Assessing Sensitivity

Vulnerability Assessment

Eric Mielbrecht
EcoAdapt

(Adapted from a presentation by Sam Veloz)
Sensitivity

Exposure

Vulnerability

Measure of whether and how a species or system is likely to be affected by a given change in climate or factors driven by 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
Sensitivity of species
Species’ Sensitivities to Climate Change

Physiological sensitivity

Nur et al. 2012
Species’ Sensitivities to Climate Change

Physiological sensitivity
Sensitive habitats and disturbance regimes
Species’ Sensitivities to Climate Change

Physiological sensitivity
Sensitive habitats and disturbance regimes
Interspecific interactions
Species’ Sensitivities to Climate Change

Physiological sensitivity
Sensitive habitats and disturbance regimes
Interspecific interactions
Location and range
Species’ Sensitivities to Climate Change

Physiological sensitivity
Sensitive habitats and disturbance regimes
Interspecific interactions
Location and range
Phenology

http://www.plosone.org/article/info:doi/10.1371/journal.pone.0031662
Species’ Sensitivities to Climate Change

Physiological sensitivity
Sensitive habitats and disturbance regimes
Interspecific interactions
Location and range
Phenology
Additional interacting stressors
Species sensitivity: Song Sparrow

3 tidal marsh subspecies: California species of special concern

Availability of tidal marsh habitat; suitable conditions

Nest survival: influenced by precipitation, temperature and extreme high tides

Nur et al. 2012
Sensitivity of Ecosystems
System sensitivities to climate change

Climate breadth

Clusters of similar climate conditions
System sensitivities to climate change

Climate breadth
Component species sensitivities
System sensitivities to climate change

Climate breadth
Component species sensitivities
Disturbance regimes
System sensitivities to climate change

- Climate breadth
- Component species sensitivities
- Disturbance regimes
- Other stressors
Will tidal marsh ecosystems in the San Francisco Estuary sink or swim?

Tidal marsh elevation sensitive to:
1. The rate of sea level rise
2. The amount of suspended sediment

Not sensitive to organic accumulation

Tidal marsh vegetation and birds also sensitive to changes in marsh habitat

Stralberg et al., 2011
Activity

Ecosystem Sensitivity Assessment

Please pay close attention to the gray boxes in each section. If time is limiting the project team can populate the non-gray fields although we may ask for participants to review answers later.

Ecosystem: _______________________________________________________

1. Direct sensitivities to changes in temperature and precipitation

Two ways to consider ecosystem sensitivity to changes in temperature and precipitation:

(1) Does the system inhabit a relatively narrow climatic zone(s) (= more sensitive); and

(2) Does the system experience large changes (composition or structure) to small climatic changes (temperature or precipitation) (= more sensitive), or does system experience small changes even with larger climatic changes (= less sensitive)?

<table>
<thead>
<tr>
<th>How sensitive is the system to temperature (means and extremes)? Please circle.</th>
<th>Confidence in the direct sensitivity to changes in temperature: Please circle.</th>
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<tbody>
<tr>
<td>Low</td>
<td>Moderate</td>
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<th>How sensitive is the system to precipitation (means and extremes)? Please circle.</th>
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Ecosystem sensitivity...

1. To changes in temperature and precipitation
2. Of component species
3. To changes in disturbance regimes
4. To other types of climate and climate-driven changes
5. To impacts of other non-climate stressors
6. Other sensitivities
Confidence

Low  Medium  High

Support from theory
Support from model results
Support from data or trends in the existing environment
Degree of consensus in expert opinion
### Working groups

<table>
<thead>
<tr>
<th>Community</th>
<th>Members</th>
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<tbody>
<tr>
<td>Alpine/Sub</td>
<td>Tricia, Gavin, Bruce G.</td>
</tr>
<tr>
<td>Yellow Pine/Mixed Conifer</td>
<td>Terri, Andrea G., Greg A.</td>
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<tr>
<td>Meadows/Riparian</td>
<td>Ryan, Laura, Shana, Alex R.</td>
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<tr>
<td>Aquatic</td>
<td>Belin, Emily B., Lonie F., Laura P.</td>
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<tr>
<td>Sagebrush</td>
<td>Chris D., MicheleS, Jo Ann</td>
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<tr>
<td>Chaparral</td>
<td>John, Ryan, Tiffany</td>
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<tr>
<td>Red Fir</td>
<td>Steve B, Joe (day 2 only), Stefan L, Bruce H</td>
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<tr>
<td>Pinyon-Juniper</td>
<td>Aimee, Angela, Leroy W.</td>
</tr>
<tr>
<td>Oak</td>
<td>Chrissy, Chris K., Anna O</td>
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