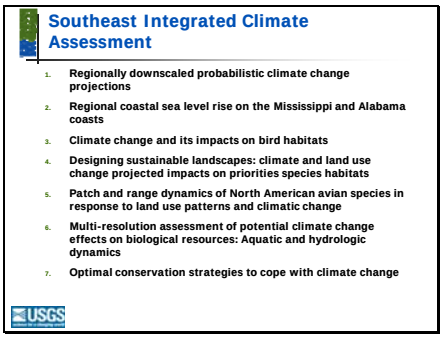
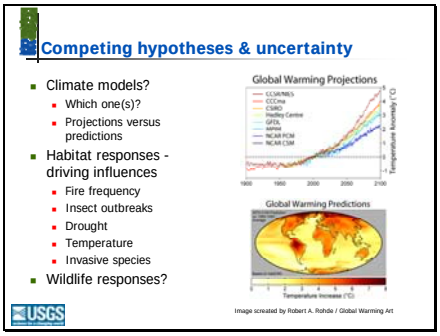
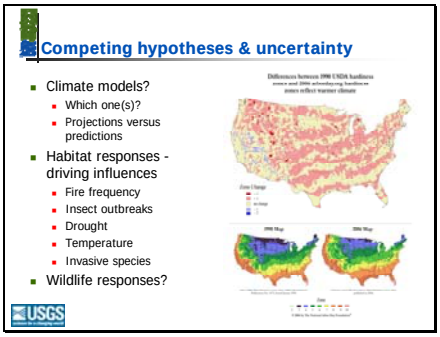
Optimal conservation strategies for dynamic landscapes

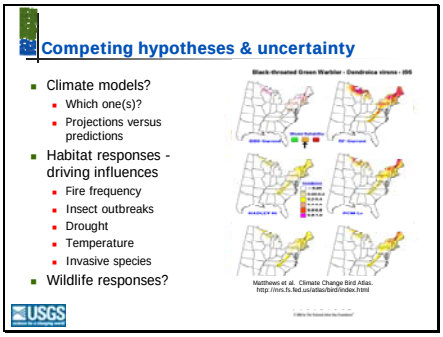
Incorporating climate change and urban growth in conservation planning

James B. Grand, USGS,Alabama Cooperative Fish and Wildlife Research Unit

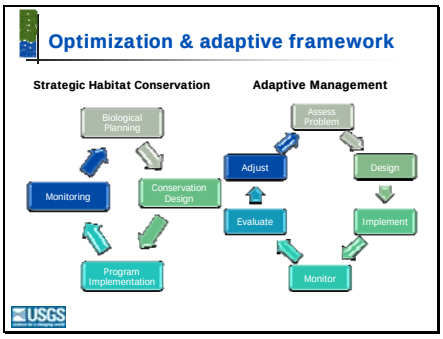


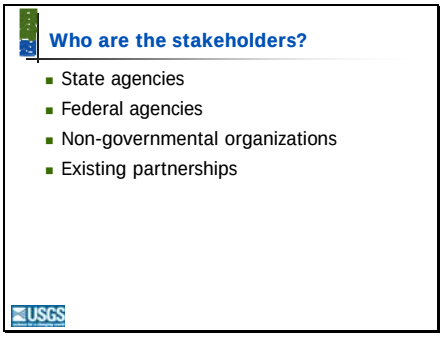


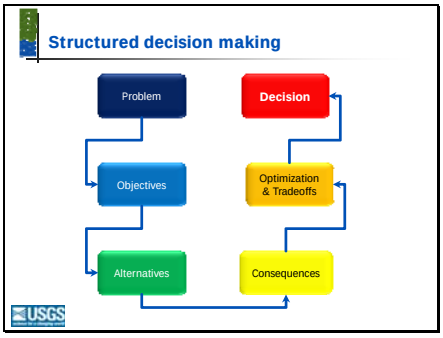


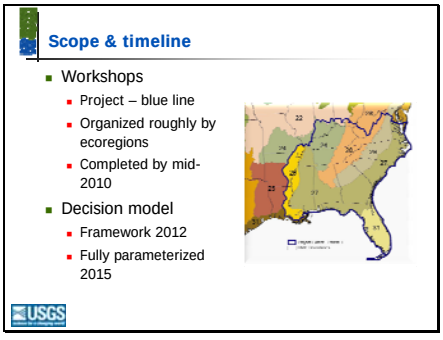


- Part of the USGS, Southeast Integrated Climate Assessment project
- Multi-disciplinary project coordinated by USGS with participation from a large number of Universities and research institutions
- Goal is to develop the core climatic datasets necessary to project regional ecosystem impacts resulting from 21st century climate change.
- Projects under the Southeast Integrated Climate Assessment umbrella
- Intent is to address four questions:
  (1) what is the magnitude and direction of climate change expected in the Southeast over the next 100 years,
  (2) how do the projected changes in climate relate to those parameters that most affect ecosystem processes specific to the Southeast,
  (3) what is the level of uncertainty associated these projections, and
  (4) how can this information be used to make informed conservation decisions?
- Approach improves upon many existing impact assessments by incorporating all available Global Climate Models (GCMs) from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4), providing new information for decision-makers through an improved quantifiable uncertainty analysis, and providing seamless downscaled ecosystem-relevant climate products for the entire Southeast.
- Projects 1-6 will provide data on climate change projections, sea level rise, historic and predicted changes in habitats, and responses of aquatic and terrestrial wildlife.
- Projects 6&7 will develop and evaluate strategies to mitigate the effects of climate change where such actions are deemed valuable and feasible.
- There are many different models for climate change. The IPCC now recognizes more than 20. Each comes with its own caveats and assumptions. Most importantly, there is great uncertainty associated with each model.
- The projections represented in the first graph are the average of many simulations for each model and each individual projection is somewhat different.
- Further, the projections generally diverge as they are extended further in time. Thus, the predictions include probability distributions around each projection and that uncertainty should be weighed in making decisions based on any of the models.
- Because uncertainty increases as we predict further into the future it is extremely important to integrate the potential value of any conservation action on the likelihood of the rewards it may provide in the future.
- To be truthful to this uncertainty, and to scientific process, each model albeit a climatic, habitat response, or animal population should be viewed as a competing hypothesis for which we can predict expected outcomes.









- Given the existence of competing hypotheses and the degree of uncertainty in how climate will change and how systems will respond to that change, now more than ever resource managers need to consider the complexity of the problems they face in making conservation decisions.
- Both of these approaches (SHC and AM) to natural resource management provide an adaptive framework for addressing complex problems. Adaptation and strategic action will be essential to conservation in a potentially dynamic environment. Both **REQUIRE** stakeholder input to succeed.
- We define stakeholders as the broader conservation community. These include state and federal agencies charged with conservation of natural resources, as well as non-governmental conservation organizations such as TNC, ABC, NWTC, NBCI who actively participate in conservation.
- The best way to engage these groups is by working through LCCs within established partnerships like the Joint Ventures, which have already embraced the development of objectives and decision tool development. Other partnerships exist to address reptiles and amphibian conservation (PARC) and aquatic resources (SARP).
- It only makes sense to engage these entities and the conservation networks they represent to become the active stakeholders in defining the key elements of SHC and AM for a broader suite of species.
- Through a series of facilitated SDM workshops, we propose to identify the habitats and populations (ecosystems) and their relative value as well as their current status.
- Stakeholders define the **PROBLEM** and our fundamental conservation objectives as clearly and explicitly as possible. They begin the pre-emptive process of triage to identify the systems and system elements that have been or are likely to be impacted in a dynamic landscape affected by climate and land use change.
- Only stakeholders can determine the explicit, unequivocal, measurable **OBJECTIVES**. These will need to be defined in terms of distribution and abundance of systems or the services they provide. They should be applicable regardless of the system dynamics or lack thereof.
- Stakeholders are the only group that can describe the **ALTERNATIVE** strategies and specific actions that may allow agencies to meet their conservation objectives. These should include portfolios of specific policies and actions that are feasible.
- Given the uncertainties that abound about this dynamic environment, modelers, managers, and taxa experts need to predict the **CONSEQUENCES** of each alternative and quantify the uncertainty associated with those predictions using the best science available.
- We need to determine the acceptable **TRADEOFFS AND THE OPTIMAL SOLUTIONS** that balance the costs, conservation rewards, uncertainty, and risk associated with each alternative.
- Finally, we need to recommend some **DECISIONS**.
- Once decisions are made and **IMPLEMENTED** we know that with adequate **MONITORING**, over time we will learn how the landscape is changing and which if any of our predictions is nearer to our observations so that we can update our beliefs in the alternatives, improve our knowledge of the systems we value and make better decisions in the future.