VIII: Community and Ecosystem-Level Conservation

Critical Species Interactions

- "Drivers" and "Passengers"
  - "Drivers" - species which tend to be responsible for community structure and function
- Keystone Species
  - Examples:
    - *Pisaster ochraceus (*a sea star; Paine 1966, 1969); remove species and richness dropped from 15 species to 8; predation *on Mytilus californicus*
    - *Enhydra lutris* (sea otter); preys on sea

Keystone species continued

- continued - urchins.
- Keystone food resource (figs, nectar, fruits)
- Habitat modifiers ("ecosystem engineers" - *Castor canadensis* (beaver); *Loxodonta africana* (African elephant; keystone browser)
- Decomposers - mycorrhizal fungi, bacteria, algae, invertebrates
- A keystone species is a species whose impact on its community or ecosystem is large and disproportionately large relative

Keystone species continued -

- - to its abundance.

- Mutualism - two or more species that benefit from close interaction
  - Examples:
    - pollinators
    - seed dispersal
    - symbionts (gut microorganisms, root nodules, etc.)
    - animal mututalism (cleaner wrasses, tick birds, nesting site use, etc.)

- Indirect effects
  - Predation effects
    - Examples: peregrine falcon - crow, bass-stoneroller
- Disturbance Regimes and Invasive Species
  - Disturbance regimes are important because they influence the chance of extinction and colonization in the landscape, thereby, effecting biodiversity.
  - A major challenge of conservation is to

disturbance regimes continued -

- maintain both late successional stages and a mix of all successional types within a landscape, not to retain ecosystems as static and unchanging.
- Traditional notions of succession such as "climax stage" have given way to "patch dynamics" . The emphasis is on understanding the effects of disturbances as unique ecological events within a landscape rather than as part of an "equilibrium" process of seral succession.

disturbance regimes continued - *(continued)*

- Exotic introductions
  - Characteristics of successful invaders:
    - pioneer species (high fecundity; short generation time).
    - long lived
    - high dispersal rates
    - single parent reproduction
    - high genetic variability
    - phenotypically plastic
    - broad native range
    - habitat generalist

exotics continued -

- broad diet (polyphagous)
- human commensal

– Characteristics of invadable communities:

- climatic similarity
- early successional
- low diversity of native species
- absence of predators
- absence of other species with similar "niche"
- absence of predators or grazers in evolutionary history

exotics continued -

- low-connectance food web
- anthropogenically disturbed

– Characteristics of communities likely to be invaded:

- simple communities
- anthropogenically disturbed communities

exotics continued - *(continued)*

- Examples of exotics that have caused severe problems:
  - mosquitofish, domestic cats, kudzu, spotted knapweed, zebra mussels, rats, fire ants, goats, killer bees, "weed species", rainbow trout, brook trout, grass carp, opposum shrimp (*Mysis relicta),* chestnut blight, Dutch Elm disease, Rinderpest virus (RVP)
- Overabundance of native species
- Importance of the biogeography of species.