Unit 2: Presentation 2

# Assessing Exposure

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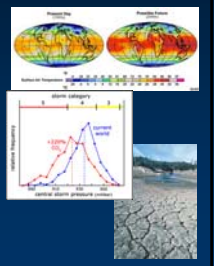
## Exposure

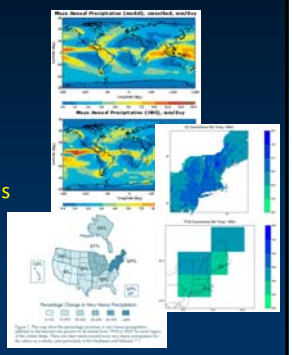
Measure of how much of a change in climate or other environmental factor a species or system is likely to experience

- Exposure to *Climate Change*
  - Shifts in temperature, precipitation (i.e., "basic climate")
- Exposure to *Associated Impacts*
  - For example, sea-level rise; hydrologic changes; changing fire regimes; changes in $CO_2$ concentrations; changes in storm frequency/intensity



## Exposure to *Climate Change*

- Global climate models
  - General Circulation Models (GCMs)
  - Atmosphere-Ocean General Circulation Models (AOGCMs)
- Downscaled climate models
  - Statistical approach
  - Dynamical approach
- Historical data
  - Observed trends



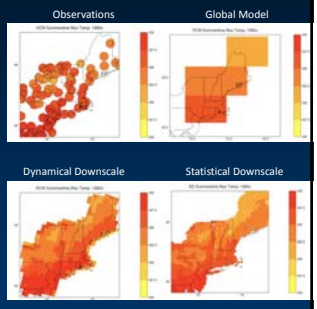
## Global Climate Models 101

Global climate models generate projected changes in climatic variables (e.g., average temperatures, precipitation) based on one or more scenarios for emissions of greenhouse gases, particulates, other factors

- Factors to consider
  - Uncertainties in scenarios (depend on policy, economics, population, etc.)
  - Some models more successful than others at reproducing observed climate and trends over past century
  - Confidence in results often higher in nearer term, also higher for temperatures than precipitation

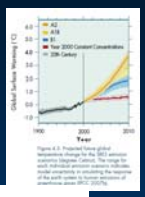
## Is Downscaled Information Necessary?

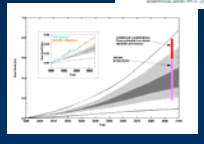
- Factors to consider
  - Scale of area being managed
  - Complexity of area being managed
- Downscaling methods
  - Dynamical
  - Statistical
- Benefits and limitations
  - Data often more relevant for management scale
  - Not necessarily more "accurate"




## Which Scenarios to Use?

- Factors to consider
  - Length of your planning horizon
  - Sensitivity of key species or processes (helps ID variables to consider)
  - Level of confidence in projections
  - Level of acceptable risk
- Level of detail
  - Specific numbers
  - A range of numbers
  - Directionality



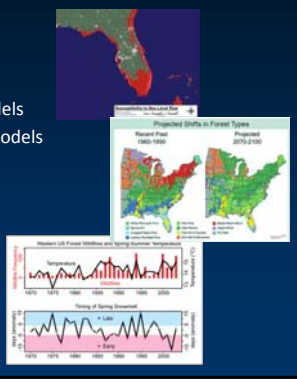


## Tools/Resources for Relevant Information

- ClimateWizard
  - www.climatewizard.org
  - Developed by The Nature Conservancy, the University of Washington, and the University of Southern Mississippi
  - Enables technical and non-technical users to assess historical and projected climate change information
- DOI Climate Science Centers (CSCs) and Landscape Conservation Cooperatives (LCCs)
  - CSCs will deliver basic climate impact science to LCCs
  - LCCs will link science with conservation delivery

## Exposure to *Associated Changes*

- Response Models
  - Conceptual models
  - Hydrological models
  - Habitat response models
  - Climate "envelope" models
  - Ecological models
- Historical data
  - Observed trends
  - Response to disturbances

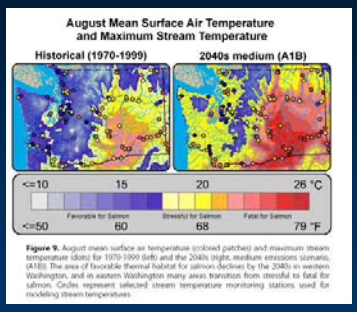


## Considerations for Response Models

- Choice of models
  - Depends on the species, habitats, ecosystems of concern (including scale)
  - Depends on the types of questions being asked
  - Depends on end-user's needs
- Limitations of response models
  - Overly-simplified (e.g., may ignore factors such as interactions between species; nonlinear, complex responses; other factors)
  - Data availability varies
  - Transferability across regions and scales

## Example: Exposure to *Air and Water Temperatures*

Exposure analysis for assessing vulnerability of salmon to climate change (salmon are sensitive to water temperatures)




## Example: Exposure to *Sea-Level Rise*

Exposure analysis for assessing vulnerability of coastal wetlands to sea-level rise (wetlands are sensitive to tides/elevation)

- Initial Condition
- 11.2-inch SLR
- 27.3-inch SLR
- Diked areas


## Break-out: Assessing Exposure