Taking the Next Step

Translating Downscaled Climate Change Projections into Useful Information for Watershed Management

Sandy River Watershed Climate Adaptation Workshop

Karl Dickman

2017-02-27
Understanding Climate Change and Watersheds
Location of Chehalis Watershed in Washington State
Chehalis Climate Change Hypothesis

- **Future Conditions in the Chehalis River**
  - Wetter Winter
  - Dryer Summer
  - More extreme storms
  - Warmer summer water temperature
Fall Chinook Distribution

http://ecosystems.azurewebsites.net/Edt/Chehalis/Diagnostic_Reports/ASHA_2016
Fall Chinook Abundance with Climate Change

Translating Downscaled Climate Change Projections into Useful Information for Watershed Management
Fall Chinook Losses from Climate Change

Translating Downscaled Climate Change Projections into Useful Information for Watershed Management
Fall Chinook
Climate Change Loss

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Spring Chinook Losses from Climate Change

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-800 -700 -600 -500 -400 -300 -200 -100 0 100 200 300 400 500 600 700 800

Modelled Loss (Absolute)

-100 -50 -25 0% 25% 50% 75% 100%

Modelled Loss (Relative)

Absolute Loss  Relative Loss
Spring Chinook Climate Change Loss
## Fall Chinook Life History

<table>
<thead>
<tr>
<th>Adults</th>
<th>Incubation &amp; Fry Emergence</th>
<th>Juvenile Rearing</th>
<th>Seaward Migration</th>
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</thead>
<tbody>
<tr>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td>Apr</td>
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<tr>
<td>Adults Arriving</td>
<td>Egg Incubation</td>
<td>Fry Emergence</td>
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<td>Winter Fry Migrants</td>
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<td>Parr Migrants</td>
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<td>Yearling Smolts</td>
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- **Age 1 Juveniles (summer active rearing and winter inactive)**

- **Sub-yearling Life History**

- **Egg Incubation**
# Spring Chinook Life History

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<td>Spawning</td>
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**Presentation Title**

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Physical Habitat

Translating Downscaled Climate Change Projections into Useful Information for Watershed Management
Habitat Suitability Models

- **Ecosystem Diagnosis & Treatment (EDT)**
  - Measures
    - Abundance
    - Resilience
    - Spatial Diversity
    - Life History Diversity
  - Diagnoses
    - Locates performance bottlenecks
    - Identifies cause of performance bottlenecks
Biological Structure
Physical Habitat + Biological Structure → Biological Response
Tributary Temperatures
Temperature Gauges in the Chehalis Basin
Extrapolated July Temperatures in the Chehalis Basin
Physical Process Models

- **Stream Temperature**
  - STARS/SSN Toolkit
  - CE-QUAL-W2

- **Hydrology**
  - HEC-RAS
  - VIC
  - VELMA
Additional Resources

- **Climate change**
  - University of Washington Climate Impacts Group ([http://cig.uw.edu](http://cig.uw.edu))

- **Climate change and stream hydrology**
  - U.S. Forest Service Rocky Mountain Research Station
    - [https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html](https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html)

- **Climate change and salmon habitat**
  - ICF ([Karl.Dickman@icf.com](mailto:Karl.Dickman@icf.com), [Willis.McConnaha@icf.com](mailto:Willis.McConnaha@icf.com))
Questions?
Coho Distribution

http://ecosystems.azurewebsites.net/Edt/Chehalis/Diagnostic_Reports/ASHA_2016
Coho Climate Change Loss

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Modelled Loss (Relative)

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