity
- c. Increased interdependence among, and regulation of, communities
- d. Decreasing vulnerability to rare events

10. The emergence and place of the human species as apex organism