Private forest owners and climate change adaptation: How science and society will shape future forests

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Canyon Creek Complex wildfire
August 12-October 31, 2015

CNN 2015

Blue Mountain Eagle 2015
Climate change adaptation and forest management

1. Climate change: threat multiplier and force of ecosystem change
   - Multiplies disturbances; impacts tree species

2. Private forest owners: Who are they? Where are they?

3. Climate change adaptation and forest management:
   - Ecologist perspective
   - Forest owner perspective

4. Forests of the future: Scientists, practitioners, landowners, and the road ahead
1. **Climate change**: threat multiplier and force of ecosystem change

   • Multiplies disturbances, impacts tree species
   
   • Exacerbates existing socio-ecological problems of suppression, fuels, and rising ignitions
Eastern Oregon summer temperatures warmed an average of 0.66 °F/decade 1975-2015, faster than global warming (0.30 °F)
1. **Climate change**: threat multiplier and force of ecosystem change

- Multiplies disturbances; impacts tree species
- Exacerbates existing socio-ecological problems of suppression, fuels, and rising ignitions
1. Climate change: threat multiplier

The 1910 Fires:
- 87 people died
- Instigated fire suppression policies of the 20th century

Ed Pulaski’s tunnel
Smokey the Counterproductive Bear

• Today > 95% of wildfires in the US are suppressed
1. **Climate change**: threat multiplier
   - High-grading changed forest structure
1. Climate change: threat multiplier
   - High-grading changed forest structure

Near Wenatchee, WA
1934 vs. 2010

Historically frequent low-mixed severity fires → forest heterogeneity

Absence of fire → forest homogeneity and mixed-high severity fire regimes

Credit: Hessburg et al. 2016
(Osbourne Collection, John Marshall Photography)
1. Climate change: threat multiplier
   - High-grading changed forest structure

Climate change $\rightarrow$ more frequent, larger fires
1. **Climate change**: threat multiplier
   - High-grading changed forest structure
   
   - Climate change doubled the area burned in the western US 1984-2015
1. Climate change: threat multiplier

Humans have expanded the “wildfire niche” across the US and other countries.
Firefighting costs

The U.S. Forest Service has spent a record $2 billion on fire suppression this fiscal year, with more than two weeks remaining on the fiscal calendar.

Total federal spending $2.39 billion*
Forest Service $2 billion*
$2.13 billion
$1.71 billion

Note: Total federal spending on fire suppression consists of the expenses of the Forest Service and the Department of the Interior, which includes the Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service.

Source: National Interagency Fire Center

John Blanchard / The Chronicle
1. Climate change: impacts on tree species

- **Box plot** showing the distribution of juvenile conifer presence across different heat load indices.
- **Scatter plot** demonstrating the relationship between juvenile conifer density per hectare and distance to seed source, with different symbols indicating serotiny status (0 vs. 1).

*See inset* for a detailed view of the data.
1. Climate change: impacts tree species

western larch

Mathys et al. 2014
1. Climate change: impacts tree species

Mathys et al. 2014
2. Private forest owners: Who are they? Where are they?

- 56% private
- Family forest owners control 36% of US forests
3. Climate change adaptation and forest management

Actions to reduce or avoid:

• forest cover loss
• declines in forest productivity
• alterations to ecosystem processes

• reductions in ecosystem services forests provide (wildlife, recreation, wood products)
3. Climate change adaptation and forest management: Ecologist’s perspective

- **Options**
  - Foundational adaptation concepts (after Millar et al. 2007)
  - Resistance: Buffer or protect from change.
  - Resilience: Promote the return to normal conditions after a disturbance.
  - Transition: Actively facilitate or accommodate change.

- **Concept**

- **Strategies**
  - Broad adaptation responses that consider ecological conditions and overarching management goals.
  - Maintain or create refugia.
  - Reduce the risk and long-term impacts of severe disturbances.
  - Facilitate community adjustments through species transitions.

- **Approaches**
  - More detailed adaptation responses with consideration of site conditions and management objectives.
  - Prioritize and maintain sensitive or at-risk species or communities.
  - Alter structure or composition to reduce risk or severity of fire.
  - Introduce species that are expected to be adapted to future conditions.

- **Tactics**
  - Prescriptive actions designed for specific site conditions and management objectives.
  - Reroute roads or trails away from at-risk communities.
  - Restore fire in oak forests to reduce surface fuel and promote fire- and heat-tolerant species.
  - Plant swamp white oak to replace ash lost to decline resulting from emerald ash borer.

Swanston et al. 2016
3. Climate change adaptation and forest management: Ecologist’s perspective

<table>
<thead>
<tr>
<th>Structure</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Density management</td>
<td>• Assisted migration</td>
</tr>
<tr>
<td>o Thinning</td>
<td>o Traditional or molecular breeding</td>
</tr>
<tr>
<td>o Replanting at lower densities</td>
<td>o Diversification – plant multiple species</td>
</tr>
<tr>
<td>• Fuels reduction</td>
<td>rather than monocultures</td>
</tr>
<tr>
<td>o Rx burns</td>
<td></td>
</tr>
<tr>
<td>o Manual/mechanical fuels</td>
<td></td>
</tr>
<tr>
<td>removal</td>
<td></td>
</tr>
</tbody>
</table>
Wheeler Point fire, 1996 (photo: 2016)

Replanted

Unplanted
Fuel Treatments

• Pace and scale of fuel treatments is insufficient

• 1% of U.S. Forest Service fuel treatments experience wildfire each year, and only remain effective for 10-20 years
Oregon Forest Practices Act:

“Landowners are encouraged to reforest with a mixture of acceptable tree species, where appropriate, to reduce the risk of insect and disease losses and to promote stand diversity. Seedlings or seeds used for artificial reforestation should be from seed sources that are genetically adapted to the growing site” (OFPA 2018, OAR 629-610-0050)
3. Climate change adaptation and forest management: Forest owner’s perspective

Hartter et. al. 2018
3. Climate change adaptation and forest management: Forest owner’s perspective

- [A] Climate changing due to human activities (2014)
  - Democrat: 76%
  - Independent: 57%
  - Republican: 40%
  - Tea Party: 20%
  - $n = 1578$, $p < 0.001$

- [B] Summer temps here warmer than 30–40 years ago
  - Democrat: 64%
  - Independent: 48%
  - Republican: 40%
  - Tea Party: 26%
  - $n = 1578$, $p < 0.001$

- [C] Climate changing due to human activities (2011)
  - Democrat: 66%
  - Independent: 32%
  - Republican: 18%
  - $n = 1432$, $p < 0.001$

- [D] Future temps here warmer than recent
  - Democrat: 67%
  - Independent: 48%
  - Republican: 36%
  - Tea Party: 26%
  - $n = 1578$, $p < 0.001$

Hartter et al. 2018
3. Climate change adaptation and forest management: Forest owner’s perspective

2012 Mail Survey: Please rank these potential threats to your forest lands from 1 (most threatening) to 7 (least threatening):

<table>
<thead>
<tr>
<th>Threat</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildfire</td>
<td>56.7%</td>
<td>11.3%</td>
<td>11.6%</td>
<td>6.3%</td>
<td>0.7%</td>
<td>2.6%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Insects in your trees</td>
<td>11.8%</td>
<td>37.6%</td>
<td>20.8%</td>
<td>13.0%</td>
<td>8.1%</td>
<td>3.7%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Diseases that affect your trees</td>
<td>4.9%</td>
<td>17.9%</td>
<td>34.0%</td>
<td>23.7%</td>
<td>11.0%</td>
<td>4.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Drought</td>
<td>3.7%</td>
<td>9.0%</td>
<td>9.1%</td>
<td>26.0%</td>
<td>27.2%</td>
<td>18.3%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Long-term climate change</td>
<td>2.2%</td>
<td>2.7%</td>
<td>5.7%</td>
<td>4.3%</td>
<td>12.7%</td>
<td>21.2%</td>
<td>50.2%</td>
</tr>
<tr>
<td>Extreme weather events</td>
<td>2.2%</td>
<td>6.6%</td>
<td>7.5%</td>
<td>9.3%</td>
<td>23.3%</td>
<td>31.5%</td>
<td>19.5%</td>
</tr>
<tr>
<td>Neighboring forest land</td>
<td>4.7%</td>
<td>11.3%</td>
<td>9.4%</td>
<td>15.7%</td>
<td>17.0%</td>
<td>17.9%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Other</td>
<td>13.8%</td>
<td>3.6%</td>
<td>1.9%</td>
<td>1.7%</td>
<td>0.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Landowner taking anticipatory actions:

*G14:* “Our goal is to maintain our property as a forested site in the face of climate change. . . I think that if areas in the southern Blue Mountains aren't managed it will be deforested -- burned over and not reforested.”
Examples of reactive adaptation:

_W6:_ “Yes, climate change will stress forests and trees will become disease prone and will die. Overall it may have effects on species, which ones can live in certain areas. I'm keeping an eye on it but I haven't planned explicitly for it. I’m in watch and wait mode - [I have] talked to [Local Forester] about possibly needing to thin even more if drought happens.”

_G7:_ “I'll continue to manage to reduce wildfire risk. . . If I notice it getting drier and direr and drier, then ya I'll probably thin the inventory a bit.”

_C4:_ “But no one really knows what's going to happen, we haven't thought that far in advance - we would harvest if trees got too unhealthy.”

► Uncertainty
Findings: Implementation Needs

Resource needs shared by eastern OR forest owners:

• Equipment

• Locally-focused education

• Labor pool

• More grants/cost-share programs

• **Institutional** – multi-ownership projects

• **Improved log markets/infrastructure** – profit incentive and chip/biomass market

*WH3: “We'd be more interested in thinning it out, but there's no market.”*

• Time
Political & Economic Challenges

• No market for small-diameter timber
• Weak timber market in many communities in part because of fallout from federal policies
4. **Forests of the future**: Scientists, practitioners, landowners, and the road ahead

**Barriers:**

- Inactive forest owners lack multiple resources – funds and/or economic incentives, education, equipment, labor, time
- Few are concerned by climate change, in part due to politicization of the issue
- For those who are aware and concerned, most favor **reactive adaptation**: may be effective strategy for drought (*stressor*), but potentially maladaptive for wildfire, insects and disease (*shocks*) that will increase as climate warms

**Opportunities:**

- Synergies between managing forests for improved growth and yield, wildfire mitigation, and adaptation: **“Meet people where they’re at,”** i.e. fuels management needs to happen regardless of climate change
- **Forest Management Plans** support diverse goals and may promote both **longer planning horizons** and potentially **encourage “visioning” of future conditions and potential adaptation options**
4. **Forests of the future:** Scientists, practitioners, landowners, and the road ahead

- Cutting and burning to save forests is politically controversial
  - Ecological scientists: which actions support climate change adaptation and mitigation?
  - Social scientists: How do you incentivize adaptation on private lands that provide substantial public benefits?

**Supporting private landowners:** USFS Forest Stewardship Program, state forestry agencies, NRCS, University extension etc.
March 2018: Congress passes wildfire funding fix, beginning 2020

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Source: National Interagency Fire Center

John Blanchard / The Chronicle
Adaptation Workbook
a climate change tool for land management and conservation

Get Started  About

Tailored to your location
Relevant resources and information for your location, giving you complete flexibility to build a custom adaptation plan based on your unique management goals, values, and experience.

Structured process
A logical, step-by-step process to help you consider climate change information for your location. The process helps you capture your thinking and align your goals to adaptation actions.

Peer-reviewed
Based on the best available science on climate change impacts and adaptation. You can access a library of information to learn more.

Take it with you
Create a custom adaptation plan. Save this plan to combine with other management documents and share with your colleagues.

USDA  Forest Service  NIACS
western larch: projected distribution
Partners

CAFOR: Joel Hartter (Advisor), Paul Oester, Nils Chistoffersen, Forrest Stevens, Mark Ducey, Michael Palace
Committee: Lawrence Hamilton, Carol Wessman, Carson Farmer, Tom Veblen
Assistants: Leah Bollin, Lisa Chubrilo, Michael Procko, Haley Evans, Noah Goodkind, Zach Schwartz

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