

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