

Unit 1: Presentation 2

Foundational Concepts and Overview of Key Steps

Session Goals

- Unpack the concept of vulnerability
- Emphasize the importance of defining goals based on user needs
- Review assessment design considerations
- Summarize key assessment steps

Components of Vulnerability

- Sensitivity
- Exposure
- Adaptive Capacity



Sensitivity

Measure of whether and how a species or system is likely to be affected by a given change in climate



- **Sunburn example:**

- Amount of melanin in skin is key physiological factor
- Melanin absorbs UV rays, which cause sunburn
- Skin with lower melanin levels is more sensitive to sunburn

Assessing Sensitivity

Factors affecting sensitivity of species, habitats, ecosystems:

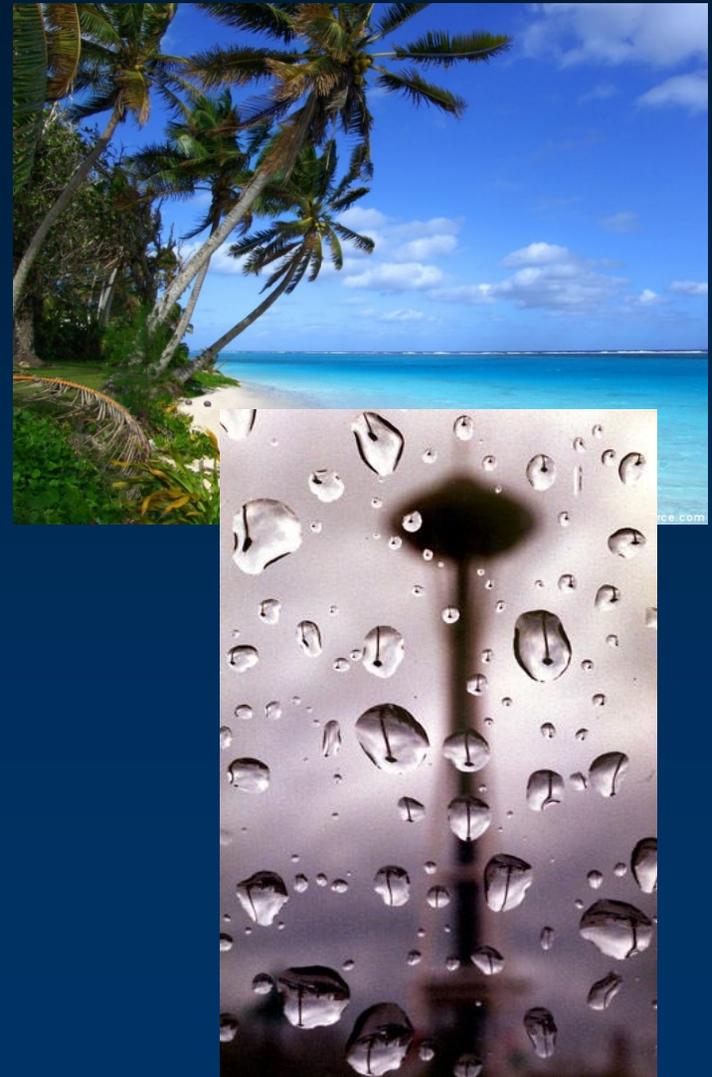


- Specialized habitat or microhabitat requirements
- Narrow environmental tolerances or physiological thresholds
- Dependence on specific environmental triggers
- Dependence on interactions with other species

Exposure

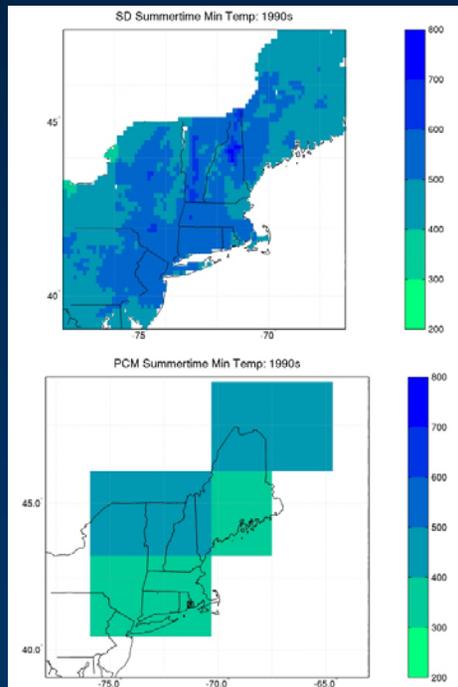
Measure of how much of a change in climate or other environmental factor a species or system is likely to experience

- **Sunburn example:**
 - The amount of UV rays determines exposure
 - Strength of rays depends on latitude, season & weather
 - With enough exposure, most anybody can burn



Assessing Exposure

Factors to consider when assessing exposure:



- **Climate models**
 - shifts in temperature, precipitation
 - Increasing availability of finer scale data (e.g., downscaling)
- **Ecological response models**
 - Sea level inundation
 - Climate related vegetation shifts
 - Landscape impediments to dispersal

Adaptive Capacity

Ability to accommodate or cope with climate change impacts with minimal disruption

- **Sunburn example:**
 - Can be intrinsic (reduce sensitivity) or extrinsic (reduce exposure)
 - For sunburn, extrinsic adaptations includes sunblock, protective clothes, shelter
 - Intrinsic adaptations include UV-induced increase in melanin production (i.e., tanning)



Assessing Adaptive Capacity

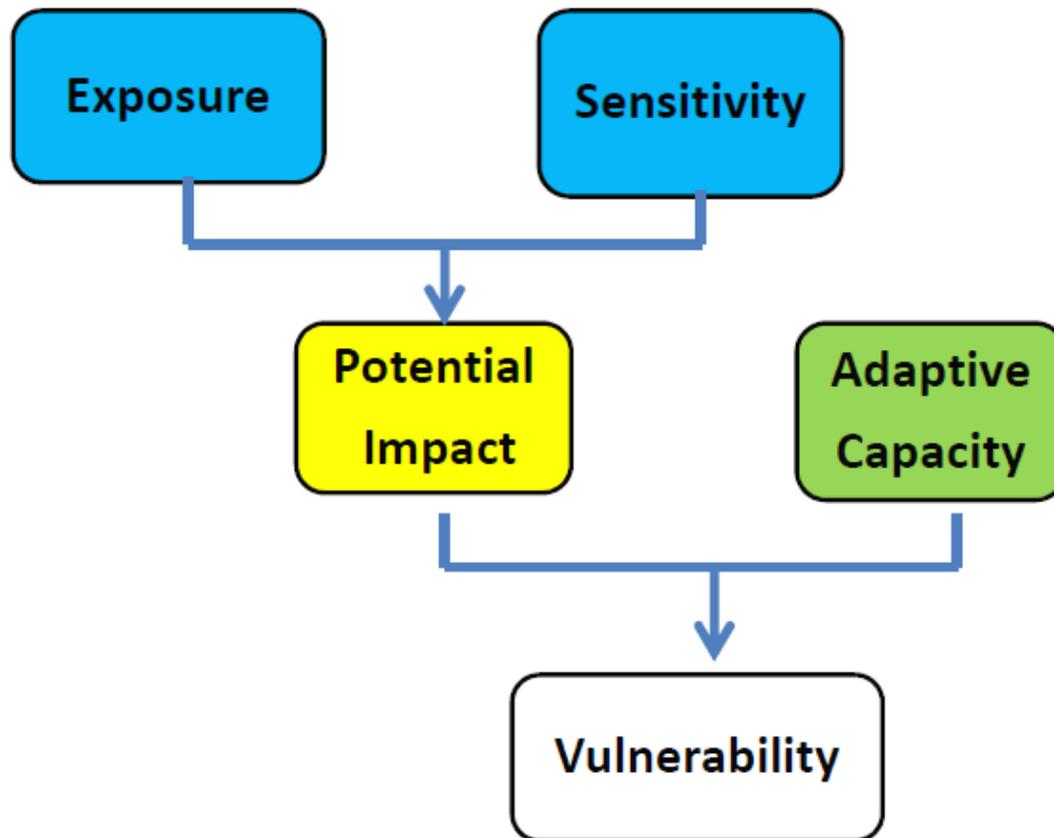
Factors that can influence amount of adaptive capacity of your system:



- **Intrinsic factors**
 - “Plasticity”
 - Dispersal abilities
 - Evolutionary potential
- **Extrinsic factors**
 - Existence of barriers to habitat migration
 - Loss of natural functions
 - Institutional capabilities



Putting it Together



Key Steps for Undertaking a Vulnerability Assessment

1. Determine objectives and scope
2. Gather relevant data and expertise
3. Assess the components of vulnerability
4. Apply assessment results in adaptation planning



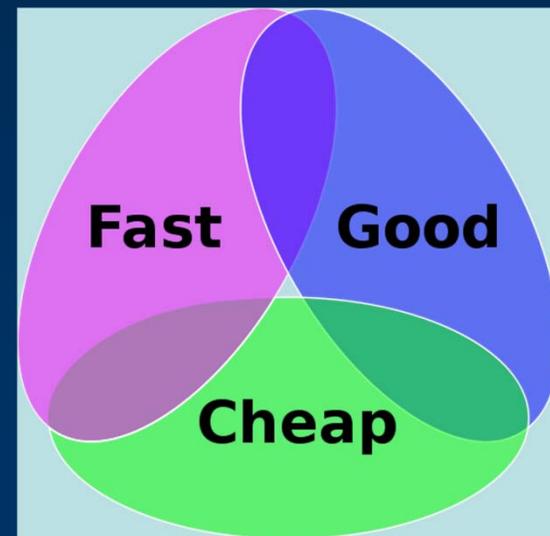
Step 1

1. Determine objectives and scope

- Audience/user needs
- Goals and objectives
- Assessment targets (species, habitats, ecosystems)
- Scale (temporal and spatial)
- Appropriate approach (one size doesn't fit all)

Complexity and Specificity

- **Level of specificity and complexity**
 - Most complex not always the “best”
 - Should be appropriate to type of decision or user needs
 - Potential for “false accuracy” when projecting at scales finer than data can bear
- **Remember project triangle: Can only maximize two**
 - Time
 - Cost
 - Quality



Quantitative vs. Qualitative Approaches

- Quantitative
 - Generally rely on computer-based models
 - Climate and ecological response models
 - Often resource intensive (data, expertise, time)
- Qualitative
 - Can rely on conceptual ecological models
 - Can make use of generalized climate scenarios
 - Often rely on expert opinion
 - Expert opinion can be gathered/analyzed in a structured process

Step 2

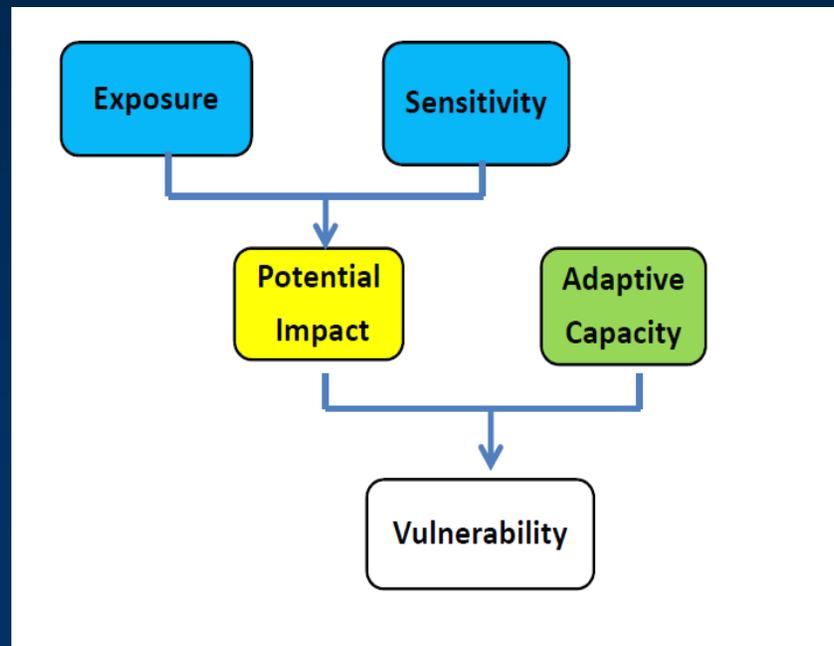
2. Gather relevant data and expertise

- Review existing literature
- Reach out to experts
- Obtain/develop climate and ecological response projections

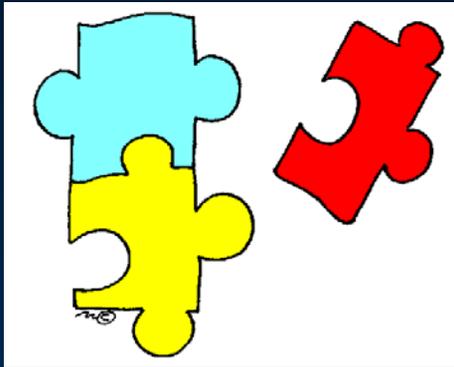
Step 3

3. Assess components of vulnerability

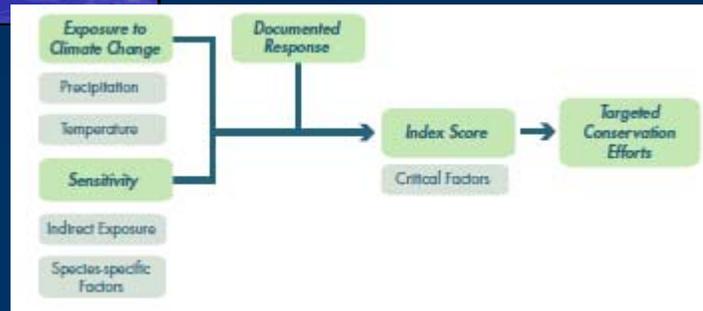
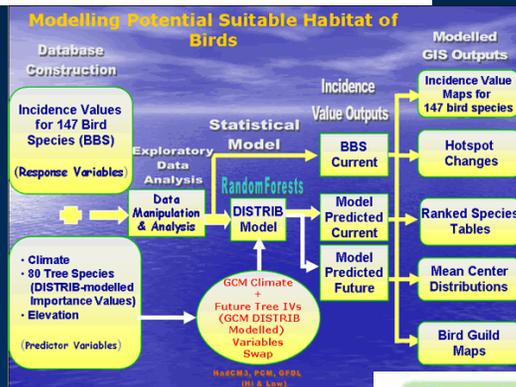
- Assess sensitivity, exposure, adaptive capacity
- Estimate overall vulnerability
- Document confidence levels/uncertainties



Putting the Pieces Together

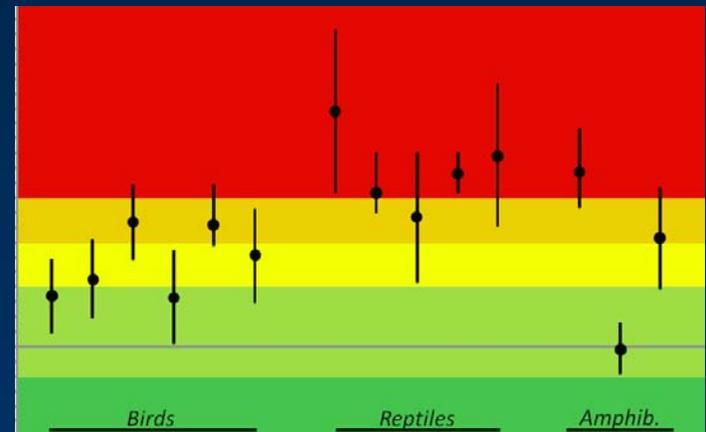


- Detailed modeling efforts
 - In-house or commissioned
- Vulnerability indices
 - e.g., NatureServe Index
- Expert elicitation
 - Supplement and/or supplant modeling



Addressing Uncertainty in Vulnerability Assessments

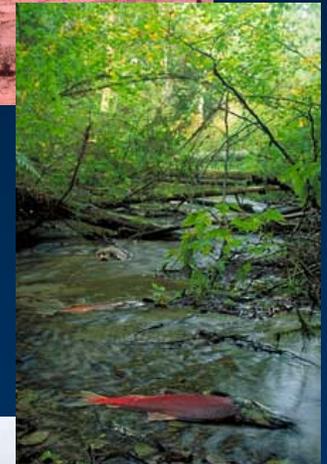
- **Natural resource management has always faced uncertainty**
 - Anxiety about uncertainty often leads to “analysis paralysis”
 - Don’t deny it, embrace it
- **Three types of uncertainty**
 - Climate predictions
 - Ecological responses
 - Management effectiveness
- **Distinguish between uncertainty in trend vs. rate and magnitude**



Step 4

4. Apply assessment results in adaptation planning

- *Reduce sensitivity*
 - e.g., actively plant drought-tolerant species in area projected to get drier
- *Reduce exposure*
 - e.g., identify and protect cold-water refugia
- *Enhance adaptive capacity*
 - e.g., remove coastal armoring to facilitate habitat migration inland in response to sea-level rise



Other Adaptation Questions

What if you can't reduce vulnerability?

- Do we still do what we are already doing to try to “buy time”?
- Do you decide to “let nature take its course”?
- Do you actively facilitate a transition to some new state?
- Should we change our conservation goals?



Using Assessment Results: An Example