

## Unit 1: Presentation 2

# Foundational Concepts and Overview of Key Steps

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# 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

# 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



# Steps 1 and 2

## 1. Determine objectives and scope

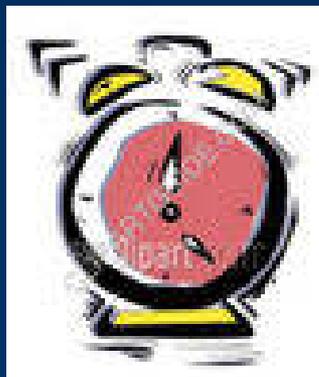
- Audience/user needs
- Goals and objectives
- Assessment targets (species, habitats, ecosystems)
- Scale (temporal and spatial)
- Appropriate approach (not one size fits all)

## 2. Gather relevant data and expertise

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

# Considerations

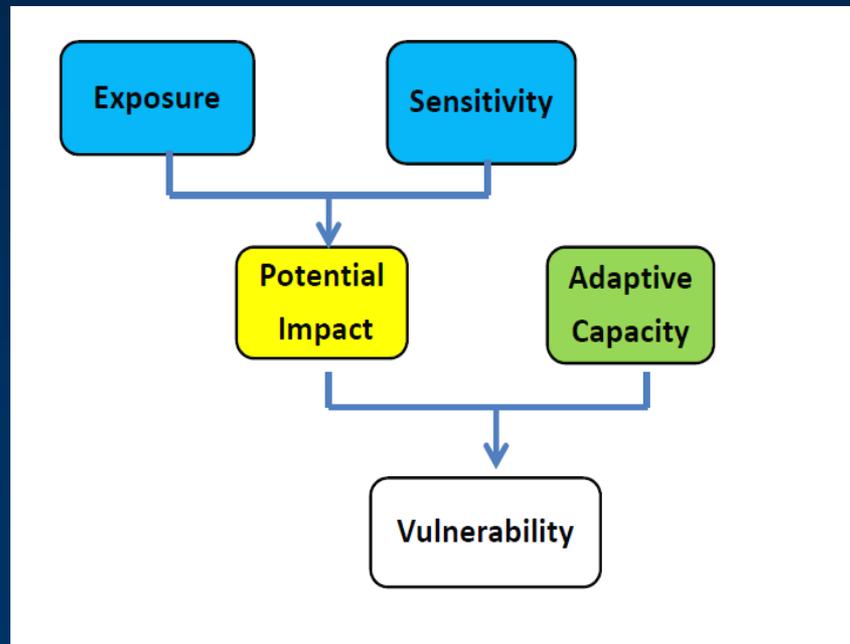
- Level of specificity and complexity also relate to objectives and type of decision processes
  - Most complex not always the “best”
  - Potential for “false accuracy” when projecting at scales finer than data can bear
- Project management triad (can only maximize two of the three)
  - Time
  - Cost
  - Quality



# Step 3

## 3. Assess components of vulnerability

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



# 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

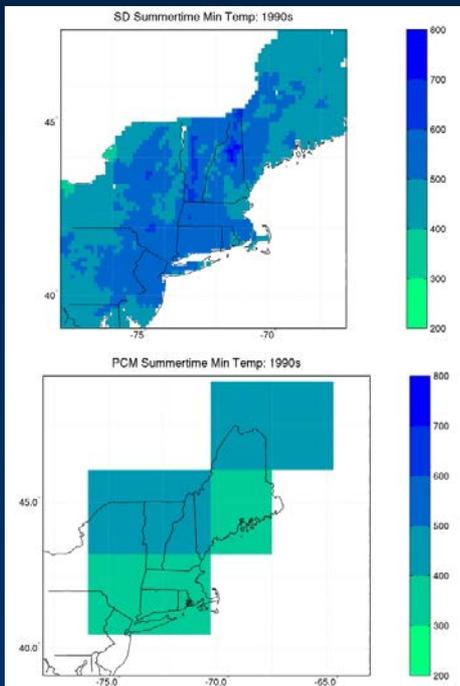
Measure of how much of a change in climate or other environmental factor a species or system is likely to experience

- **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

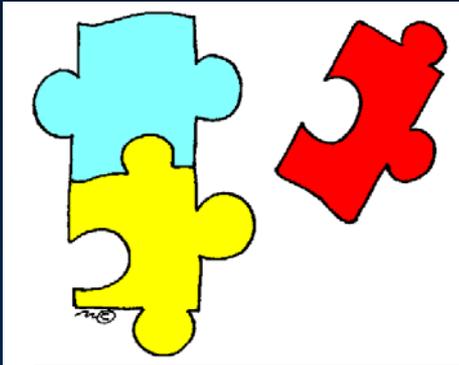
Factors that can influence amount of adaptive capacity of your system:



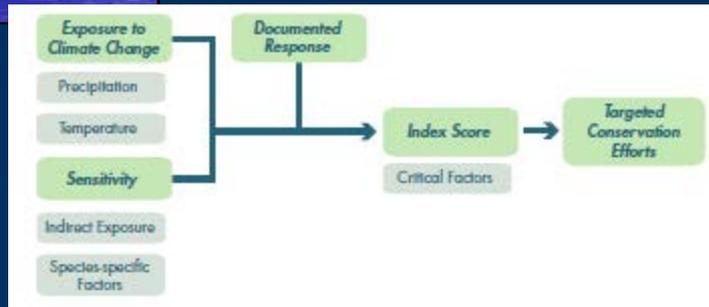
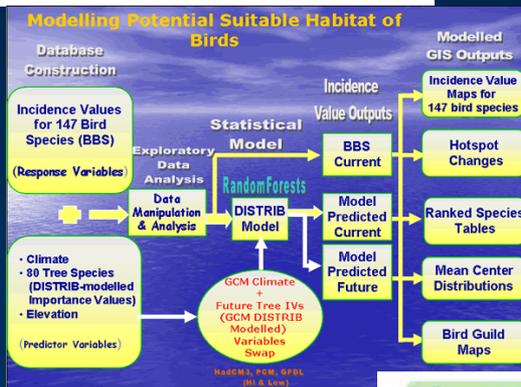
- **Intrinsic factors**
  - “Plasticity”
  - Dispersal abilities
  - Evolutionary potential
- **Extrinsic factors**
  - Existence of barriers to habitat migration
  - Loss of natural functions
  - Institutional capabilities



# Putting 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

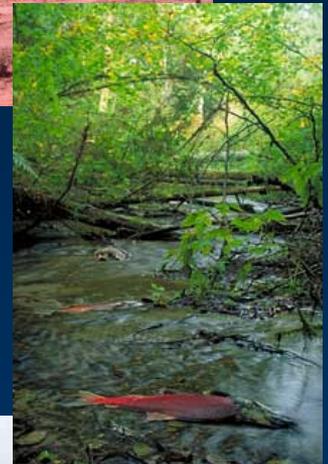


Likelihood Scale	
Terminology	Likelihood of the Occurrence/Outcome
Virtually certain	>99 percent probability of occurrence
Very likely	>90 percent probability
Likely	>66 percent probability
About as likely as not	33 to 66 percent probability
Unlikely	<33 percent probability
Very unlikely	<10 percent probability
Exceptionally unlikely	<1 percent probability

# 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