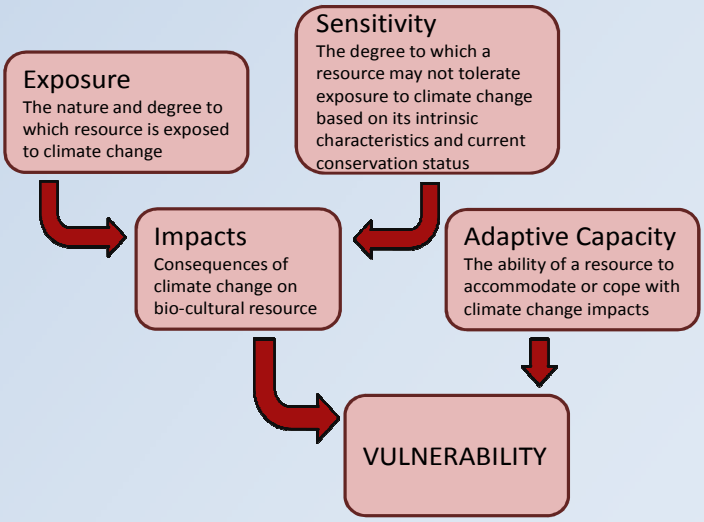
Climate change vulnerability assessments for effective adaptation of Pacific Island wildlife and plant conservation

OVERVIEW

While vulnerability assessments are an increasingly popular tool for climate change adaptation, limitations of past approaches may reduce the utility of such assessments to wildlife and plant conservation efforts in Pacific Island settings. For instance, although the descriptions of climate change vulnerability commonly mention the interactions among climatic and non-climatic threats, in practice vulnerability assessments seldom evaluate these interactions critical to Pacific Island wildlife and plant conservation and management.

In collaboration with colleagues from USGS, US FWS, TNC, UH Hilo, and NRCS, the Pacific Island Climate Change Cooperative's (PICCC) vulnerability assessment for Hawaiian forest bird and plant species follows from a critical evaluation of past assessment methodologies and a needs assessment to ensure the utility of the effort to relevant management and conservation efforts.

PICCC's first vulnerability assessment is based on a three-phased approach that integrates multiple factors relevant to long-term persistence of species. Phase 1 defines the landscape vulnerability of species based on current and future species ranges and the overlapping relevant landscape vulnerability factors (e.g., topographic diversity). Phase 2 defines the vulnerability to climate change of species based on species biological traits and current conservation status (e.g., generation length). Phase 3 involves field-based expert observations (e.g., capacity to colonize restored habitat) and integration of results from prior phases with emphasis on the interaction between climatic and non-climatic threats.



Vulnerability *is the degree to which a species is susceptible to, and unable to cope with, adverse impacts of climate change.*

Phases 1 and 2 make use of analyses and data sets that are currently available for a large number of Hawaiian plant and forest bird species and will focus on the general patterns of vulnerability across species groups and regions. Phase 3 is where individual species results from the past two phases are vetted by experts and combined with expert field knowledge to create estimates of vulnerability that are robust to information gaps and diverse data sources.

What should a tool to assess climate change vulnerability of Hawaiian forest bird and plant species include?

- Issues relevant to Pacific island biota;
  - Consider 'non-climatic' threats and their interaction with climate change
  - Account for island ecological patterns and processes: small populations and ranges, restricted latitudinal and elevational movement, wider historical distributions
  - Be robust to common lack of data for island species
- Relatively simple methods that yield consistent results across data sources and experts
- Compatibility with user's planning and activities such as ESA listing and recovery plan design
- Uncertainty measures for the underlying data and results

The dietary versatility of `Amakihi may make it less vulnerable to climate change than other native bird species

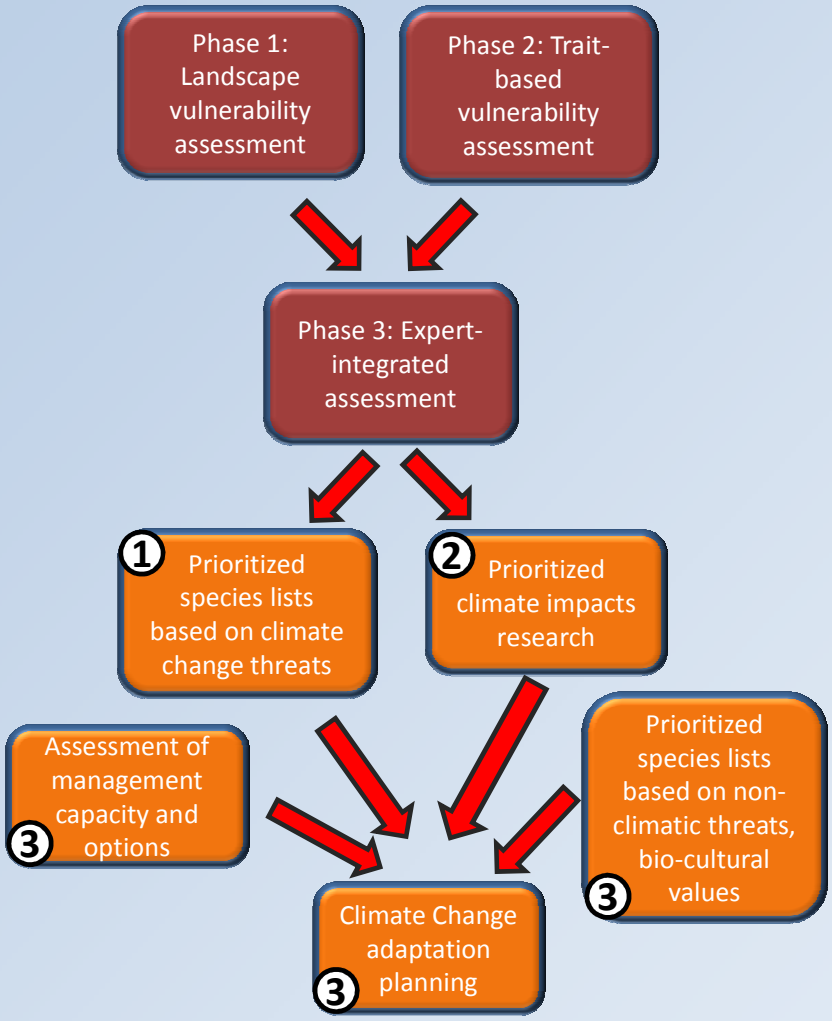
The 'Akeke'e, now inhabiting only the highest elevations of Kauai, have nowhere else to go with rising temperatures

Climate change Vulnerability factors:

Population size
Species range
Dispersal/ migration
Disturbance regime
Niche specificity
Future habitat
Interspecific interactions
Genetics and plasticity
Physiology
Current threats

Expected outcomes from vulnerability assessment

The assessment should help ①define the relative vulnerability of the species to climate change, thus helping prioritize management targets. Also, results ②will highlight the primary factors driving the vulnerability of species and the uncertainties and data gaps.



Lastly, we expect our initial assessment to lead to more detailed vulnerability assessments and research more tightly integrated with post-assessment steps ③necessary for effective climate change adaptation.

About the Pacific Islands Climate Change Cooperative

The Pacific Islands Climate Change Cooperative (PICCC) is a self-directed, non-regulatory conservation alliance whose purpose is to assist those who manage native species, island ecosystems and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands. The PICCC's mission is to improve the ability of native island species and ecosystems to accommodate future climate change and related perturbations, and support the long-term protection of key cultural resources by providing useful projections of climate and natural resource change in the Pacific Islands, innovative management options, and a membership that supports coordinated action among institutional and community stakeholders.