A Climate Change Assessment of Vegetation, Fire, and Ecosystem Services for Tribal lands in the Pacific Northwest

Michael Case, Case Research LLC
John Kim, US Forest Service Pacific Northwest Research Station
Becky Kerns, US Forest Service Pacific Northwest Research Station

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Background
Objective: Apply MC2 to assess changes to vegetation, fire, and ecosystem services.
Approach

1. Generate maps of key climate impacts, uncertainties, and mechanisms
2. Consult with tribes to identify how impacts translate to effects on tribal ecosystem services
3. Produce a vegetation-type guide summarizing climate change impacts
4. Collaborate and identify adaptation opportunities (via workshops)
Climate data
NASA Earth Exchange (NEX) Downscaled Climate Projections (NEX-DCP30) downscaled to 1 km$^2$

Future scenario
RCP 8.5 (business as usual)

General circulation (climate) models

https://cds.nccs.nasa.gov/nex/
NASA NEX-DCP30 Downscaled Climate Projections RCP8.5, 1961-1990 to 2071-2100

- **mean** - CESM1-CAM5
- **hot-dry** - BNU-ESM
- **hot-wet** - CANESM2
- **cool** - MRI-CGCM3
MC2 Vegetation Types

CESM1-Cam5 2080

Vegetation Type:
- Alpine tundra
- Subalpine woodland
- Subalpine forest
- Maritime coniferous forest
- Coniferous forest
- Warm mixed forest
- Coniferous woodland
- Cool mixed woodland
- Warm mixed woodland
- Shrubland
- Evergreen broadleaf forest
- Subtropical mixed forest
- Moist coniferous forest
- Dry coniferous forest
- Semidesert shrubland
**KEY IMPACTS**

**Change in Vegetation Types by 2100**

- Subalpine forest: -6.1%
- Subtropical forest: +8.7%
- Warm forest: +2.5%
- Moist forest: -5%
- Coniferous forest: -0.6%
- Dry coniferous forest: +1.7%
- Coniferous woodland: -2.5%
- Shrub steppe: -7.2%
- Dry shrub steppe: +4.2%
MC2 Biomes

- Desert
- Shrubland
- Grassland
- Woodland
- Forest
KEY IMPACTS

Change in Biomes by 2100

- historical
- hot-dry - BNU-ESM
- hot-wet - CANESM2
- mean - CESM1-CAM5
- cool - MRI-CGCM3

<table>
<thead>
<tr>
<th>Biome</th>
<th>Change by 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert</td>
<td>0%</td>
</tr>
<tr>
<td>Shrubland</td>
<td>-2.9%</td>
</tr>
<tr>
<td>Grassland</td>
<td>0%</td>
</tr>
<tr>
<td>Woodland</td>
<td>-2.4%</td>
</tr>
<tr>
<td>Forest</td>
<td>+6%</td>
</tr>
</tbody>
</table>
Change in Biome Extent

KEY IMPACTS

Predicted forest gain
- 1-8
- 9-14
- 15-21
- 22-28

Predicted forest loss
- 1-8
- 9-14
- 15-21
- 22-27

Legend:
- Cascade Crest
- Urban/-agricultural
- Non-forest
- Forest
Identified relevant ecosystem services and important species

Determined their corresponding vegetation type using a combination of literature reviews and expert elicitation

Assessed the change to that ecosystem service and/or the habitats they rely on

Assessing Impacts to Ecosystem Services
KEY IMPACTS

Impacts to Ecosystem Services & Species

Overall Change in Vegetation Types

Ecosystem Service

Foods & Medicinal Plants
Trees
Aridland plants
Animals
Birds

Graph showing impacts to ecosystem services and species.
Applying the Results - Workshops

1. Present and discuss how these results may affect relevant and important ecosystem services on tribal lands and sacred places
   - Conduct rapid vulnerability assessment (assess sensitivity, exposure, and adaptive capacity)

2. Interactively identify relevant adaptation strategies through hands-on activities
   - List adaptation actions, challenges to implementation, resources needed, partners, timeframe, where to implement, feasibility of success
Project Partners – Thank you!

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Carrie Berger, Northwest Fire Science Consortium
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Jonathan Treasure, The Confederated Tribes of the Warm Springs
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Brittni Kilborn, Bureau of Indian Affairs
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Stacy Schumacher, Confederated Tribes of the Umatilla Indian Reservation
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