

Photo by Matt Stensland



The role of fire refugia in ecosystem recovery

Arjan J.H. Meddens

Assistant Research
Professor

Department of Natural
Resources &
Society

University
of Idaho

*Central Idaho Fire and Fuels
Workshop, McCall ID, June 11*



*Acknowledgements: Crystal Kolden, Andrew Hudak, Jim Lutz, Anthony Martinez,
Jasper Steenvoorden, Eva Strand, John Abatzoglou, and many more!!*

Gila National Forest, June 15, 2012. Credit: KC Shedden (U.S. Forest Service)



Outline:

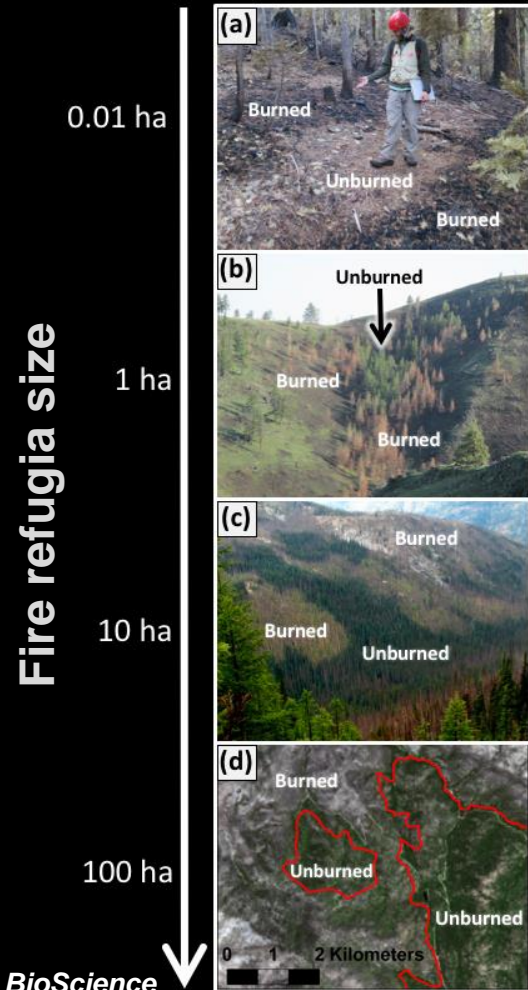
- **Short overview of fire refugia**
- **Research project 1: Detect and develop database of unburned areas**
- **Research project 2: Identify fire refugia and rank unburned islands for management purposes**
- **The importance of fire refugia in ecosystem recovery**

Overview of fire refugia

Fire refugia: Locations that are disturbed less frequently or less severely by wildfire than the surrounding landscape matrix (Krawchuk et al. 2016)

Different types of fire refugia:

- **Used by different biota (butterflies vs elk)**
- **From $<1 \text{ m}^2$ to $>100 \text{ ha}$**
- **Important at different times following fire:**
 - **During (shelter)**
 - **Immediately after (habitat, food resources)**
 - **Ecosystem recovery (biodiversity)**



Why should managers care about fire refugia:

1. Seed sources

- Forest recovery, erosion control

2. Critical habitat

- Preservation of critical species

3. Monitoring

- Invasive species

4. Preservation

- Fuel management, suppression



Research project 1: Detect unburned areas

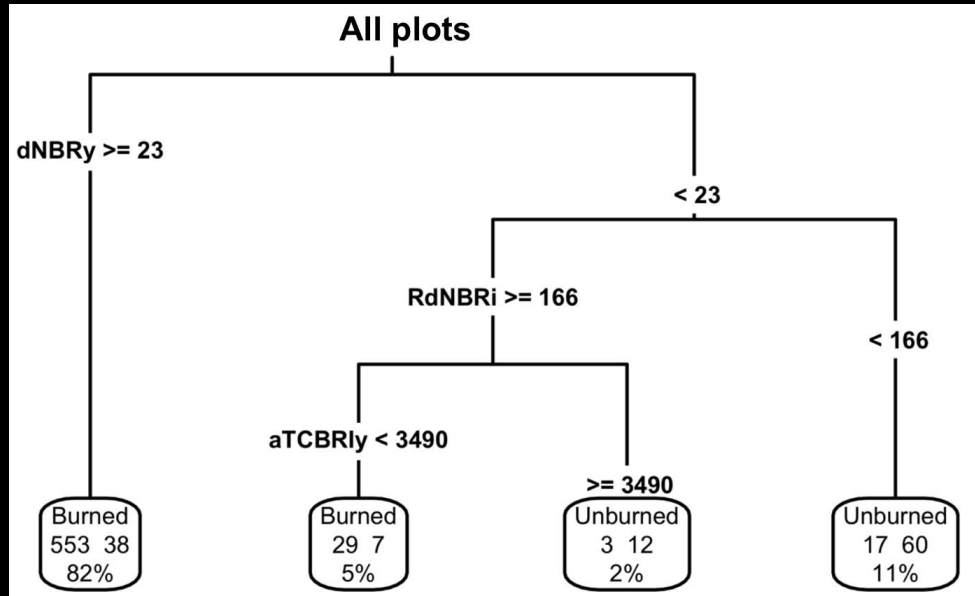
Objectives:

- Detect unburned areas across the inland northwest
- Assess spatial and temporal patterns of unburned areas
 - *Hypothesis: Unburned areas are disappearing given changing temperatures*
- Use developed unburned island database for subsequent analyses



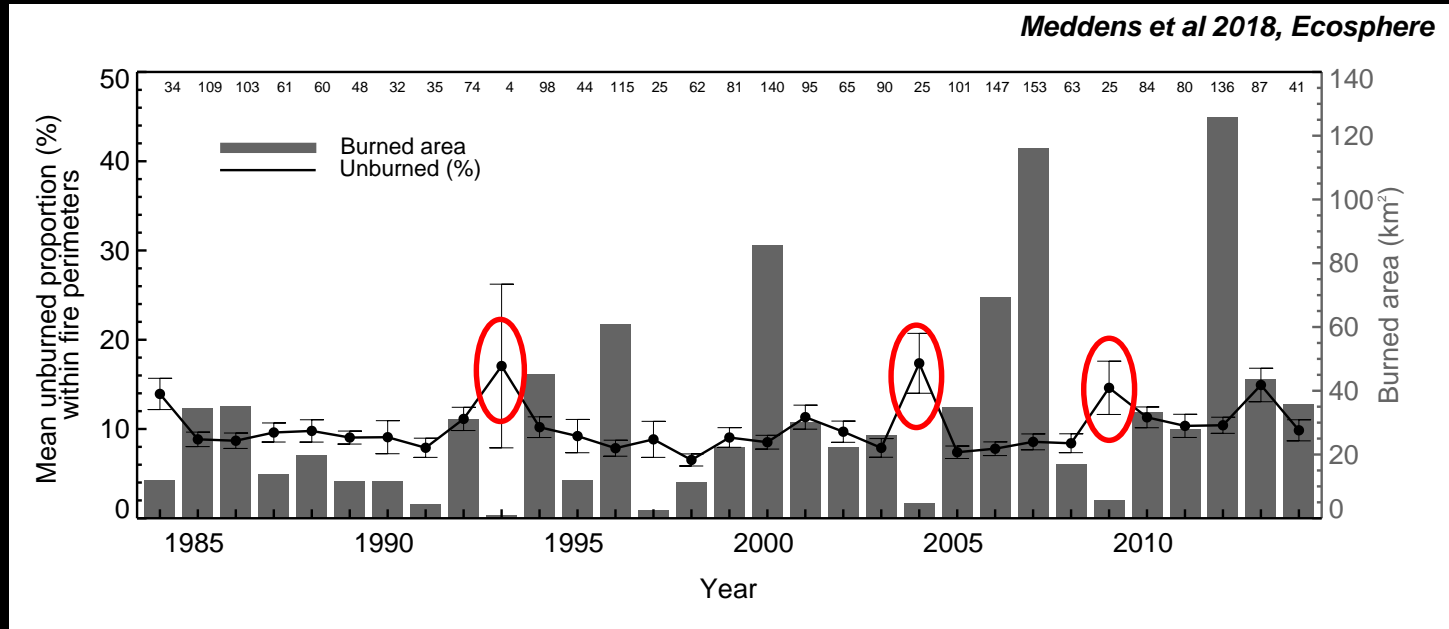
Methods

- Pre-fire, post-fire, and differenced Landsat data
- Use field locations (>850 plots) and CARTs to separate unburned from burned
- Overall accuracy: 89% (evaluated by independent data)



Results

- Apply CART algorithm to all fires (1984 - 2014) across Inland NW



- No significant trend → Refugia are not (yet?) disappearing
- Exceptionally low fire years have increased unburned proportion → Moist years (?) equals more unburned area

Research project 2: Ranking unburned areas

Unburned areas \neq fire refugia

(e.g., roads, rocks, etc.)

But some are:

- **Old growth forest (spotted owl)**
- **Unburned patches of grassland (sage-grouse)**



Objectives

- **Develop methods for ranking the importance of unburned areas within the NW**
- **Identify and characterize important unburned areas (fire refugia) for management**

Methods

Co-produce importance ranking with land managers:

- 1) Organize workshop
- 2) Participatory GIS

Develop ranking system:

- 1) Spatial explicit
- 2) Incorporates geospatial data and expert knowledge

Are you a land manager?

Help us understand how you would manage fire refugia – Take our Participatory GIS survey!

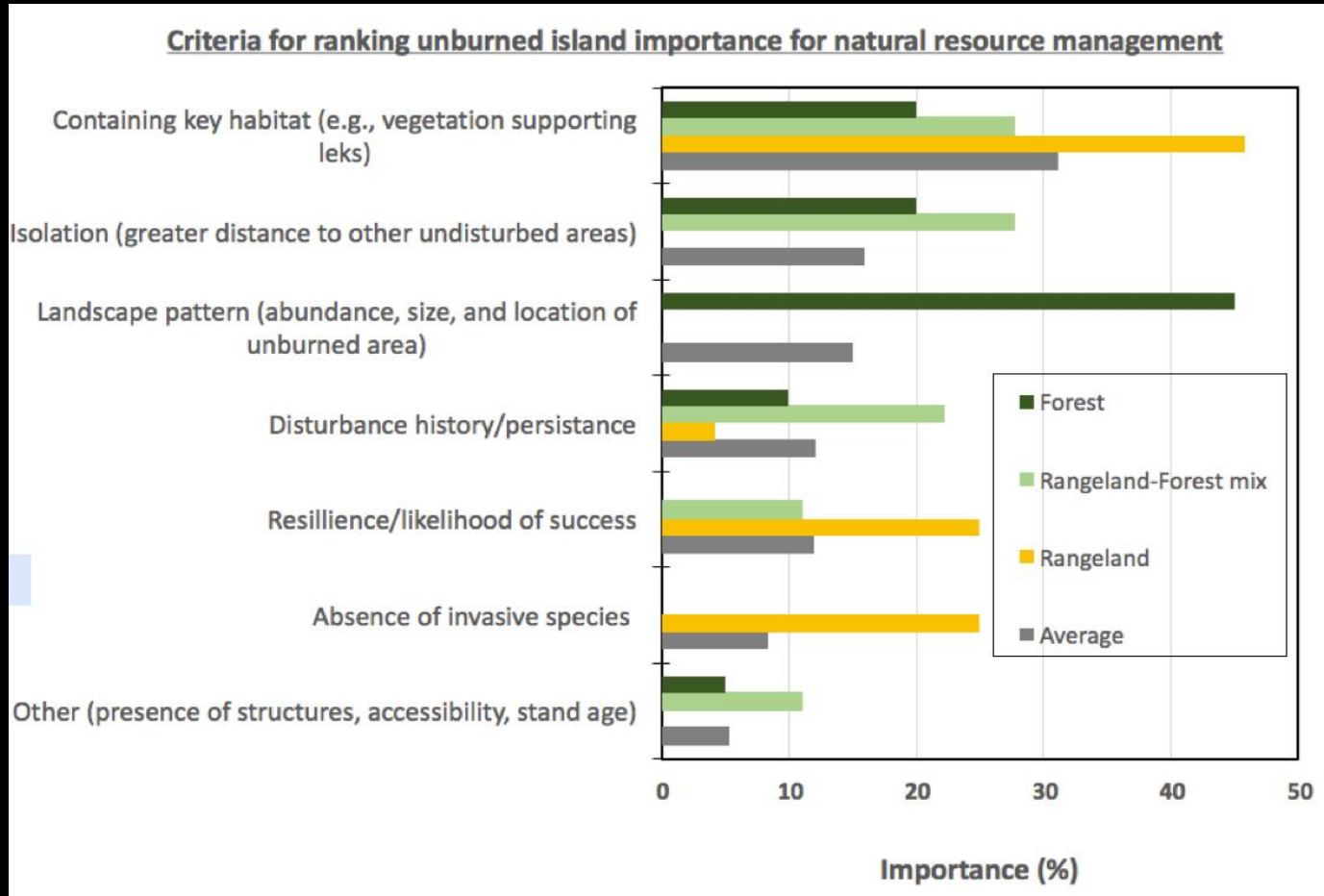


For a survey link, please email ajmartinez@uidaho.edu or ameddens@uidaho.edu

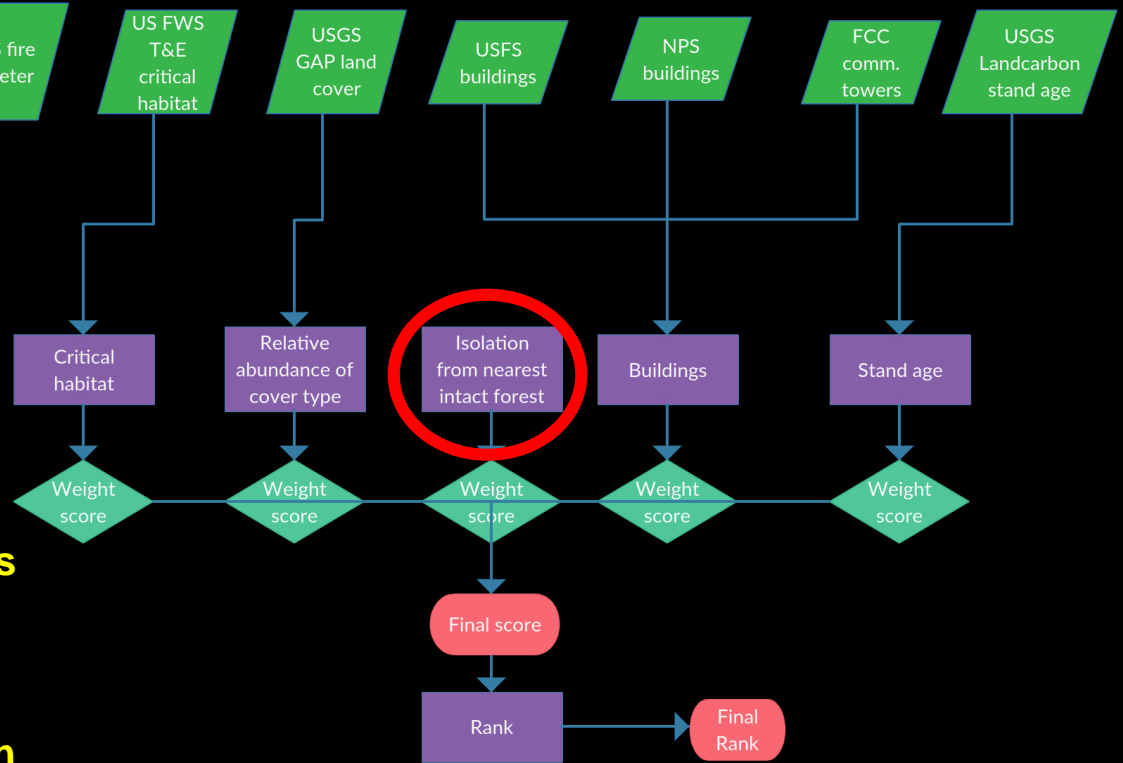


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May 2017 – Workshop outcomes



Ranking unburned areas

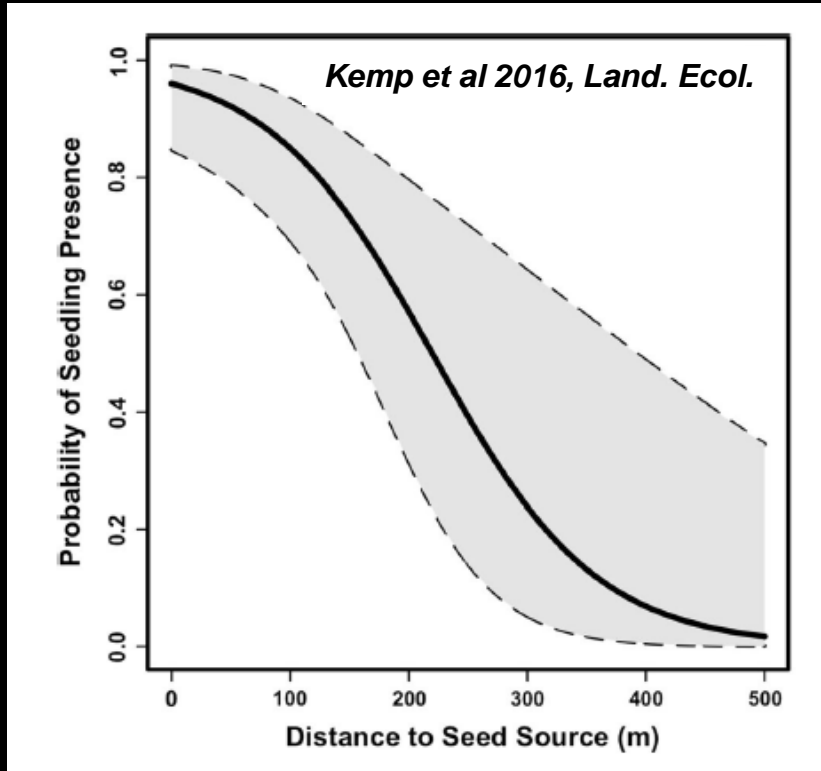


- **How?**

- **Using multiple criteria identified by managers as important to refugia**
- **Criteria combined using Environmental Evaluation Modeling System (EEMS)**

The importance of fire refugia in ecosystem recovery

- Distance to seed source is important



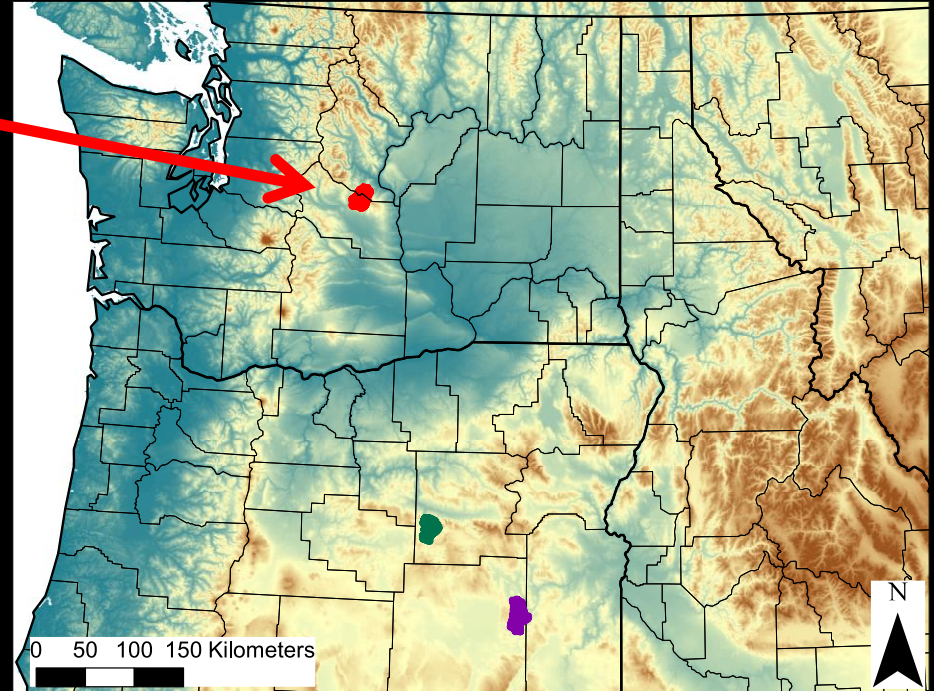
Conclusions:

- 1) Fire refugia strongly promote natural forest regeneration
- 2) Small patches of trees in burn interiors → especially valuable for forest recovery

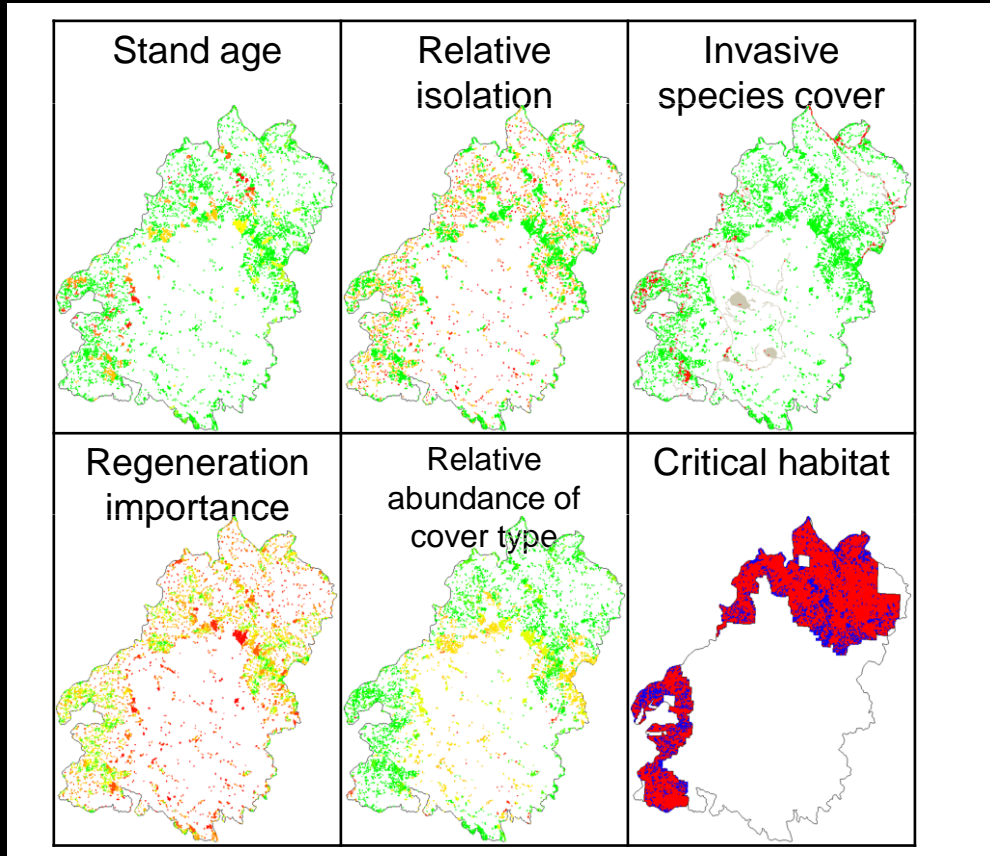
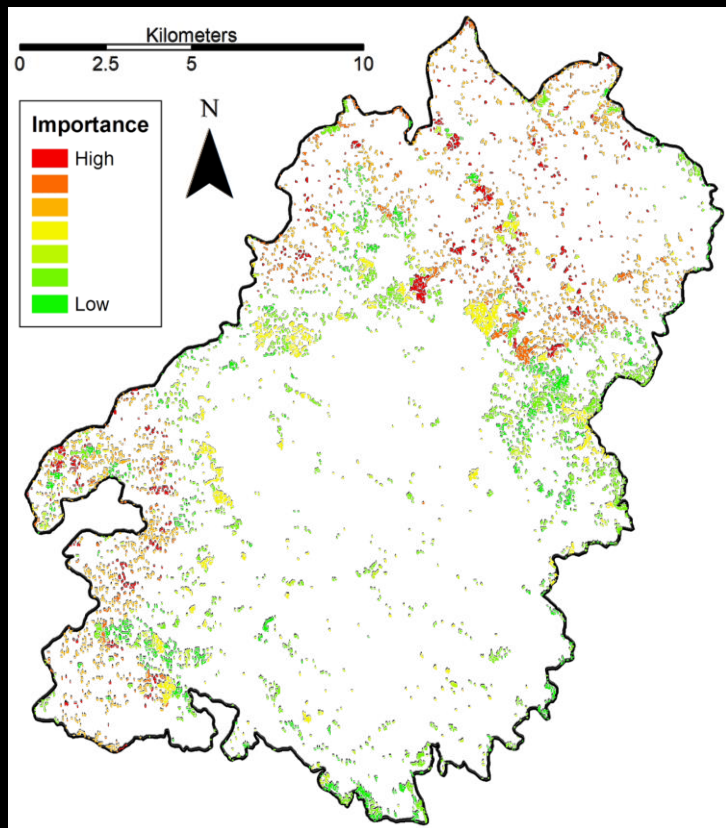
- Modeling fire refugia effects on regeneration (Coop et al. in prep)

Ranking unburned areas: Preliminary results

- **Table Mountain Fire (WA, 2012, 66,000 acres)**
- **Overall goal: More effectively manage post-fire landscapes through management actions**



Ranking unburned areas: Preliminary results



Summary:

1. Unburned areas → Fire refugia (if consists critical habitat for biota) or when unburned for longer time (old growth)
2. No trend in overall unburned proportion across the inland northwest; more research is needed to asses dynamics of important unburned areas
3. Fire refugia are important for resource management: Improve landscape resiliency and enhance ecosystem recovery



Thank you!

Questions or comments...?



Are you a land manager?

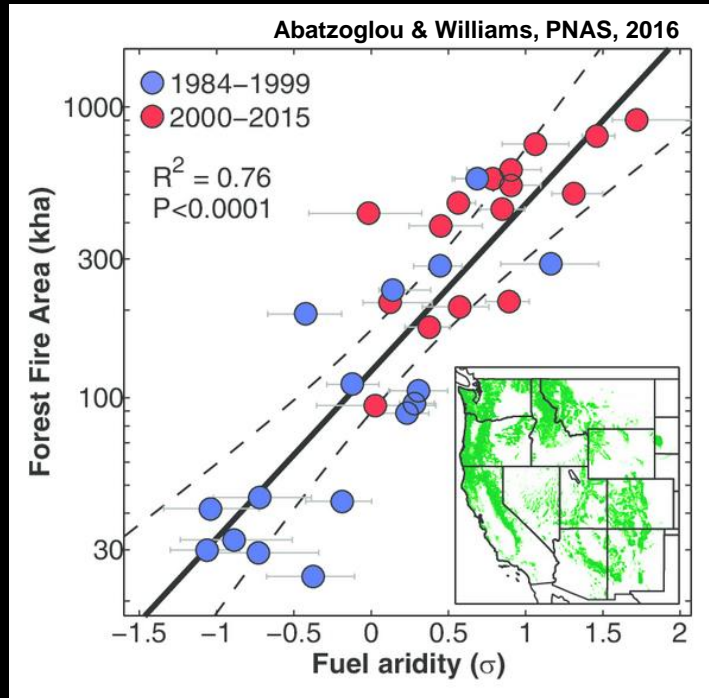
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Climate change and fire refugia



Climate change driver of increased forest fire activity

