I. Climate change and extinction

1. Golden Toad of Costa Rica – first extinction due to climate change?
2. Some estimates project 40% of species could be extinct within 50 years due to climate change.
   a. Based primarily on SDM models.
   b. Many assumptions and results questioned but still changed cons bio
   c. Dispersal key (without it many more species are projected to become extinct)
3. Tropical species could be especially vulnerable to warming – if they’re adapted to narrow range of temperatures common to the tropics then even a small change in temperature could be very detrimental (need data!).
4. Bottom line – much uncertainty but many reasons to fear climate change impacts on biodiversity.

II. Terminology regarding the managing of climate change impacts

1. Mitigation – Actions taken to minimize the impact of climate change and warming temperature (e.g. cutting CO2 emissions).
2. Adaptation (social) – Actions taken in response to and in order to tolerate climate change impacts (e.g. assisted colonization).
3. Adaptation (biological) – Species can evolve to tolerate climate changes.
4. Assisted Colonization - (aka Managed Relocation, Assisted Migration): translocation to novel site caused by rapid habitat degradation (often climate change) of historical range.
5. REDD – Reducing emissions from deforestation and forest degradation – Market incentives to limit emissions via forest conservation.

III. Guidelines for and features of conservation in the face of climate change

1. Many more studies in recent years have started to look at conservation management under a changing climate.
2. General principles much more common than actionable items.
3. Increase extent of protected areas (rather obviously) – case study of C. verrucosus shows PAs protect under climate change.
   a. C. verrucosus scenarios modeled via SDMs and PVAs.
   b. Different climate change models (e.g. PCM vs. GFDL, not to be confused with climate change emissions scenarios) can affect species differentially.
   c. Urbanization (habitat loss) will likely have compounding impacts on species.
4. Land use changes (urbanization, agricultural development) could challenge connectivity under a changing climate.
5. Protect and create stepping stones, refugia and corridors to facilitate dispersal and connectivity.
6. Many strategies related to protected species:
   a. More intensive ex-situ conservation actions (e.g. zoos and the Amphibian Ark).
   b. Translocation/ assisted colonization.
7. Requires large scale planning (e.g. Landscape Conservation Cooperative) and significant social, legal and political involvement.

V. REDD
1. Could be a significant potential source of income for developing countries.
2. Importantly – a conservation and mitigation strategy
3. In theory sounds great – in practice very difficult to implement effectively.
   a. What precisely are the market tools?
   b. Doesn't necessarily address drivers of deforestation.
   c. If forests conserved in one country through REDD, what about neighboring countries?