Ecosystems

Biological & Conceptual

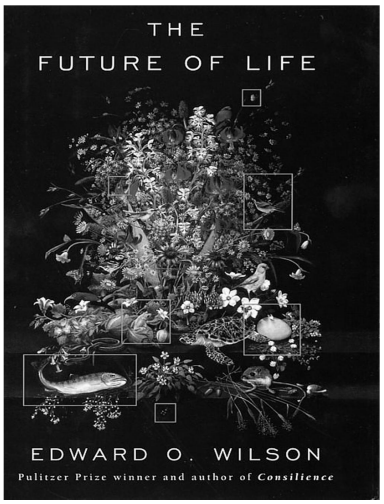
Today: Ecosystems & Ecological Thinking

- Ecosystems (Biological, scientific term)
  - Defined:
    - Unit of interdependent organisms sharing the same habitat.
    - A system formed by the interaction of a community of organisms with their physical environment
  - E.g., Hawaii as described by E.O. Wilson
- Ecosystems (Conceptual, philosophical term):
  - Ecological Thinking
  - Systems Thinking/Theory – Reality as …
    - 1. Dynamic (process focus)
    - 2. Networked (relational webs constitute reality)
    - 3. Recursive (systems within systems)

Are we seeing...

the end of nature?
the end of life?

- E.O. Wilson, *The Future of Life:*
  - Ch 3: Nature's Last Stand



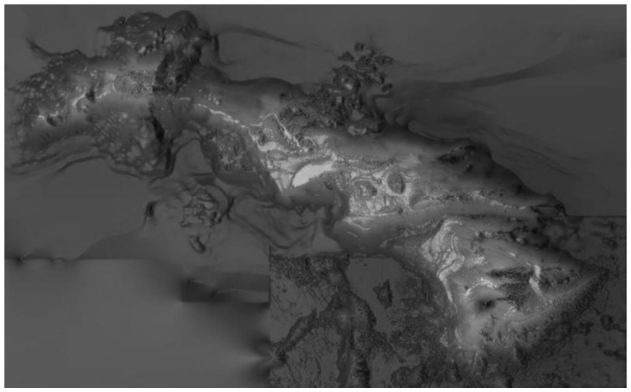
Wilson

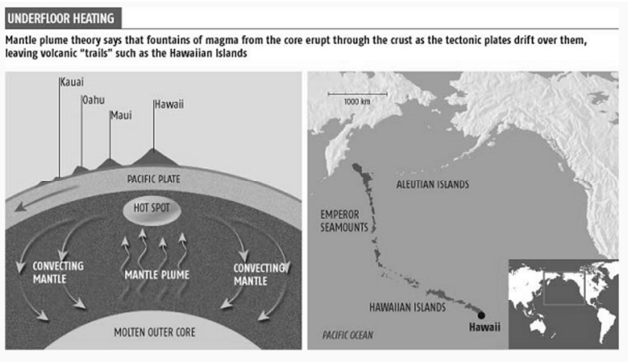
- Goals:
  - 1. Understand threats to ecosystems
    - Species Extinction Crisis
    - Relation to Global Warming
  - 2. Moral implications of species extinction
- Key Points
  1. Case Study in Degradation: Hawaii
  2. Forces of Extinction: HIPPO
  3. Damage of Deforestation
  4. Impact of Global Warming
  5. Invasive Species, Pros & Cons
  6. Future Life

1. Case Study in Degradation: Hawaii

- Myth: An ecosystem is a random collection of species.
  - How is this inaccurate?
- Points to consider:
  - Geological History
  - Natural History
  - Human History, Impact
  - Role of invasive species

Geological Origins of Hawaii

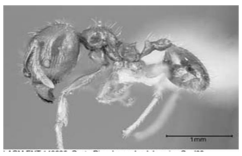




What's the significance of this?

Invasive Species in Hawaii

- The angry ant-
  - Pheidole megacephala



- The pesky pig

2. Extinction Forces: HIPPO

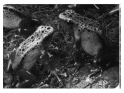
- Myth: Pollution is the chief cause of species extinction.

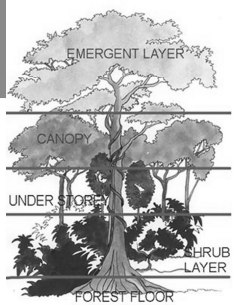
- Synergistic Insults
  - Habitat destruction
  - Invasive species
  - Pollution
  - Population
  - Overharvesting
- Eg: Vancouver Island Marmot (*)
  - Subalpine meadows
- Eg: Golden Toad
  - Amphibian Ext. Crisis

3. Damage of Deforestation

- Myth: Saving 10% **of Amazon** rainforest is enough **– we can** replace as needed.

- Rainforest points:
  - Extensive biodiversity
  - Fragile
  - Disappearing (FL)
  - 10sq km
  - Cutting into
  - Rainfall





Damning Statistics: Hawaii & Forests

- Pre-human immigration rate to Hawaii?
- 8,790 insect & anthropod species. What percent Alien?
- Percent of original forest lost?
- 1950s: 50 million sq. km; 2000:
- Tropical Rainforests: 6% of land & __ % of known species?
- Amount of rainforest lost every year:
- Europe's plants and animals equals __ sq km of rainforest?

Answers

- **1/1000yr**
- **35%**
- **50%**
- **34mil & ê**
- **50%**
- **½ Florida**
- **10**

4. Global Warming

- Degrees of yearly temperature fluctuation for 10,000 years post ice-age?
- Increase from 1500 – 1900?
- Increase from 1900-2000?
- Concentration levels of ____ highest in 400,000-year span.
- [1995] Predicted increase by 2100?
- [2001] Predicted increase by 2100?

Answers

- **2°F**
- **0.9°F**
- **0.9°F**
- **CO_2**
- **1.8°F to 6.3°F**
- **2.5 to 10.4**

5. Invasive Species, Pros & Cons

- Myth: Adding new species can improve an ecosystem.
- What typically happens?
  - Songbird romanticism?
  - Rosy Wolfsnail, Turgie's demise
  - 1.5 Million Years B.C. to January 1996

6. Future Life

- What two views does Wilson offer?

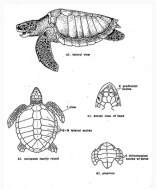
- Loose Ends:
  - What locales in particular danger?

Extinction Crisis, Moral Crisis?

- Wilson: ½ species extinct by 2100
- Wilson's critique of sacred texts.
- Matthew 6:25-28:
  - *Therefore I tell you, do not worry about your life, what you will eat or drink; or about your body, what you will wear… Look at the birds of the air; they do not sow or reap or store away in barns, and yet your heavenly Father feeds them. Are you not much more valuable than they?*
- *What's "natural" if nature is transfigured?*

- *What's happens to "human nature" if nature ends?*

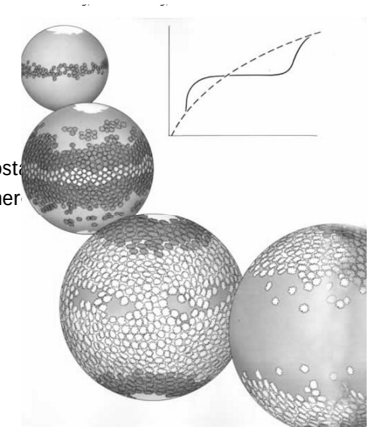
Ecological Thinking (Systems Thinking)



- Biology as Model (not physics)
  - Parts of organisms
  - Organisms
  - Communities of Organisms
- Systems Thinking Principles
  - Reality is Dynamic (Process determines material conditions)
  - Networked (Relational, interdependent webs)
  - Recursive (No parts, nested systems within systems)
- Other systems
  - Economies, families, cultures/language, organizations

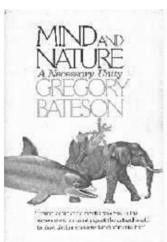
Versions of Systems Thinking

- Gaia Hypothesis
  - By James Lovelock
  - {Greek Earth Goddess}
  - Earth as living organism
  - "Geophysiology"
  - Complex, dynamic, homeosta
  - Self-regulation of atmospher
  - Daisy world modeling



Versions of Systems Thinking

- Gregory Bateson: Mind and Nature
  - Human thought part of ecology
  - Parallels between nature and mind
    - § Dynamic, selective, interpretive systems
  - Mind emergent within nature
  - Mind as potentially pathological
    - § Ways of thinking can be ecologically destructive
    - § Conscious, linear thought dangerous



Bateson: Dynamics of Ecological Crisis

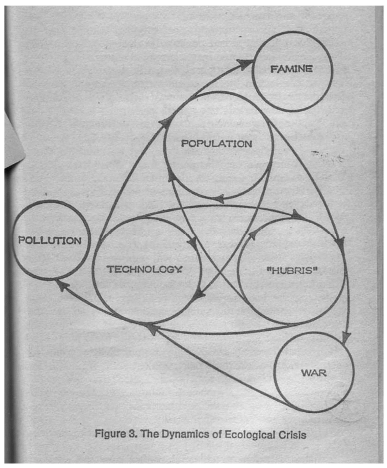


Figure 3. The Dynamics of Ecological Crisis

Versions of Systems Thinking (cont.)

- Deep Ecology (Arne Naess)
  - Against merely human-centered, shallow ecology
  - Ask deeper questions, question assumptions
    - What makes life meaningful?
    - Intrinsic value of other species
    - More inclusive democracy
    - Self-realization as identification with whole
- Transpersonal Psychology (Warwick Fox)
  - Abraham Maslow's Development
    - From behaviorism to humanism (Hierarchy of needs, Self-actualization)
    - Limitations: egocentric, particle, atomistic
    - Transcenders different
    - Transpersonal psychology – emphasize interconnections

Versions of Systems Thinking (cont.)

- Applied Examples studied later in course
  - Dwelling
    - Sprawl & Cars vs. Density and Public Transit
  - Eating
    - Industrial Agriculture & Fast Food vs. Sustainable Farming