I. Ecosystems Definition and Threats

1. Ecosystems are the set of interacting living organisms and the non-living components of the environment in which they live.
2. Defined at large scales, on the order of hectares – Landscape Ecology.
3. Millennium Ecosystem Assessment – 1 of the main findings was the large scale degradation of ecosystems over the past 50 years.
   a. Among the most threatened ecosystems of the world include coral reefs (20% lost, another 20% degraded), mangroves (35% lost), freshwater ecosystems (40% of the world’s fish, 20% of which are extinct or highly imperiled).
   b. Because (partly) ecosystems are hard to define and delineate there is not (yet) a “Red List” for threatened ecosystems.
4. Humans “dominate” Earth’s ecosystems and are the source of increasingly massive amounts of nutrient inputs and atmospheric/oceanic pollution (e.g. CO2 and N).

II. Ecosystem Services

Nature’s Services – Gretchen Daily

1. Ecosystem services are “the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life.” (Daily 1997)
   a. In Hawaii for example, the tourism industry (which makes up a quarter of the state’s economy) relies heavily on nature (in other words, Hawaii’s natural ecosystem has significant economic benefits).
   b. Ecosystems govern biogeochemical cycles and are responsible for a variety of critical processes including carbon capture, oxygen manufacturing and nitrogen fixation.
      i. However, human impacts are disrupting these cycles (at a global scale) and “tipping the balance”.
      j. But if we conserve ecosystems humans can be the beneficiaries of a wide variety of positive impacts.
2. Examples:
   a. Forest conservation can aid carbon storage (offset emissions) and reductions in deforestation can mitigate climate change.
   b. Hydrologic services of natural ecosystems (e.g. forests) can include water filtration, storage, and flow regulation.
   c. Soil provides services in the form of hydrologic cycle moderation, plant support, retention of nutrients, disposal of wastes, and element cycles.
      i. Furthermore, erosion (which often results from ecosystem/forest degradation) can cause significant human detrimental impacts (e.g. $250 billion USD/year) including loss of food supply (most critically), siltation and water quality declines.
   d. Mobile links represent animals which can affect ecosystem processes (and the services they provide) in important ways by connecting habitats and ecosystems across space.
i. Seed dispersal by birds for example can be important for ecosystem health and functioning.

e. Some species (birds) can control pests in agroforestry systems.

f. Pollination is a hugely important ecosystem service for the global economy and locally as well (e.g. studies have shown that forest fragments can improve coffee quality and yields).

3. It should be noted that ecosystem services are a good example of the necessity in conservation for interdisciplinarity (economics and ecology).

4. Is there a danger to economically valuing ecosystem services?

   a. Nile Perch introduced into Lake Victoria – caused the extinction of many native species but ALSO began a lucrative fishing industry.