I. What’s an endangered species?

1. A species is defined as endangered by the IUCN if any of the following criteria are fulfilled indicating a very high risk of extinction in the wild:
   a. Significant decline in the population (e.g. 90% in ten years).
   b. Significant reduction in geographic extent (e.g. only known from a single location).
   c. Population size estimated to be fewer than 2500 individuals and significant decline.
   d. Population size fewer than 250 individuals.
   e. Analysis (e.g. PVA) suggesting 20% probability of extinction within 20 years or five generations (which is longer – max 100 years).

2. Species can also be Critically Endangered (e.g. 50% probability of extinction within 5 years), Vulnerable, Near Threatened etc.

3. The U.S. Endangered Species Act (ESA) in 1973 mandated federal protection of species in the U.S. and defined species as endangered if “in danger of extinction throughout all or a significant portion of its range.” The government then:
   a. legally prohibits “take” (capturing, killing etc.) of endangered (or threatened species).
   b. protects critical habitat (and, importantly, can stop development).
   c. designs and implements recovery plans.

4. Many endangered species, as defined by IUCN, not endangered under ESA.

II. Identification of endangered species

1. What to protect? Species, populations, subpopulations? Lots of arguments about what constitutes a species/ subspecies (ESA protects both).


3. Which species? Umbrella? Flagship? ALL?! The ESA legally applies to any species which fulfills the endangerment criteria... in practice listing is very political (e.g. the polar bear).

III. Protection of endangered species

1. What are the threats? Caughley (1994) provides two conservation paradigms:
   a. Small population paradigm: small populations are prone to extinction by virtue of their smallness (vulnerable to stochasticity).
      i. Stochasticity key – inbreeding, catastrophes etc.
      ii. Minimum Viable Population (MVP) – 50/500 rule is that 50 individuals (at least) are needed to prevent inbreeding and 500 are needed to prevent extinction. Utility of MVP debated.
   b. Declining population paradigm: “There is an agent of decline” and we as conservation biologists look to determine the cause and “prescribe its antidote” (<- a familiar paradigm/ analogy?).
   c. We know the threats: habitat loss, overharvesting, invasives etc.
d. Threats vary by location: biggest threat to vertebrates in the U.S. is habitat loss (92%) whereas in China the biggest threat is overharvesting (78%).

2. Where do endangered species live? Unfortunately, not always in protected areas. In the U.S., very often on private land.

3. Protection under the ESA.
   a. Federal government cannot engage in any activity that harms a listed species (no logging in national forests containing the Northern Spotted Owl). 100s of thousands of jobs lost (supposedly).
   b. Citizens cannot harm listed animals – even on their own land! Controversial – what do you do if you found a listed species in your backyard?

IV. Recovery of endangered species
   1. What actions should we take to secure the recovery of the endangered species?
      a. ESA requires recovery plans – but limited in their power and usefulness. Not often implemented effectively.
      b. Management actions are challenging – land is expensive, disturbance difficult to regulate, invasives nearly impossible to stop.
   2. Recovery of most endangered species requires active interventions ($$$).

V. Incentives, disincentives and limitations of endangered species programs
   1. Incentive – cash payouts to landowners to conserve species.
   2. Disincentives – penalties / jailing for harming listed species.
   3. “Safe Harbor” is a compromise within the ESA where if land is improved for listed species on a landowner’s property, take may be permitted.
   4. Most species are data-deficient, i.e. we don’t know if they’re endangered or not.
   5. ESA has been used as a tool for conserving habitat and many species are used as umbrella / flagship species. But does this work?

VI. Hong Kong protected species
   1. Wild Animals Protection Ordinance (WAPO) – many species (not all endangered) covered such that hunting of most species is illegal (e.g. no hunting of Tree Sparrows!).
   2. An ESA equivalent doesn’t really exist in HK.
   3. CITES (Convention on International Trade in Endangered Species) is enforced in HK and regulates international trade of protected species.