

Managing Your Forests for Forest Health

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Today's Outline

- Tree health vs. Forest health
- Silviculture is key...on the ground
- Future considerations
- How to do it?



Tree Health and Forest Health

- **Tree Health**

- The obvious condition of a tree.

- **Forest Health**

- Your values applied to a particular area of forested land.

- **Management of...**

- Forest Pests and Pathogens
- Biodiveristy
- Wildlife
- Ecological services
- Endangered species
- Fire



White pine blister rust,
Wind River, WA

Tree Health

- Condition of the tree.
- Forest pathogens and insects pests ...their direct interaction with the tree.
- Does the tree just sit there and take it????

• **NO**



Example: Compartmentalization of decay

After a tree is wounded, the cambium begins to form a new protective wall.

The wall is both an anatomical and a chemical wall.

This wall separates the tissue present at the time of wounding from tissue that forms after.

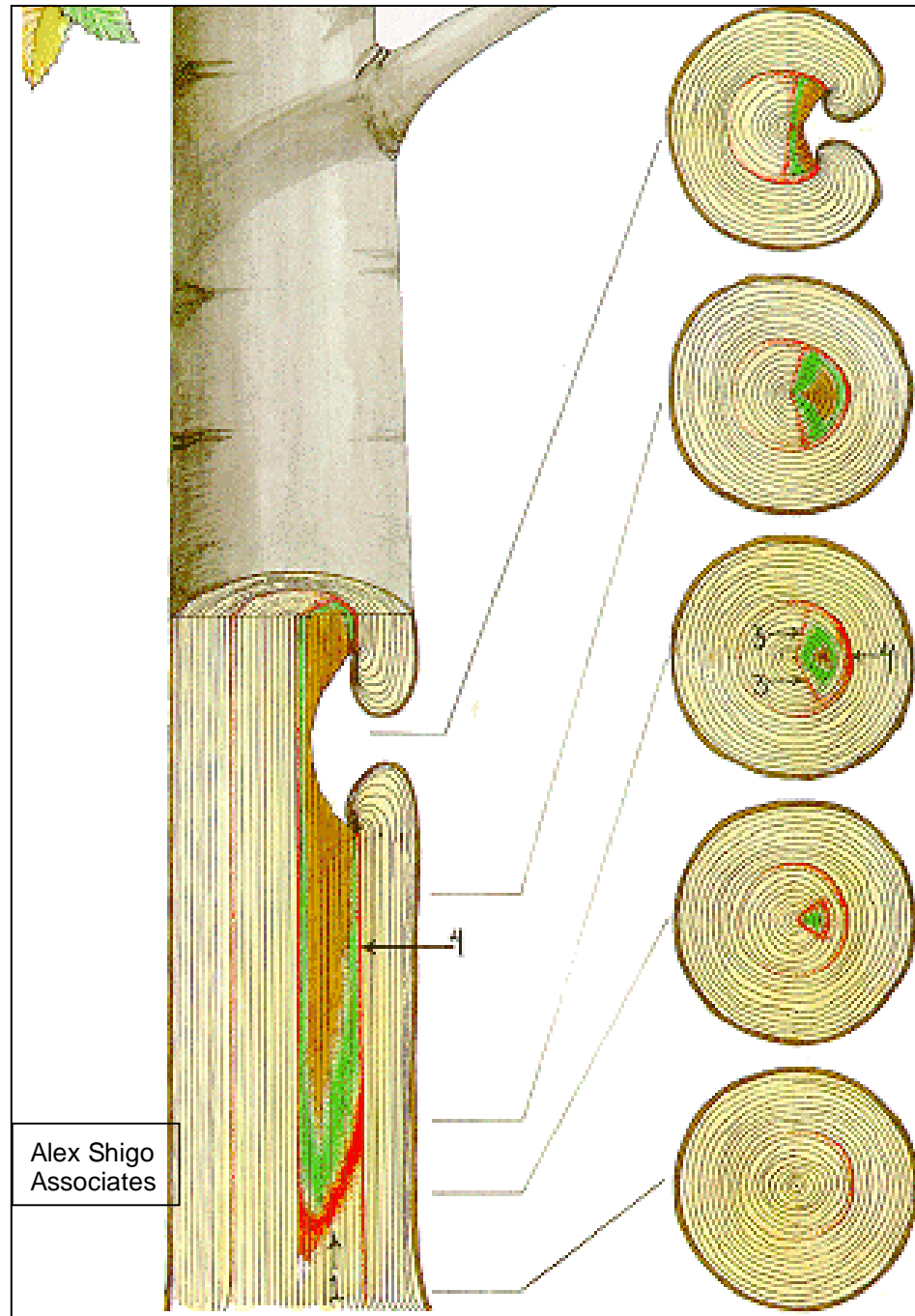


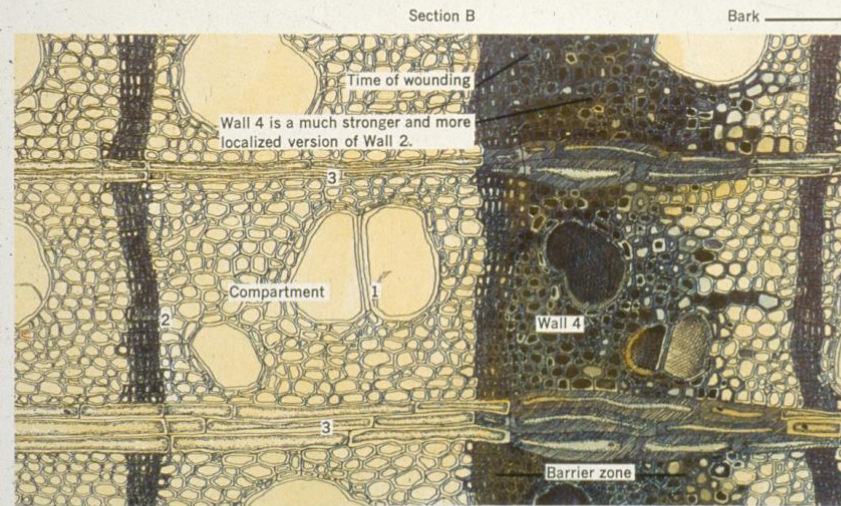
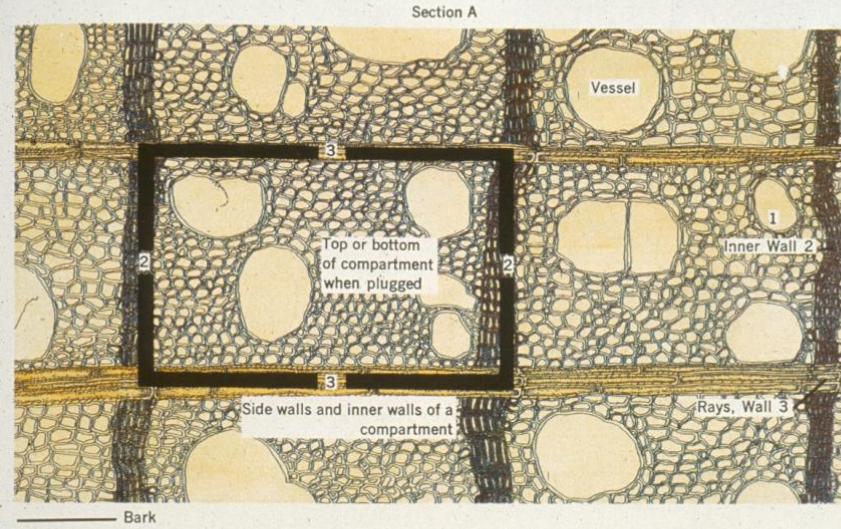
Compartmentalization:

Red-Tree response
(chemical protective
reactions).

Green-pioneer
microorganisms

Brown-decayed wood





1—Top and bottom walls are weakest walls 2—Inner wall 3—Ray wall
4—Barrier zone equals strongest wall

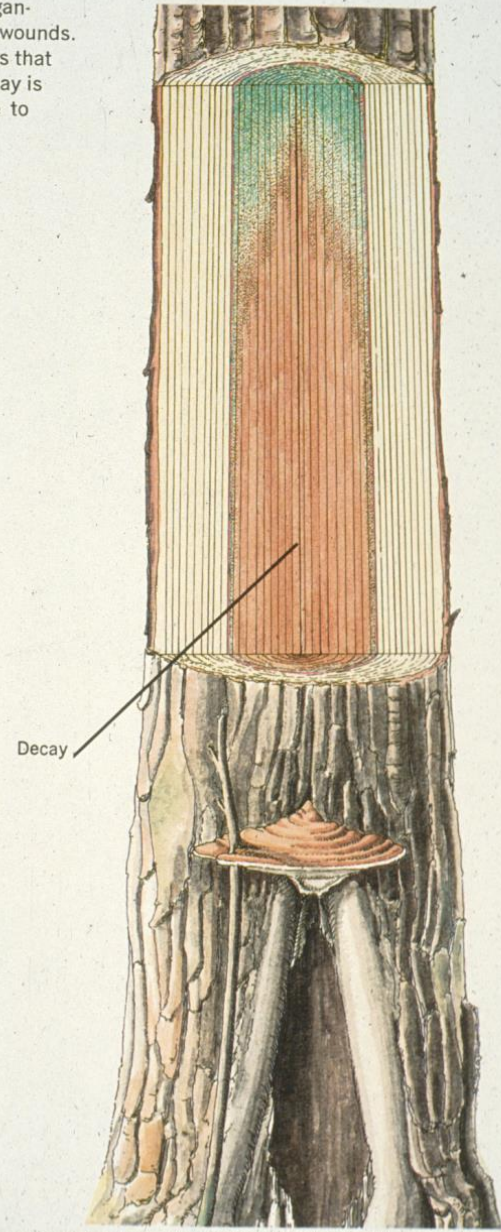
Hardwood

Normal
Growth
Ring

Protective
Growth
Ring



Wood-inhabiting microorganisms enter trees through wounds. Wounds start the processes that can lead to decay. And decay is a major cause of damage to trees.





Armillaria

on

Western
Hemlock

from

wound

Pine Butterfly

Theoretically..

The foliage that
grew back after
defoliation was
really different.

Tougher, and
more defensive
chemicals



Forest Health

- Numbers and patterns of “sick” or dead trees
- Ecological benefits of native insect pests and pathogens
- Rate of mortality/year
- Fire occurrence, severity
- Biodiversity
- Ecosystem services



Biodiversity

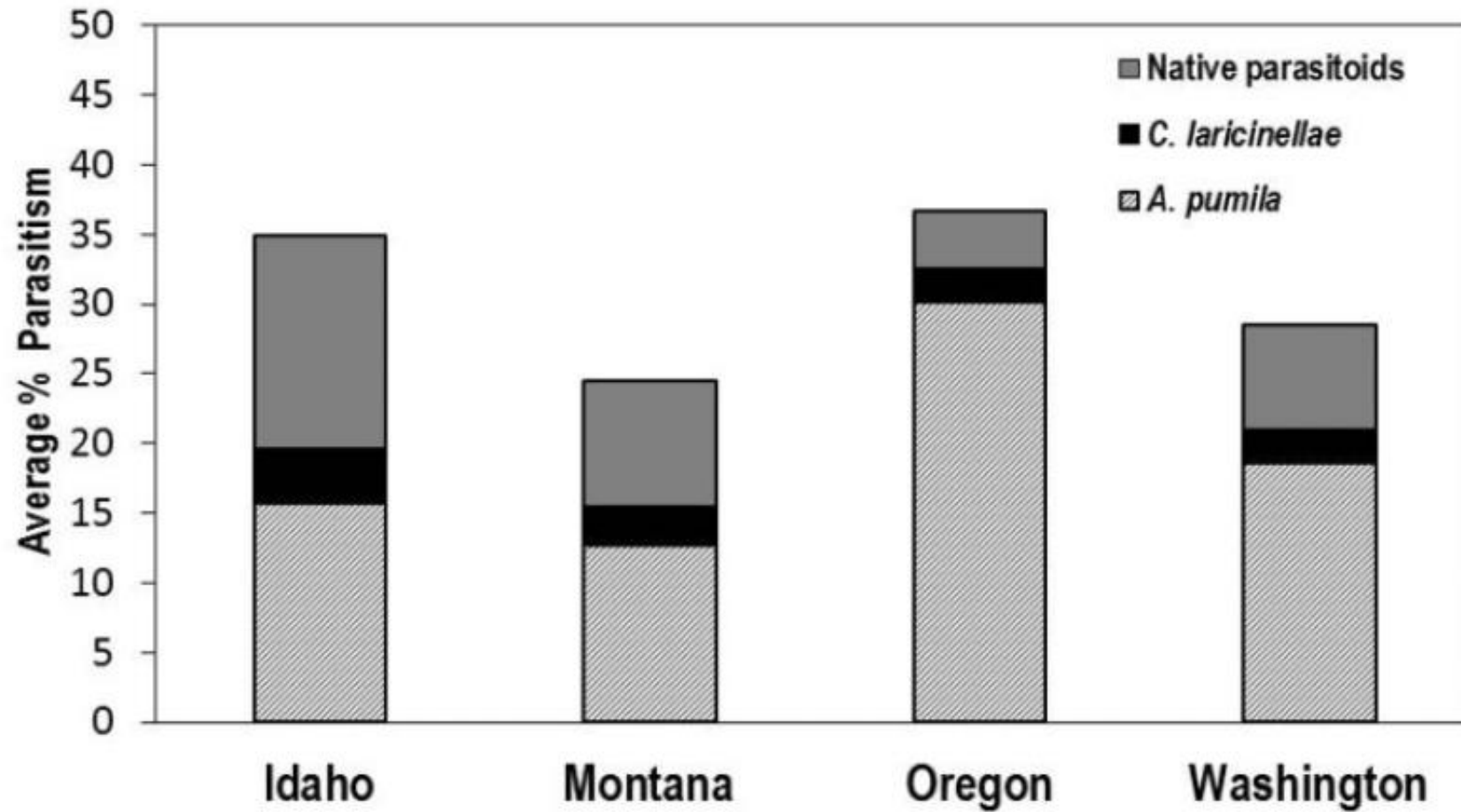


Fig. 4. Average parasitism rates in each state for native parasitoid species, *Agathis pumila*, and *Chrysocharis laricinellae*.

Ecosystem services



On the ground: Silviculture is key

- Active management of forests, stands, plantations:
 - Requires the science of Silviculture
 - Provides an objective framework to achieve goals
 - Plans for long-term

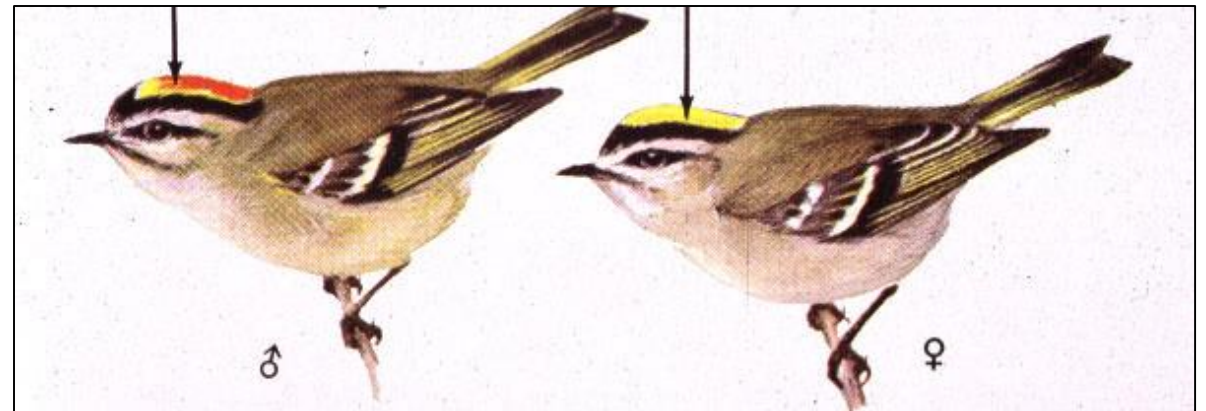


Fuels treatments

- Obvious need in western forests
- Everywhere?
- Is thinning the answer?
- Impacts of ground-based operations



Resiliency is dependent
on biodiversity:
Keep all the pieces



Protect the soil

- There is only one thing left after all the trees are gone....
- Soil takes 1,000's of years to develop.
- Keep soil on the mountain!



- I know you are gonna ask about assisted migration.

- I am opposed to assisted migration

- except in the context of regional improvements in species growth or forest plantations

- and adjustments in elevation and latitude for native species.

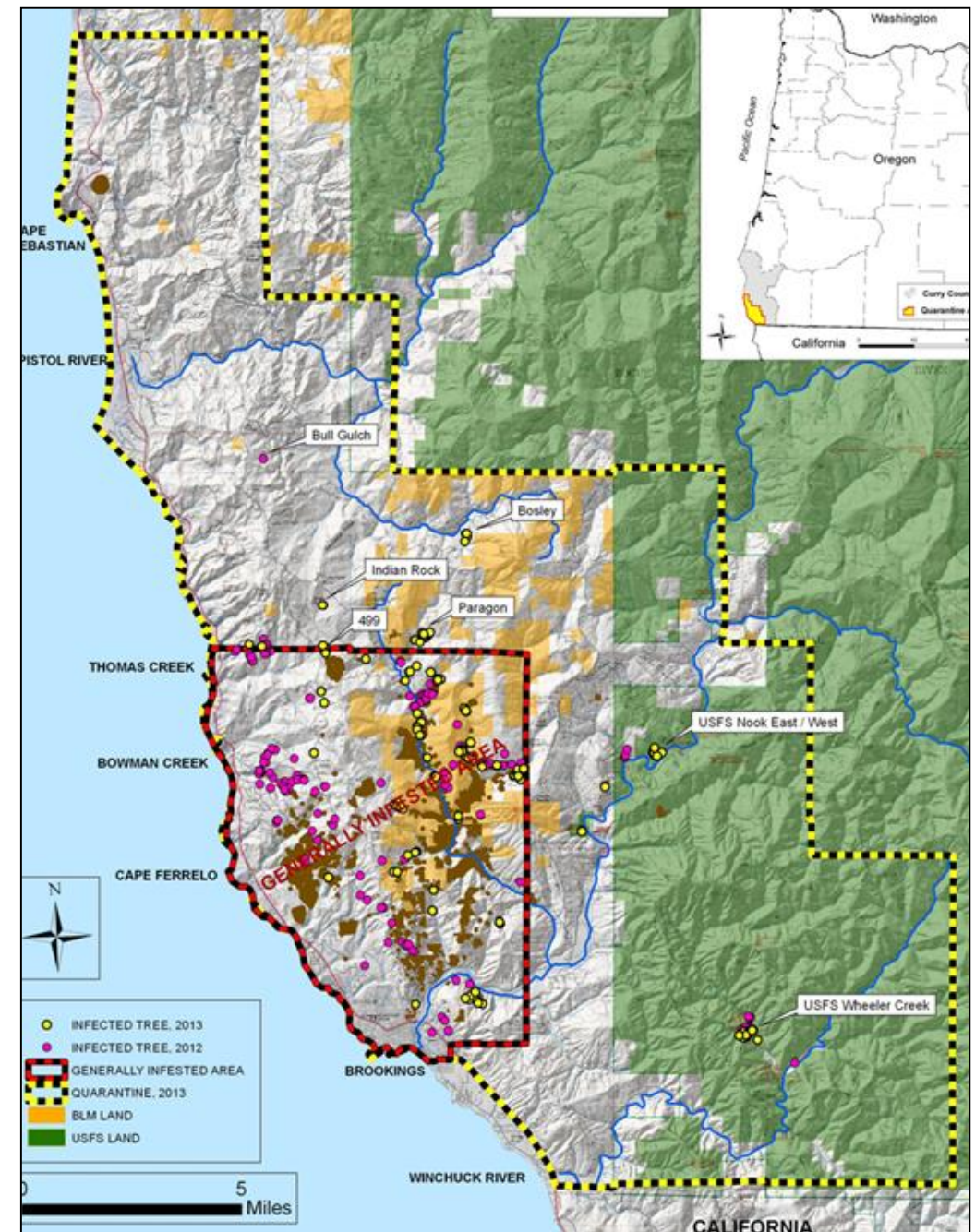
Future considerations



<https://www.climatecents.org/beat-the-drought-by-planting-more-trees/#!/>

Assisted migration

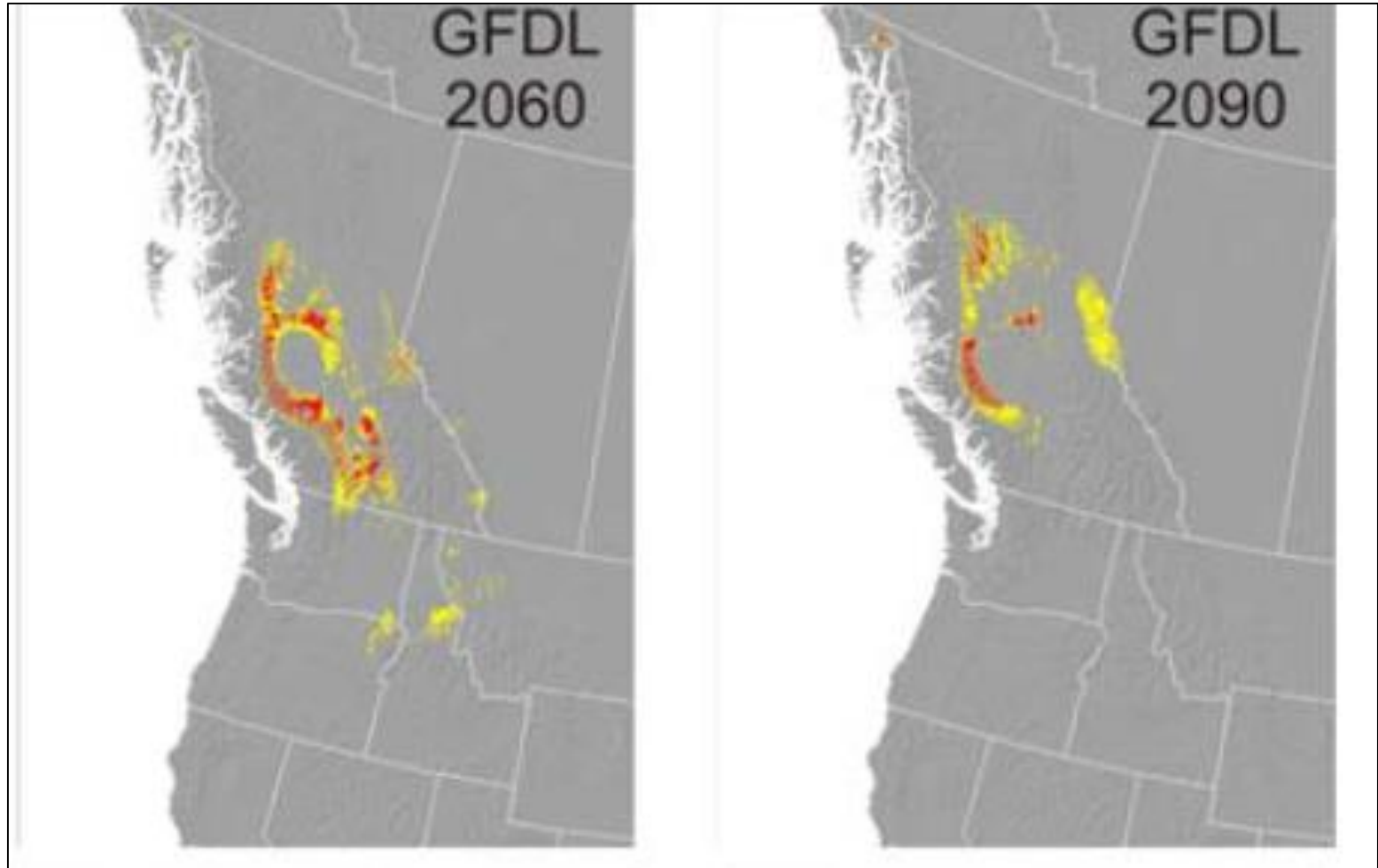
- The threat of invasive species:
 - Do not transport soils.
 - Phytophthoras!!!
 - Do not transport live plants across continents
 - Your new tree could turn into a pest



Sudden oak death quarantine map. SW Oregon

Assisted migration

- Interpret models with caution
- Major investments in movement should be supported by field trials
- Conservation of native biodiversity is a priority
- New trees change soils and trophic dynamics



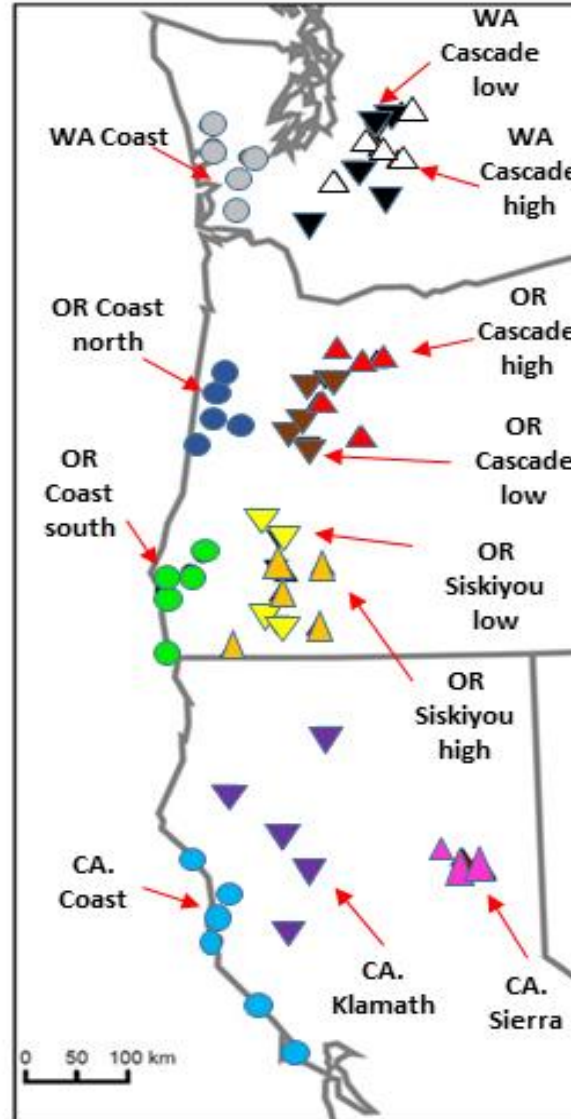
Prediction of western larch future habitat suitability

Reciprocal Planting Studies

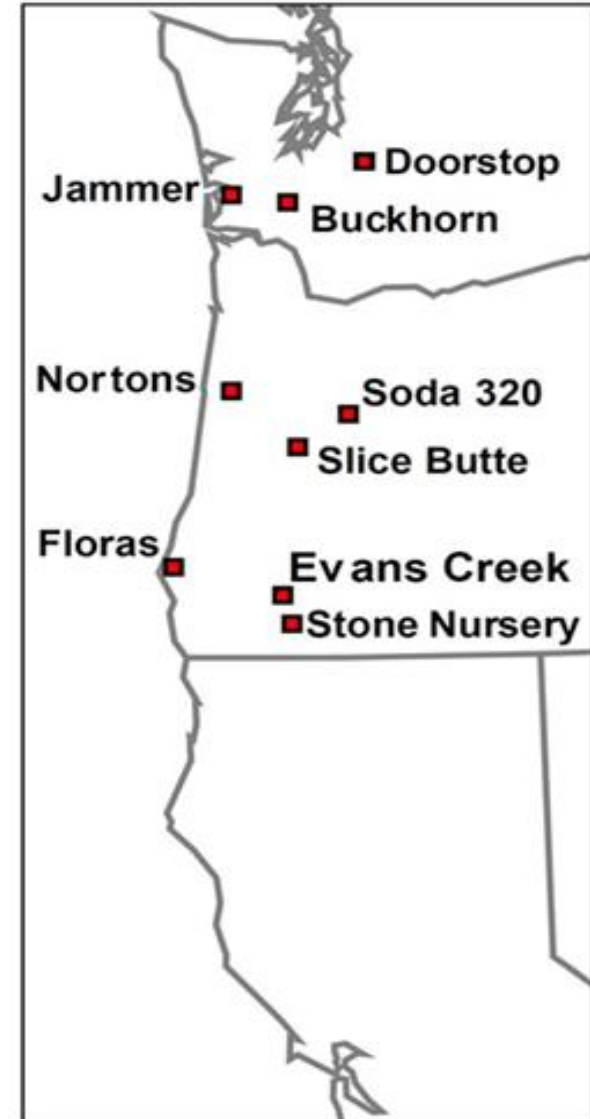
Harrington and
St. Clair

Douglas-fir seed
source
movement trials

60 Populations



9 Planting Locations



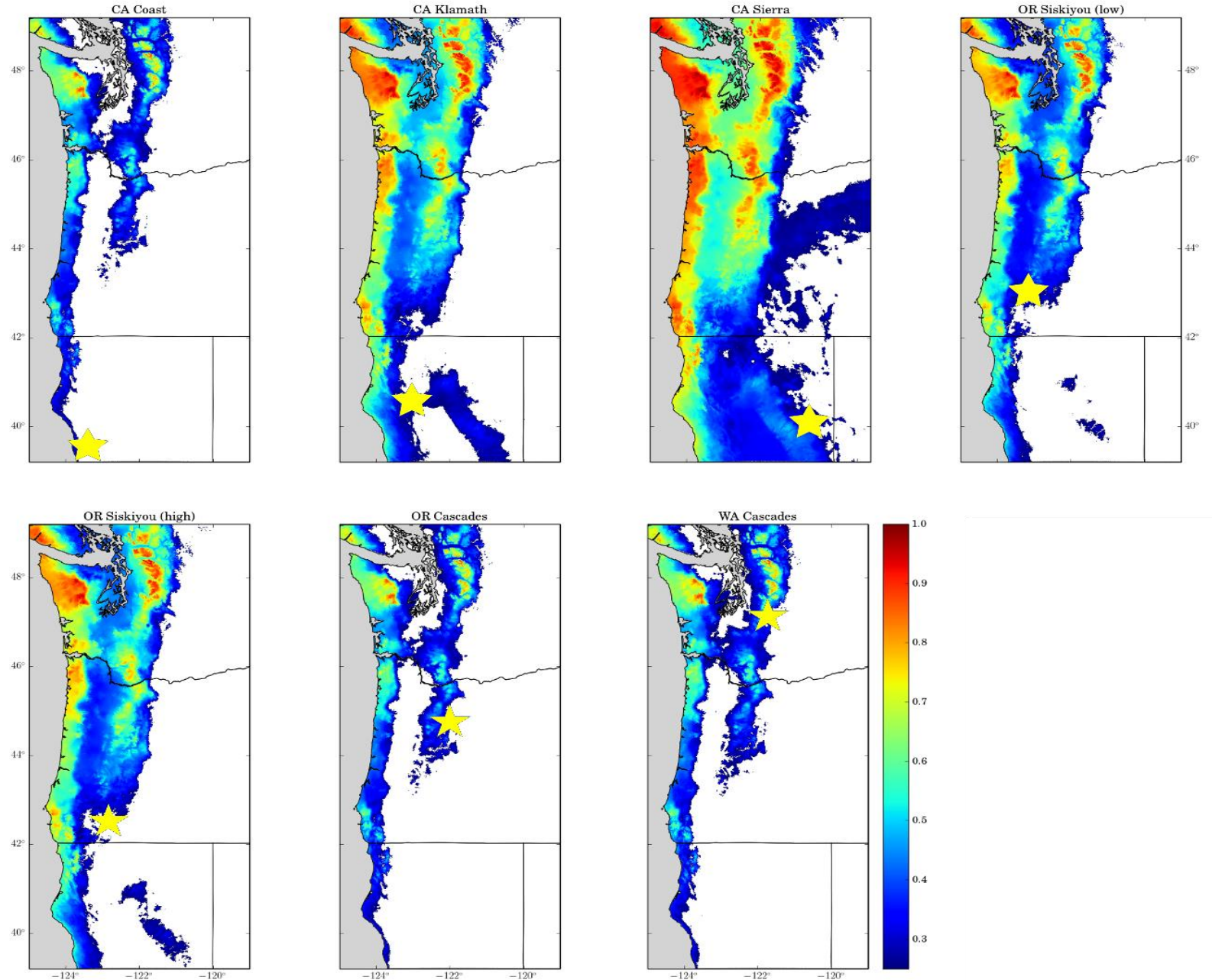
Douglas-fir and foliage disease

Rhabdocline

Star = origin

Red = hammered

From N. Wilhelmi
MS Thesis, OSU



Assisted Migration

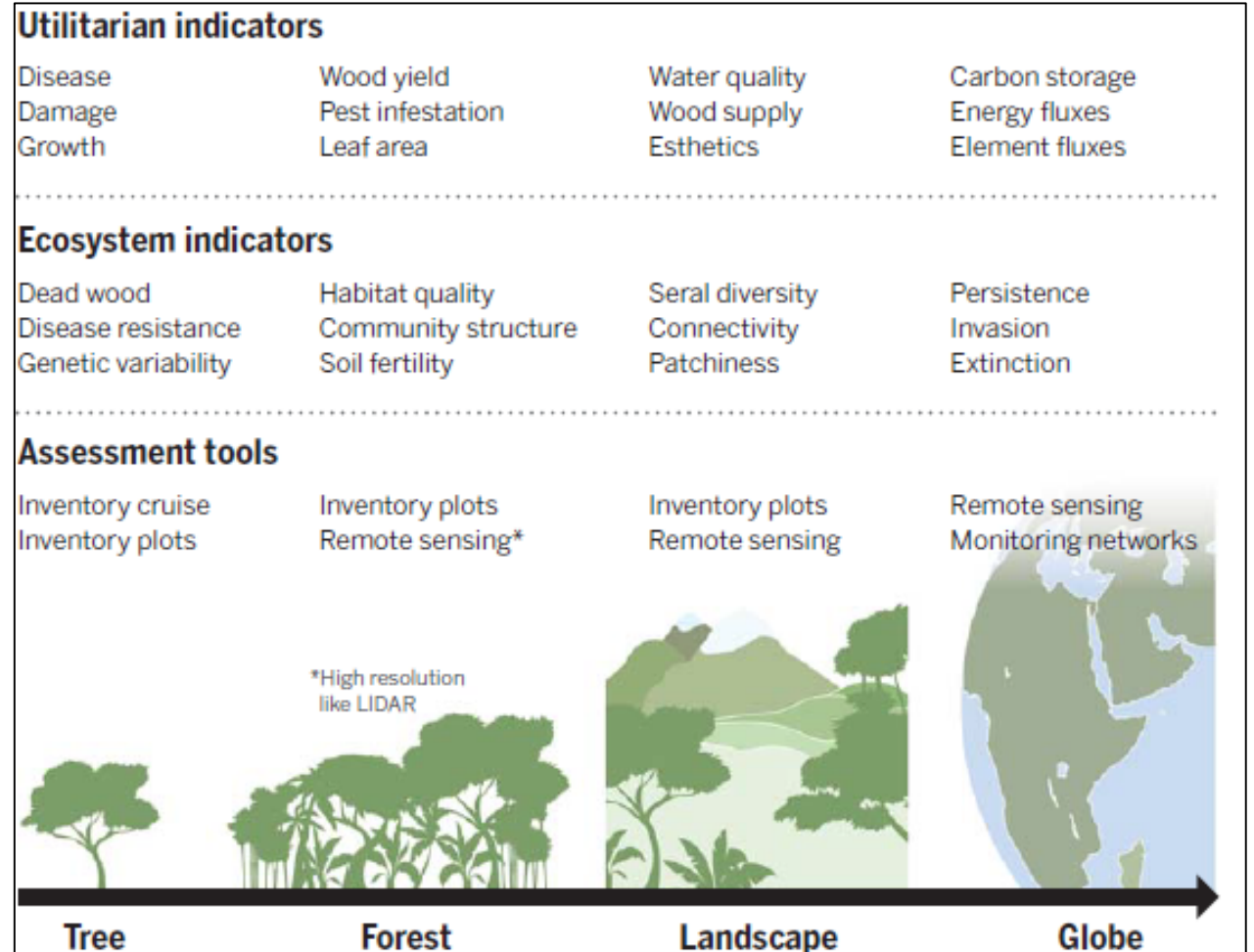
- What is goal?
 - Keep green stuff on the landscape?
 - Timber?
 - Biodiversity?
 - Restoration?
 - Ecosystem services?



<http://www.patheos.com/blogs/allergicpagan/2015/04/24/arb-or-day-earth-day-for-procrastinators/>

How to do it! Forest Health Management

- Aerial detection survey
- Ground based monitoring
- Remote sensing
- Research
- Integration of monitoring and research
- Outreach and collaboration with Foresters



- Aerial Detection Survey
- USDA Forest Service and Oregon Dept of Forestry



This data is very important

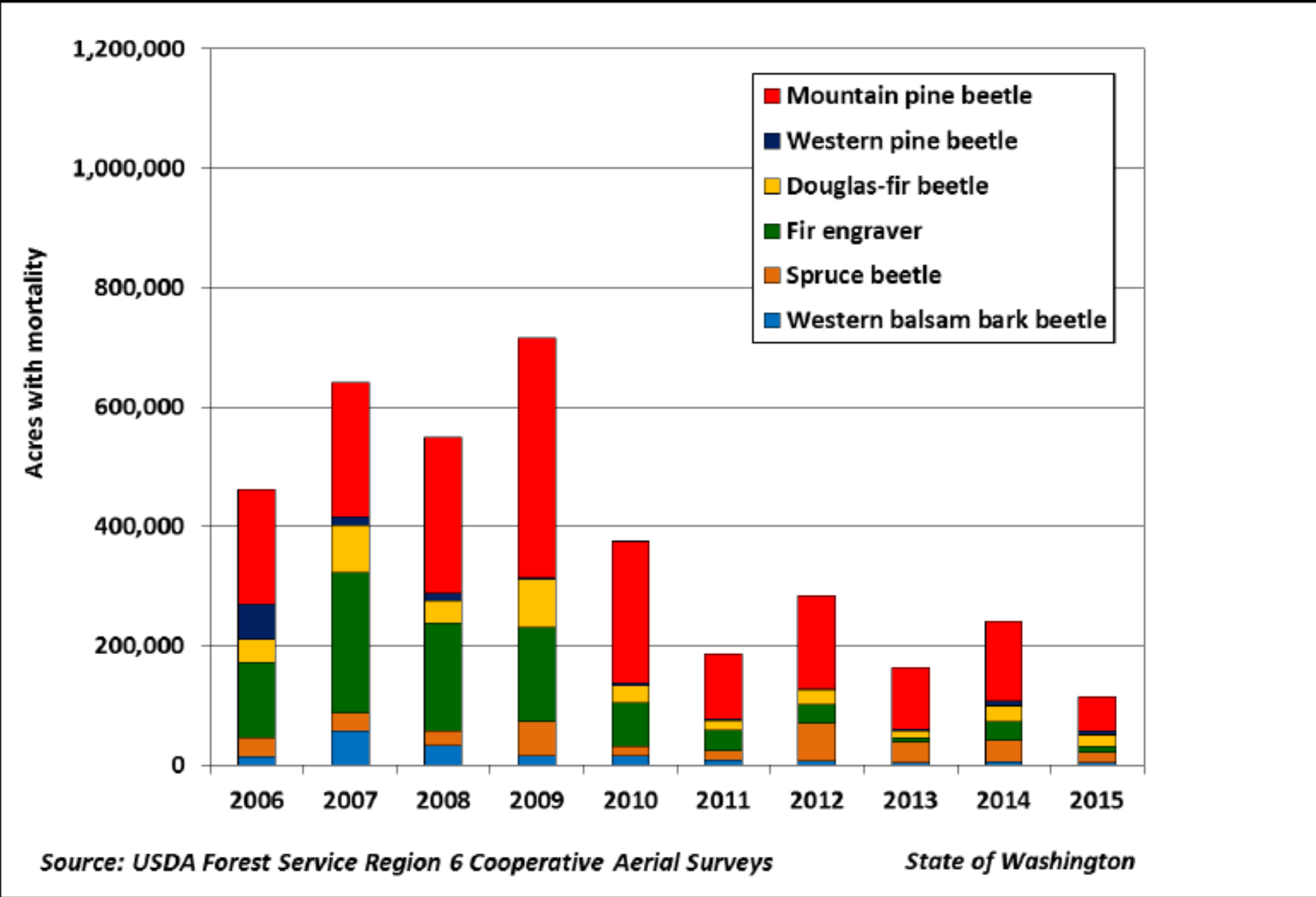


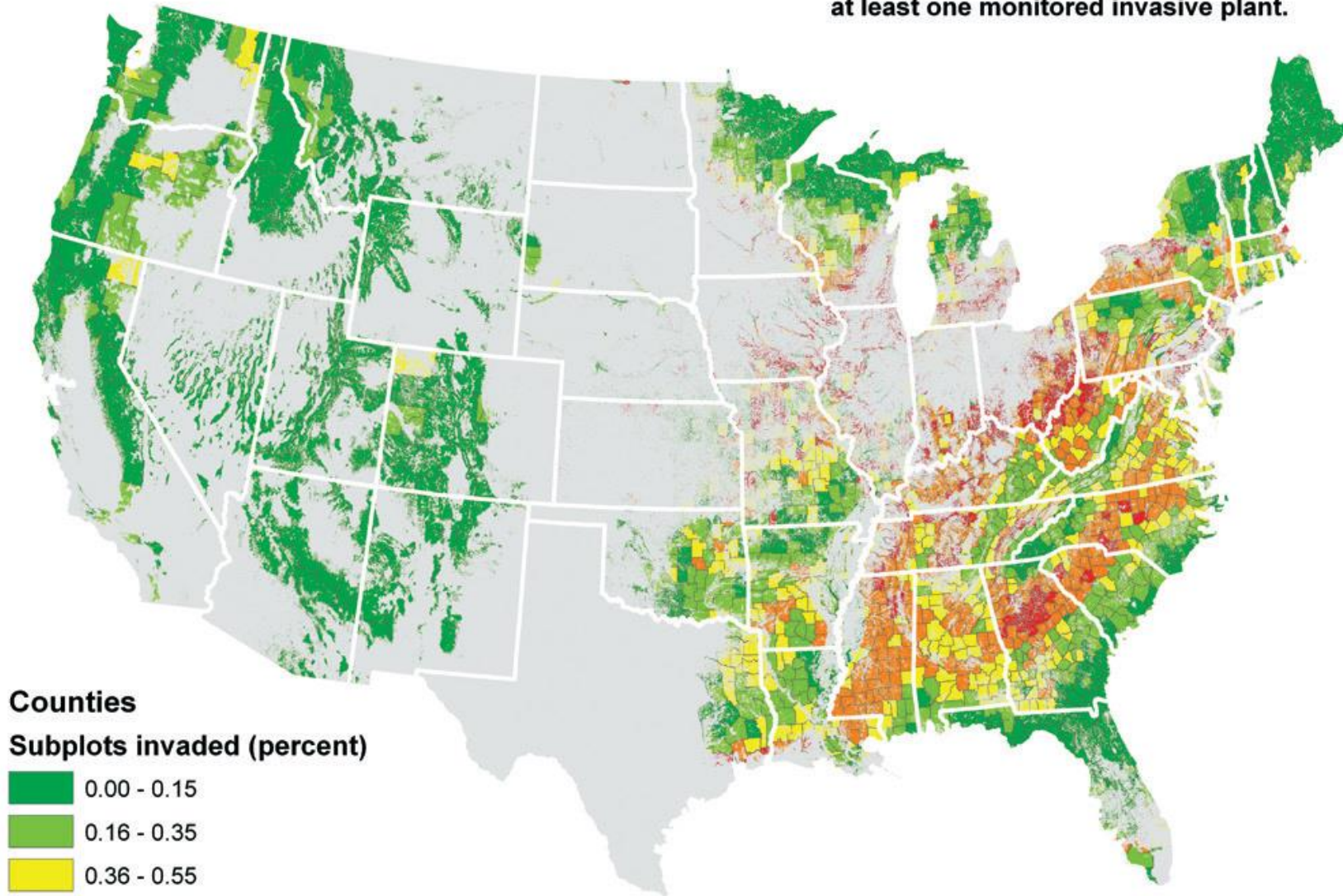
Figure 21. Ten-year trend of tree mortality attributed to bark beetles by annual aerial survey in Washington, 2006-2015.

On the ground: monitoring

The screenshot shows the USDA Forest Service Forest Inventory and Analysis National Program website. The main heading is "Forest Inventory and Analysis" in large red text. Below it, a "Welcome to our site" section includes the tagline "We are the Nation's Forest Census" and a brief description of the FIA program. A sidebar on the left contains navigation links for "U.S. Forest Service", "Forest Inventory & Analysis", "Regional Offices", "Program Features", "FIA Data and Tools", "FIA Library", "FIA Symposium", "Links", "Contact Us", and "Site Map". A vertical menu on the right lists "Reports on Forest Resources of the U.S.", "Program Accountability: Strategic Plans, Annual Reports, National User Group Notes", "Most Recent FIA Data By State", "Engagement Portfolio", and "2015 FIA Carbon Estimation Tables". At the bottom, there are four featured content boxes: "Forest Inventory and Analysis Report", "Forest Facts Tables" (available in multiple languages), "FIA Phase 2 User's Manual", and a "Go" button. The footer includes "USDA Forest Service", "Last Modified: April 20, 2016", and "Disclaimers | Privacy Policy | Print This Page".



Percent of forested subplots invaded with at least one monitored invasive plant.



Counties

Subplots invaded (percent)

- 0.00 - 0.15
- 0.16 - 0.35
- 0.36 - 0.55
- 0.56 - 0.80
- 0.81 - 1.00

Southern Research Station,
Forest Inventory & Analysis Program.
Christopher M. Oswald, March 2013.



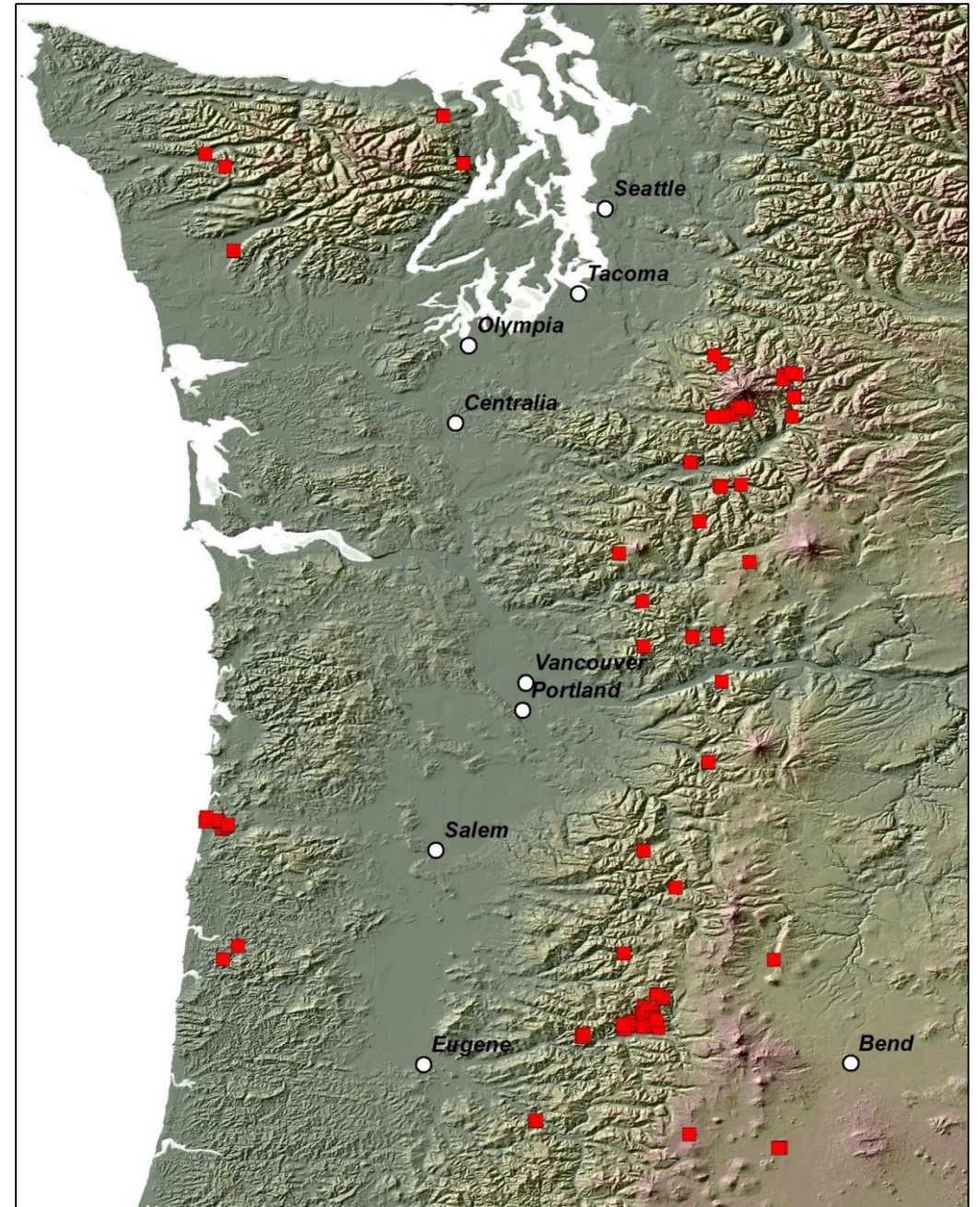
0 145 290 580 Miles



FIA Data used to show invasive species distributions

Regional plot networks

- Regional plot networks support the FIA framework with more focused data.
- Example at right:
 - Permanent Sample Plot System
 - PNW Research Station, HJ Andrews Experimental Forest and LTER, OSU, UW, WSU, USU, UM
 - **135 installations measured every 5-6 years**
 - Slide Rob Pabst



PSP data availability

- Archived in the Forest Science Data Bank (FSDB) since 1984
- On-line and downloadable since 2003

The screenshot shows a web browser window with two tabs for 'Andrews Experimental Forest...'. The address bar contains the URL: `andrewsforest.oregonstate.edu/data/abstract.cfm?dbcode=TV010&topnav=97`. The page header features the logo of the HJ Andrews Experimental Forest, which includes a stylized tree and a salamander, and the text 'HJ Andrews Experimental Forest Long Term Ecological Research'. Navigation links for 'Login', 'Donate', and 'Contact Us' are present, along with social media icons for Twitter, Facebook, and RSS. A search bar is also visible. The main content area has a dark blue navigation bar with links for 'Home', 'About', 'Research', 'Data', 'Publications', 'Outreach', and 'People'. Below this, the title 'TV010' is displayed in large, bold letters. The subtitle reads: 'Long-term growth, mortality and regeneration of trees in permanent vegetation plots in the Pacific Northwest, 1910 to present'. A list of bullet points provides details about the project: PI (Mark E. Harmon), Originator (Jerry F. Franklin), Other researchers (Robert J. Pabst, Charles B. Halpern, Janneke HilleRisLambers, Andrew J. Larson, James A. Lutz, Mark E. Swanson, James Freund, Paul A. Harcombe, Todd M. Wilson, Kenneth J. Bible, Julia A. Jones), Dates of data collection (Feb 1 1910 -), Data collection status (Study continues and further data collection is planned), Data access (Online), Access constraint (Stands from the Andrews Experimental Forest and from the Hemlock-Spruce series are available except for the most recent remeasurement), and Last update (Mar 19 2015 (Version 8)). At the bottom, there are three links: '<Citation>', '<Acknowledgement>', and '<Disclaimer>'.

Andrews Experimental Forest... x Andrews Experimental Forest... x +

andrewsforest.oregonstate.edu/data/abstract.cfm?dbcode=TV010&topnav=97

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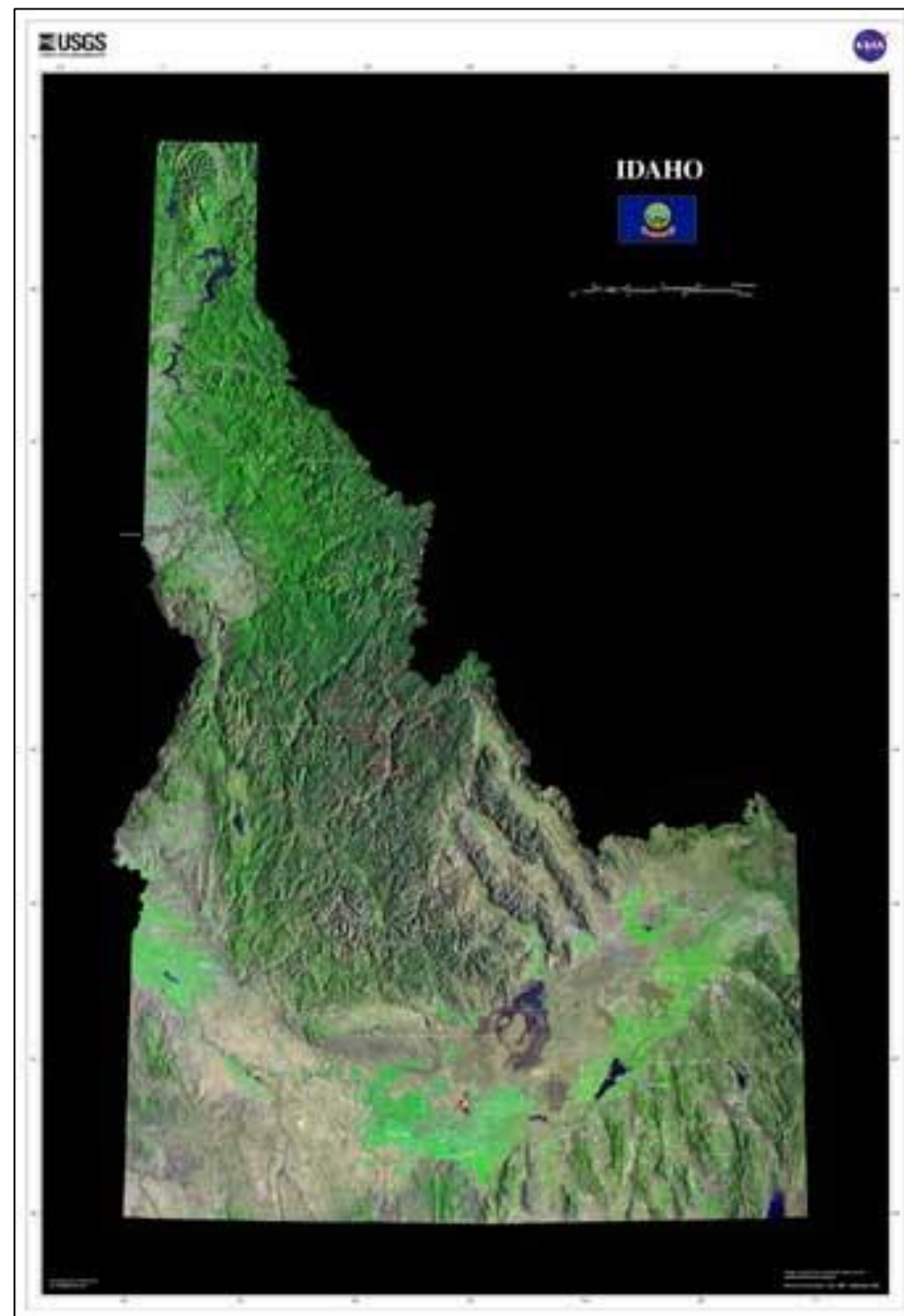
TV010

Long-term growth, mortality and regeneration of trees in permanent vegetation plots in the Pacific Northwest, 1910 to present

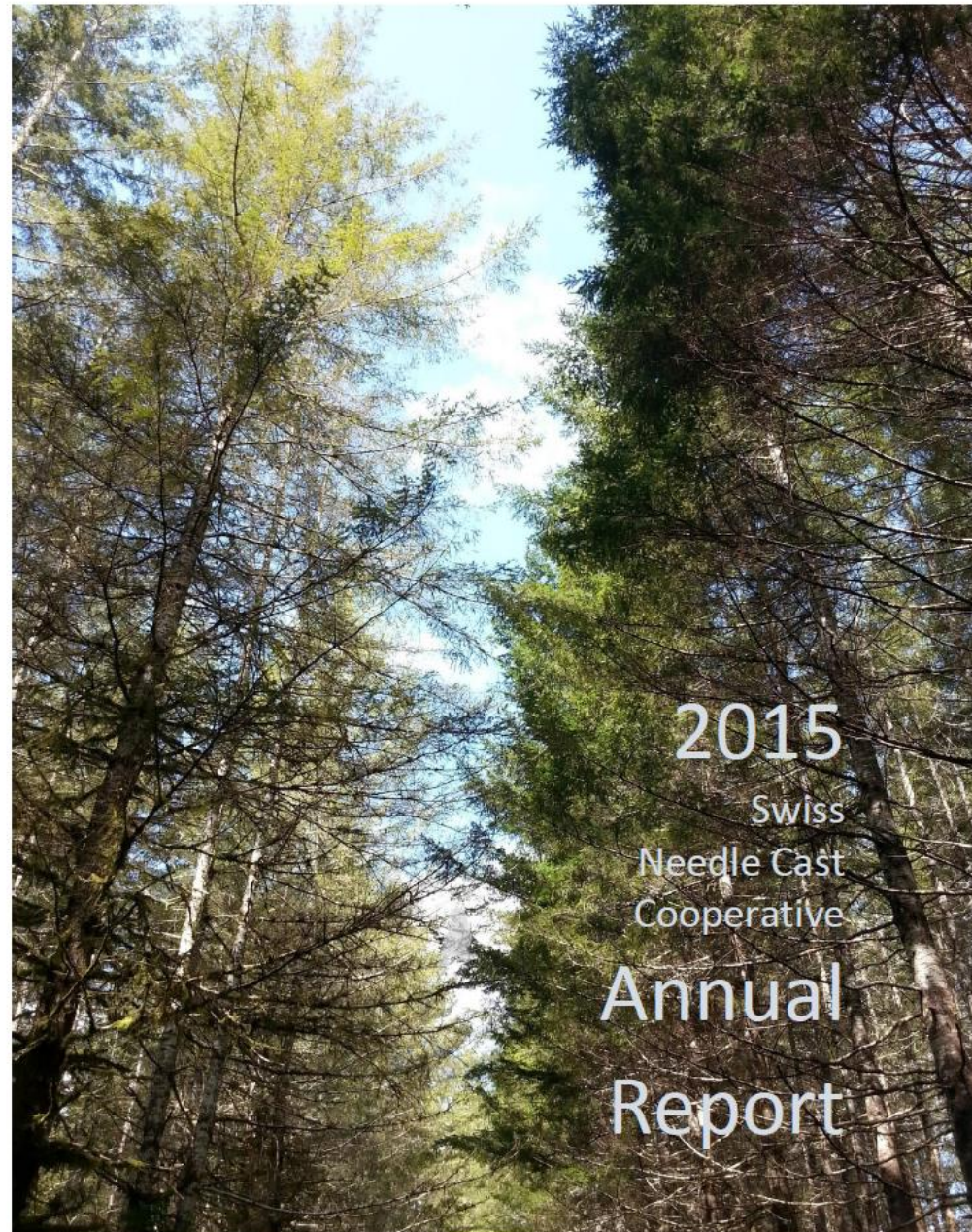
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<Citation> <Acknowledgement> <Disclaimer>

Remote sensing



Research and Monitoring make the story!



2015

Swiss
Needle Cast
Cooperative

Annual
Report

Outreach and collaboration with Foresters

- USFS: Forest Health and Protection
- State forestry forest health professionals
- Forestry Extension
- Universities and Colleges



United States Department of Agriculture

Forest Health Highlights in Oregon—2015



Oregon Department of Forestry
Forest Health Program
February 2016



for the greatest good



Oregon Department of Forestry
Forest Health

Pacific Northwest Region
Forest Health Protection

There you have it!

- We are already managing our forests for forest health.
- The PNW/USA has the most advanced and integrated program of monitoring and research for forest health in the world!
- You are a part of the future NOW!

