



# All mixed up: Challenges and opportunities for restoring mixed conifer forests in Central Oregon

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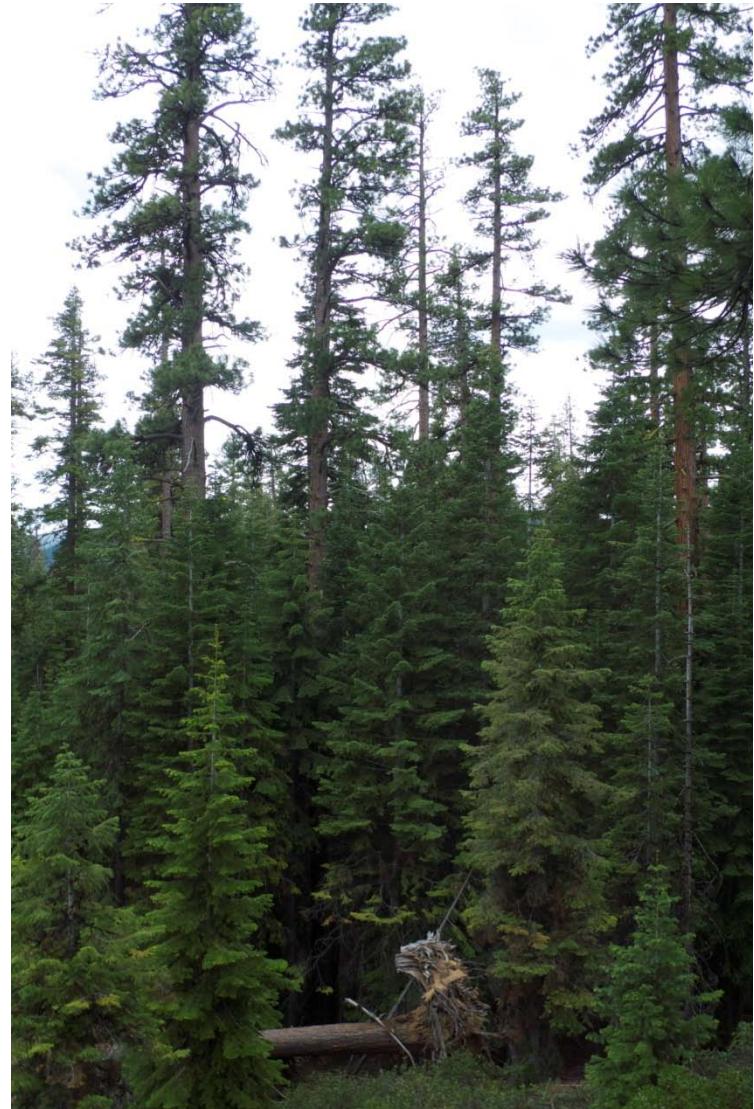
# Acknowledgements

- Robin Vora, DNF
- Keith Olsen, OSU



# Objectives

- What are we learning about mixed conifer forests?
- Why restore or manage?
- Challenges
- Suggestions



# Environmental Distribution of Major Plant Association Groups on Deschutes National Forest

Wet

TSME



Dry

ABCO-ABGR

PIPO

PICO

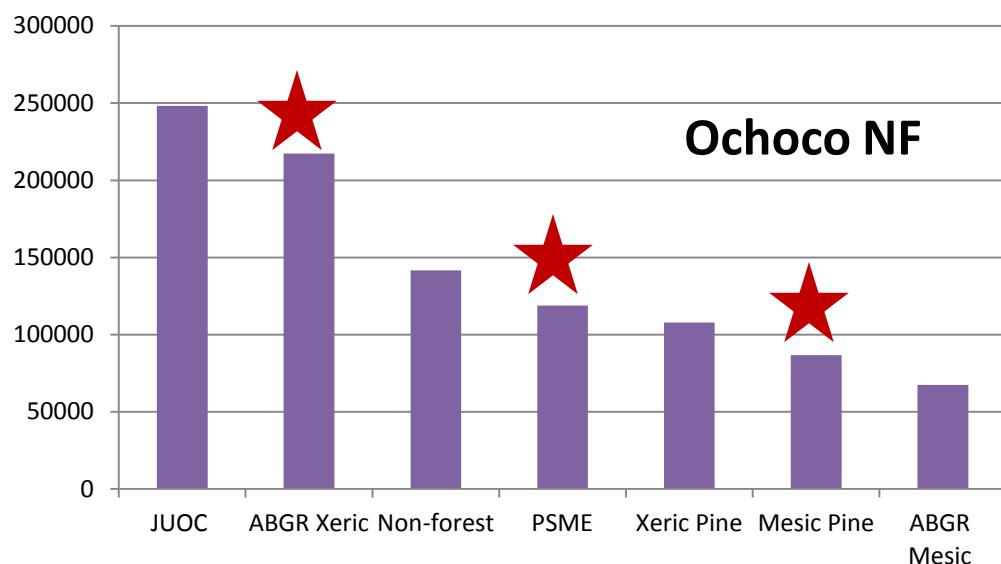
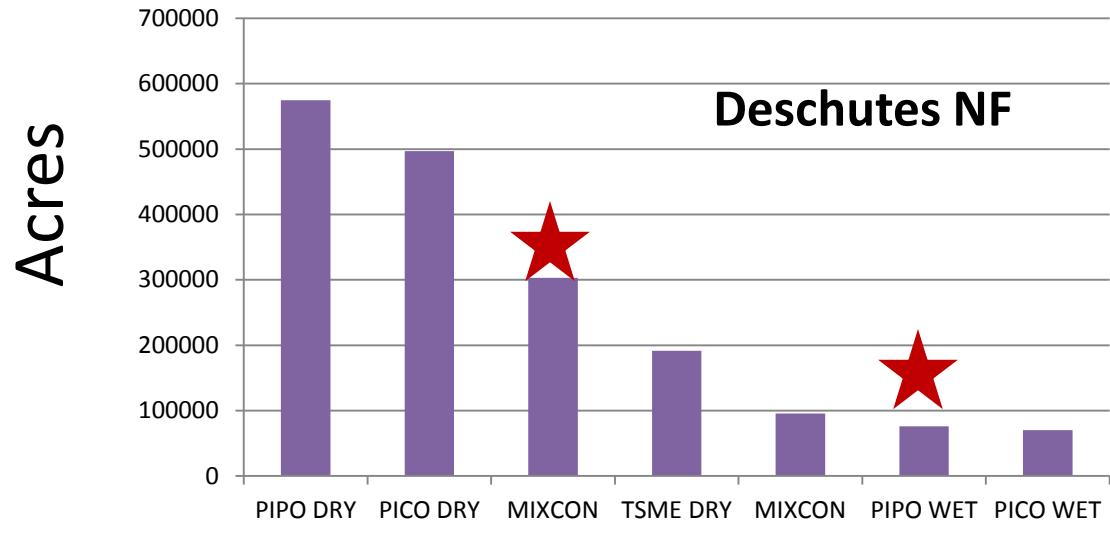
Warm

Cold

Based on Simpson 2007

# Area of Major Plant Association Groups

★ = “Mixed Conifer”

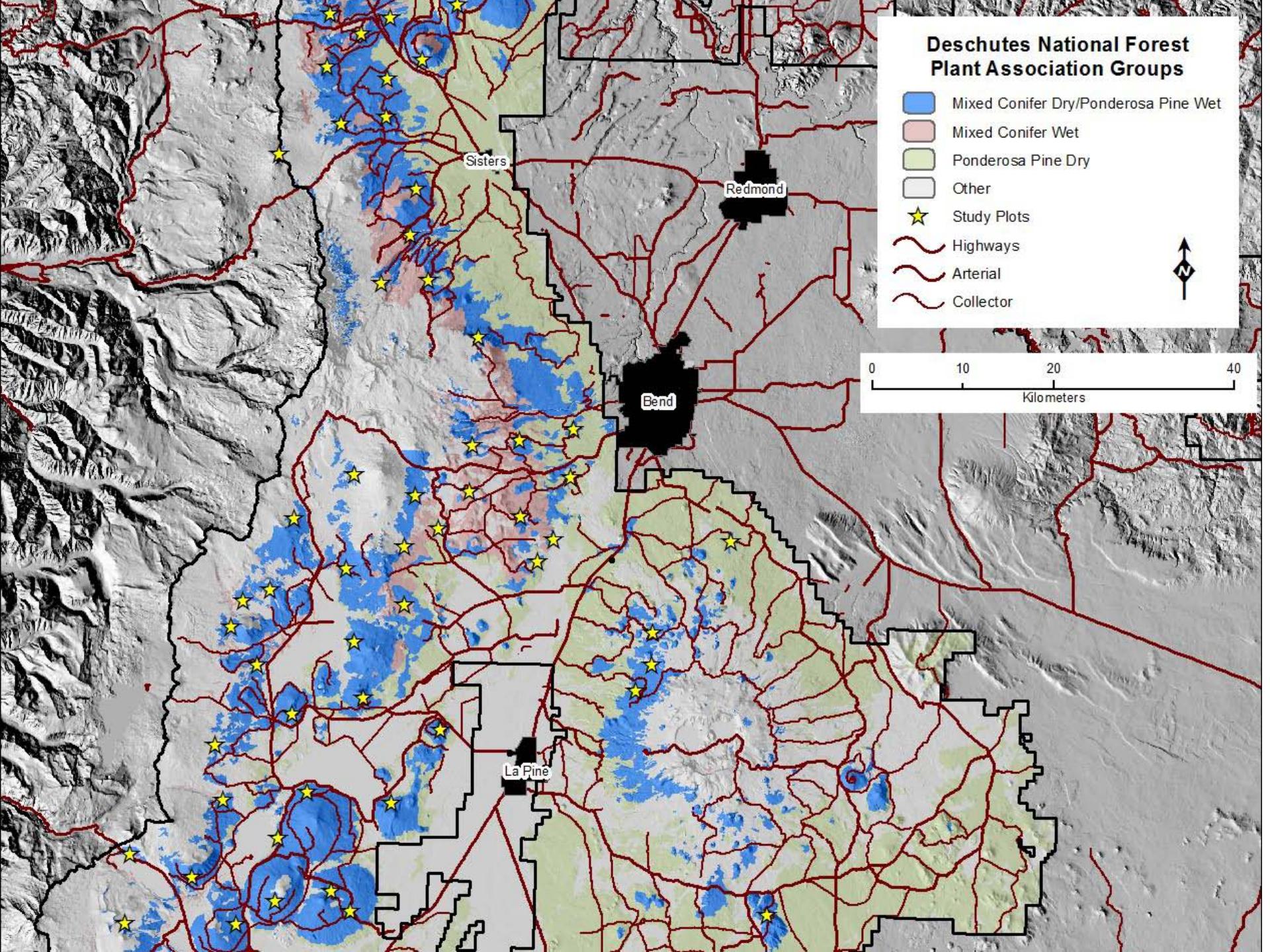


## Deschutes National Forest Plant Association Groups

- Mixed Conifer Dry/Ponderosa Pine Wet
- Mixed Conifer Wet
- Ponderosa Pine Dry
- Other
- Study Plots
- Highways
- Arterial
- Collector

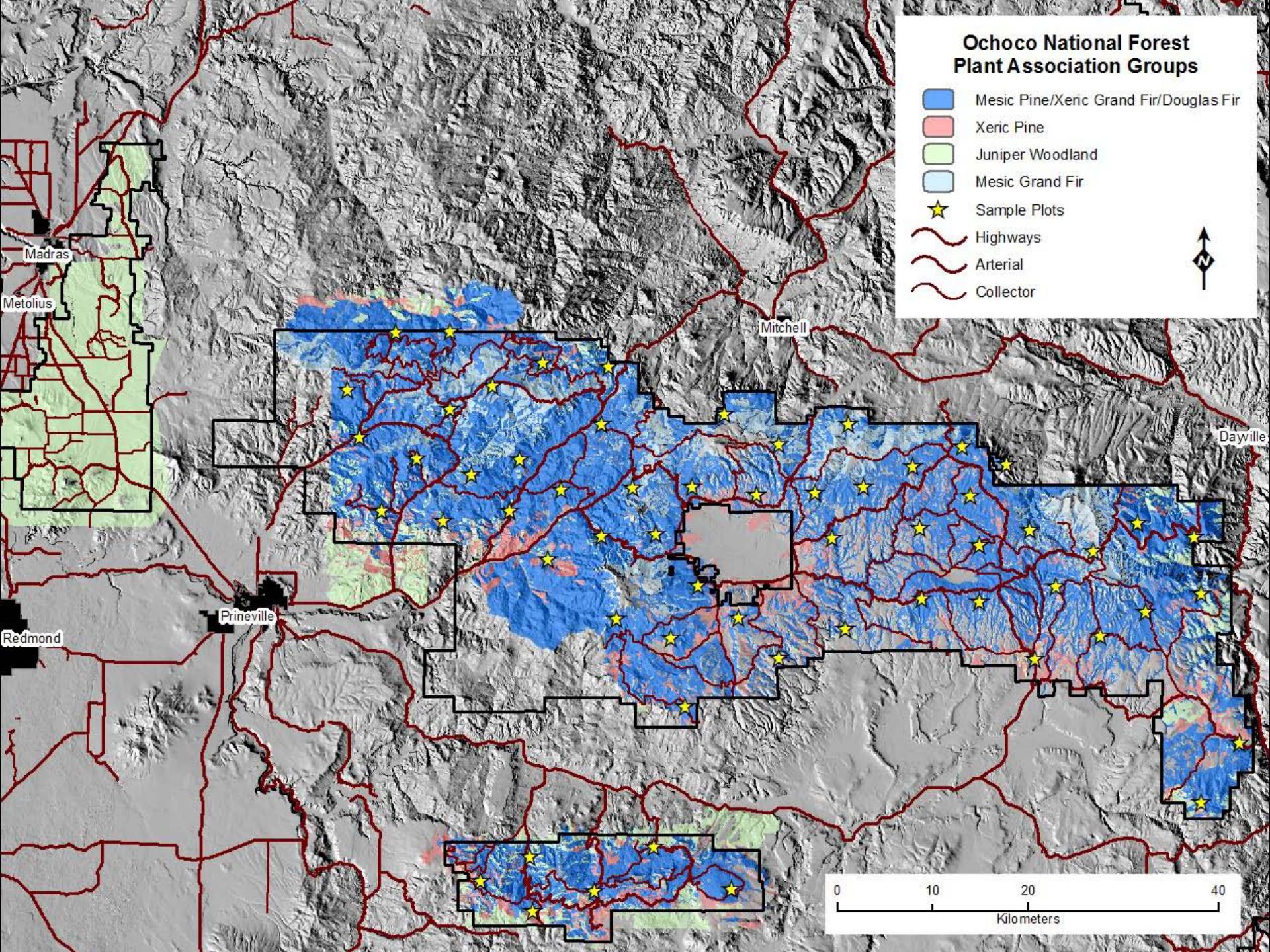


0 10 20 40  
Kilometers



## Ochoco National Forest Plant Association Groups

- Mesic Pine/Xeric Grand Fir/Douglas Fir
- Xeric Pine
- Juniper Woodland
- Mesic Grand Fir
- ★ Sample Plots
- Highways
- Arterial
- Collector



Madras  
Metolius

Redmond

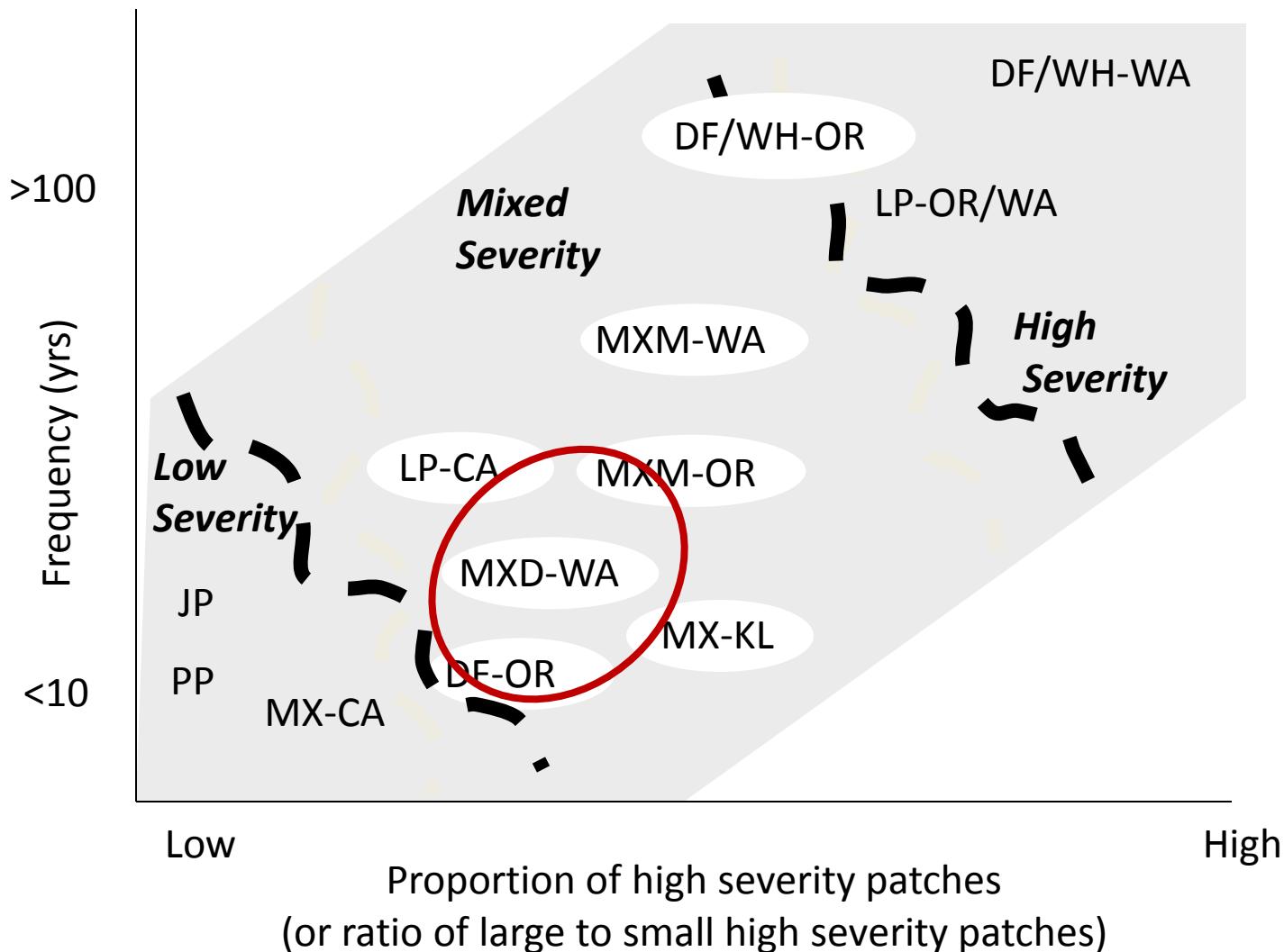
Prineville

Mitchell

Dayville

0 10 20 40  
Kilometers

# Fire regimes of Dry Plant Association Groups In NWFP Area



Perry et al. 2011

## Mixed Conifer as a Intermediate Structural Type of Old Growth



Douglas-fir/  
Western Hemlock  
Washington



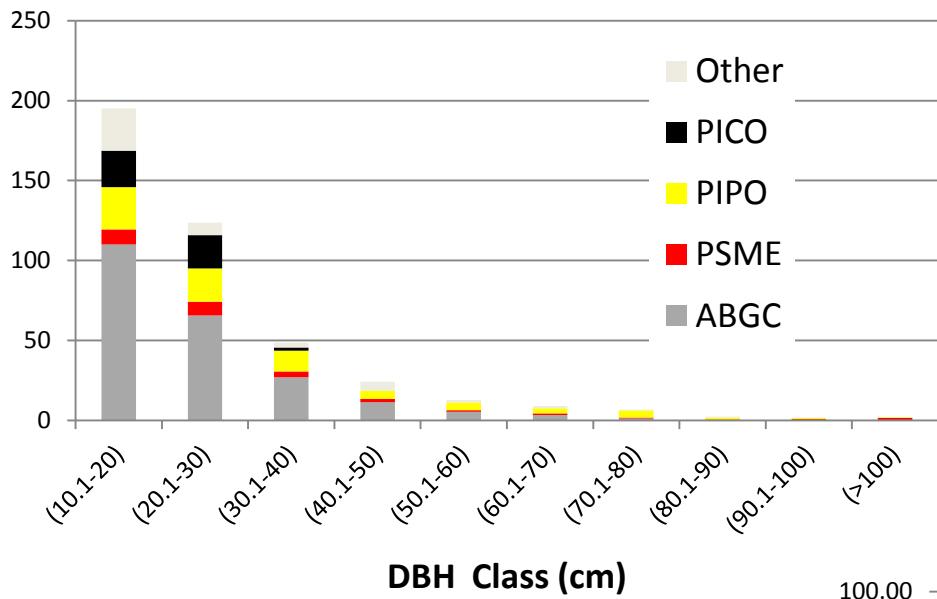
Mixed Conifer  
Sierra Nevada



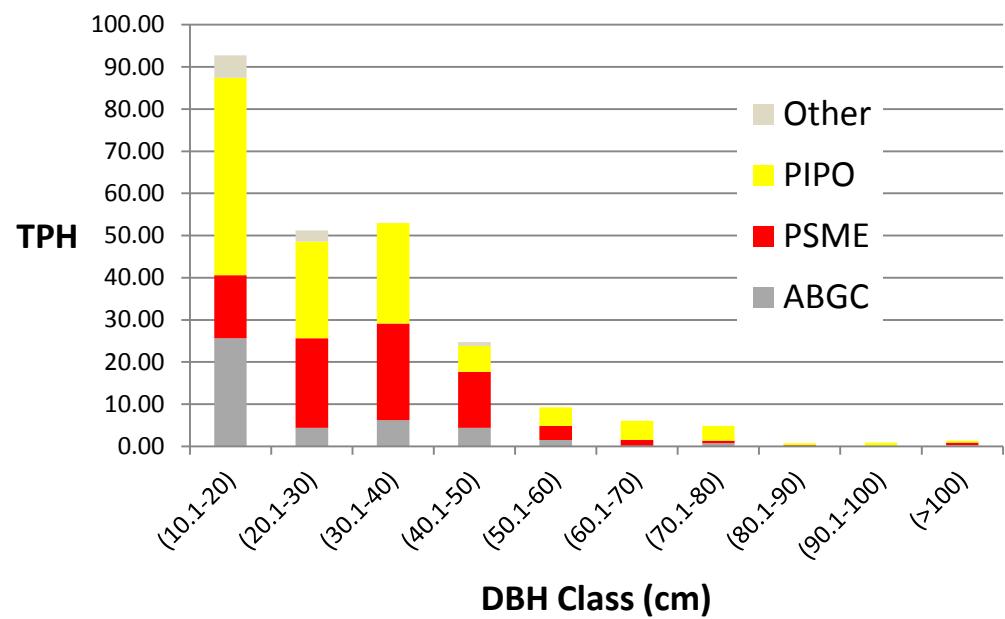
Ponderosa Pine  
Oregon

Drawings by R. Van Pelt

# Size and Species Distribution Old-Growth Mixed Conifer Stands



Deschutes NF—south half  
n=20 stands



Ochoco NF—western half  
n=15 stands

# Why Restore or Manage for ecological goals?

- Lack of fire creates an overabundance of late successional conditions
- Risk of high-severity fire and disease and insects
- Loss of large pines from logging and succession
- Homogenization of forest at landscape level

# Successional change and increasing risk of high severity fire



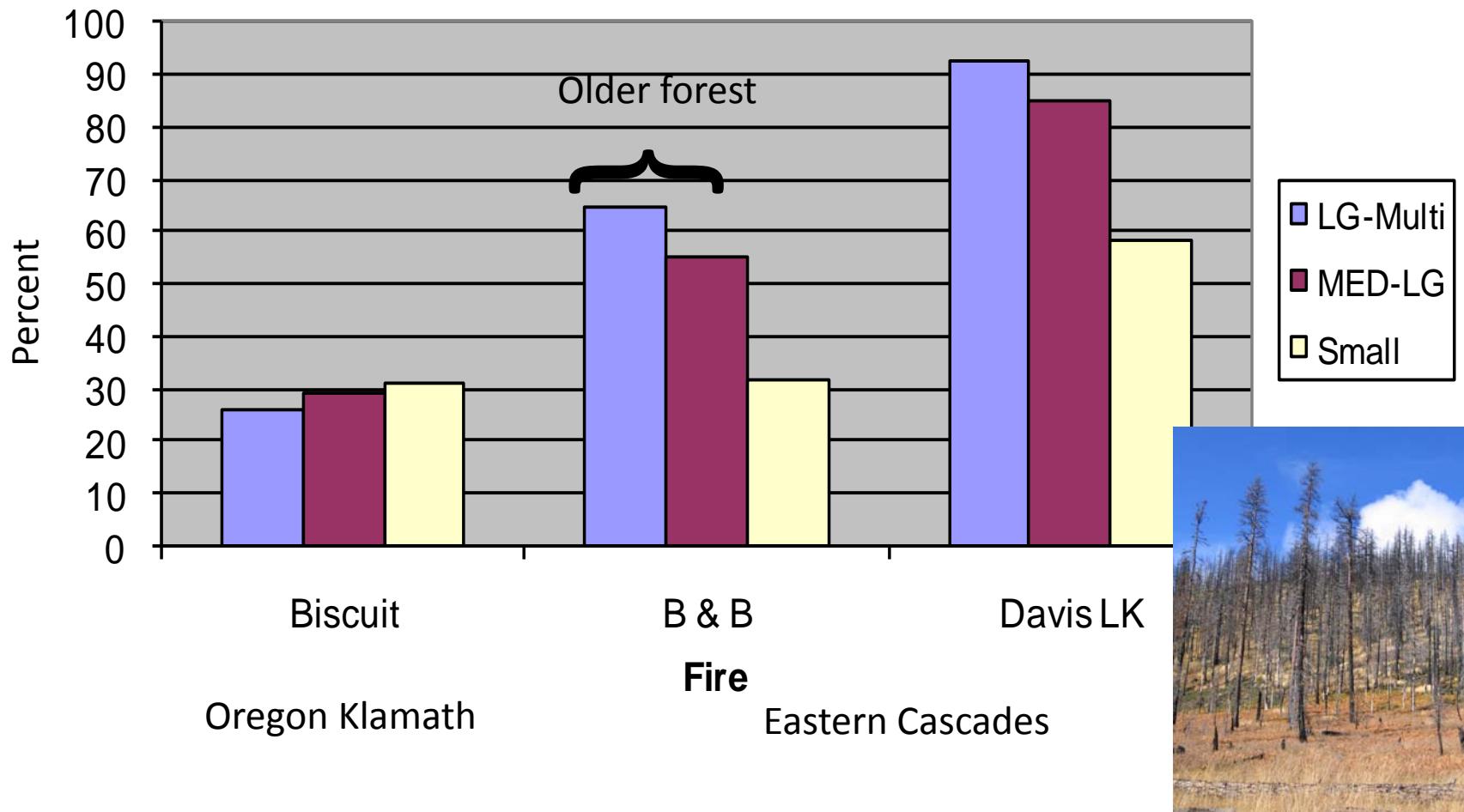
Abies understories  
on dry mixed conifer  
Sites are primarily  
less than 50 years  
old.

Deschutes N.F.

Perry et al. 2004

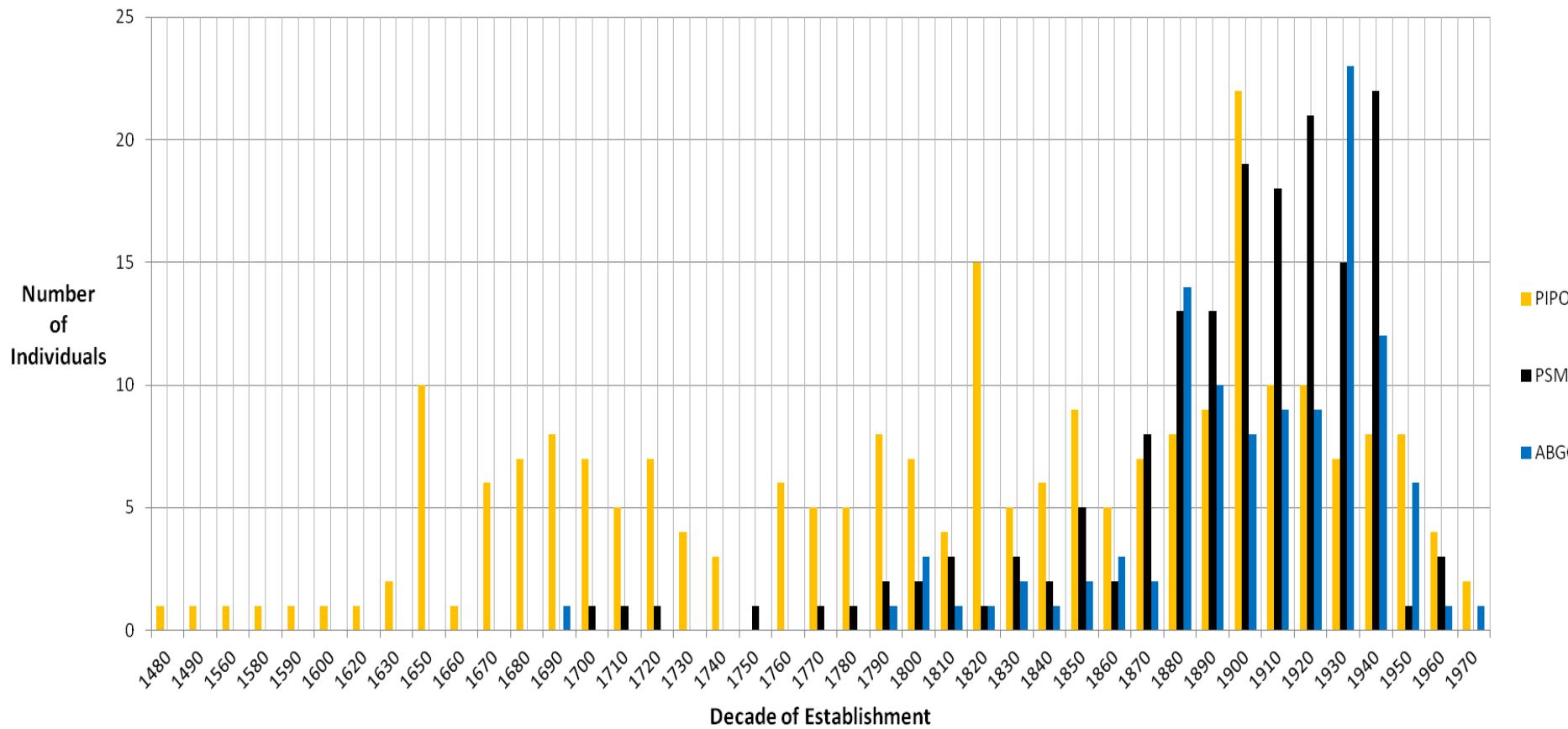
# Older forest in eastern Cascades may be more likely to experience high severity fire (MTBS classes)

□



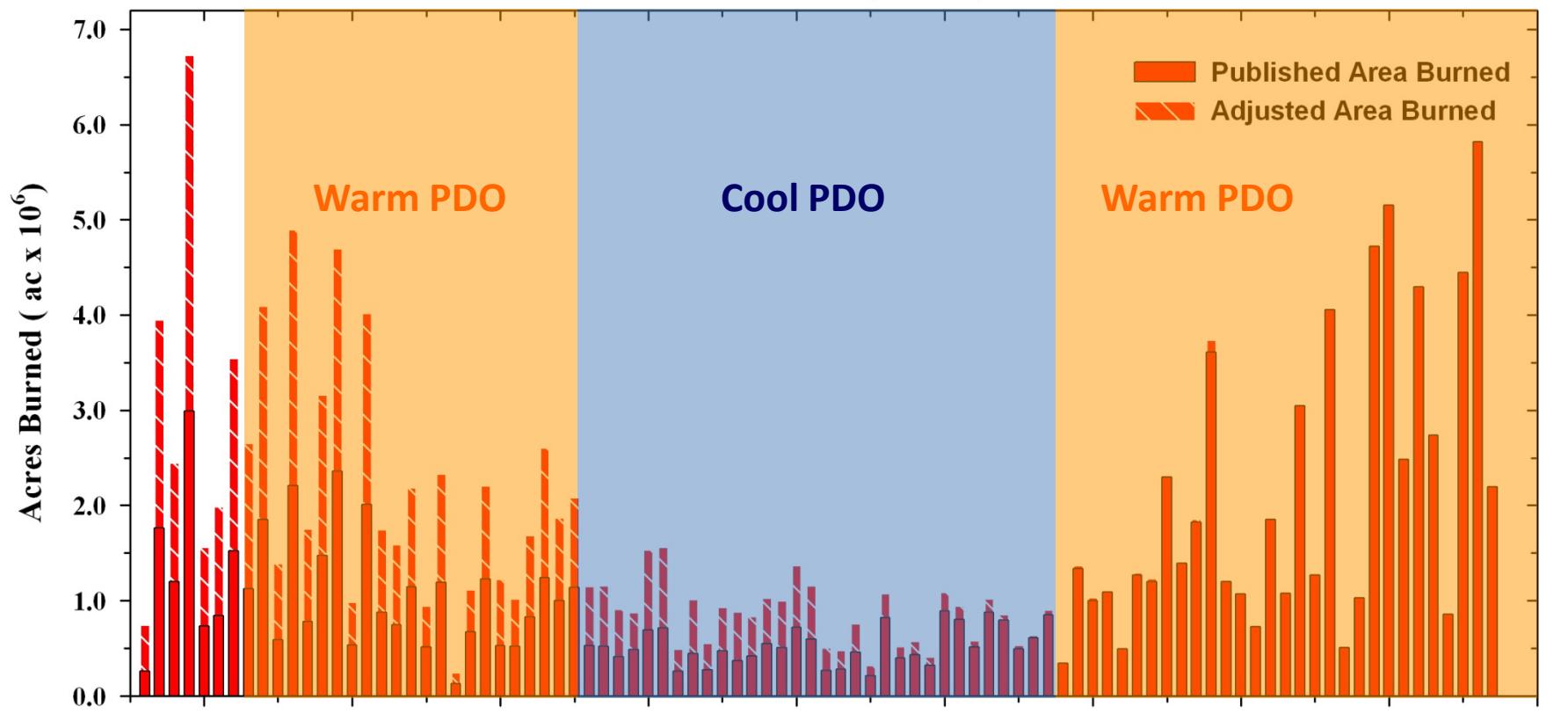
# Tree Establishment in Existing Patches of Old Mixed Conifer

## Tree Establishment by Decade-Ochoco National Forest



# Area burned – Western U.S., 1916 - 2007

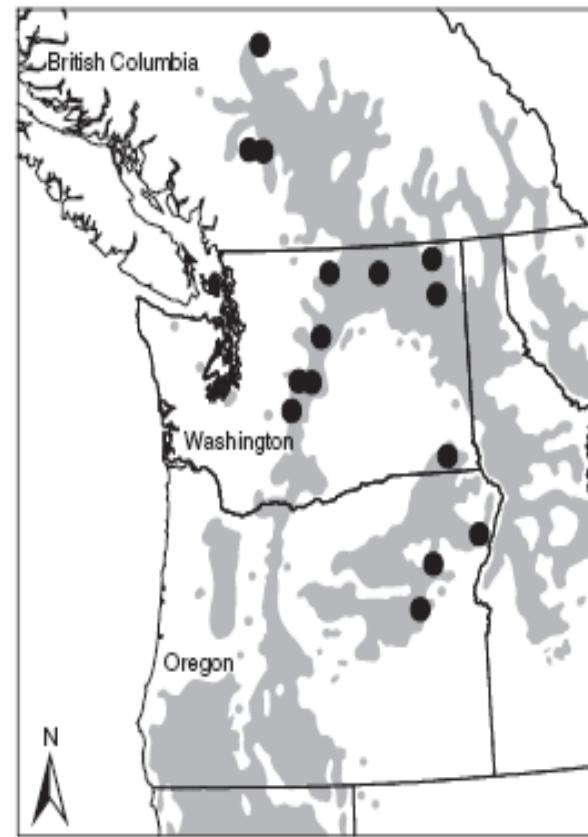
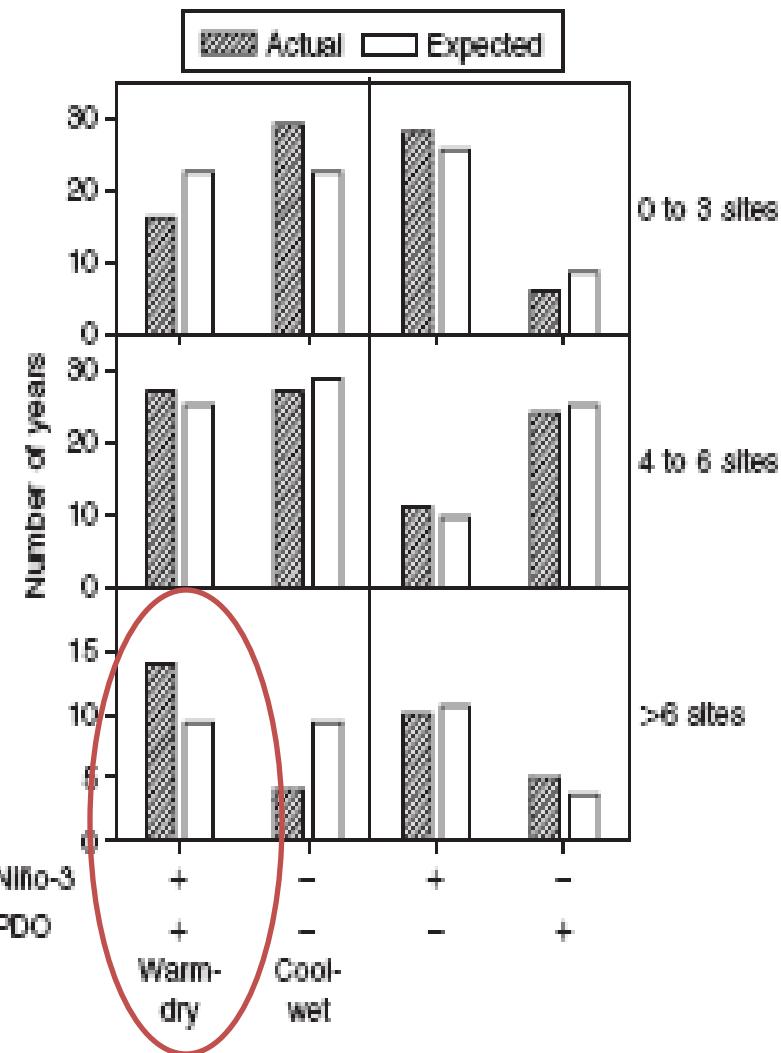
Annual Area Burned on Federally-Protected Lands  
Western U.S (no AK)



Fire suppression → Fire exclusion → Fuel accumulation  
Lots of fire → Much less fire → Lots of fire

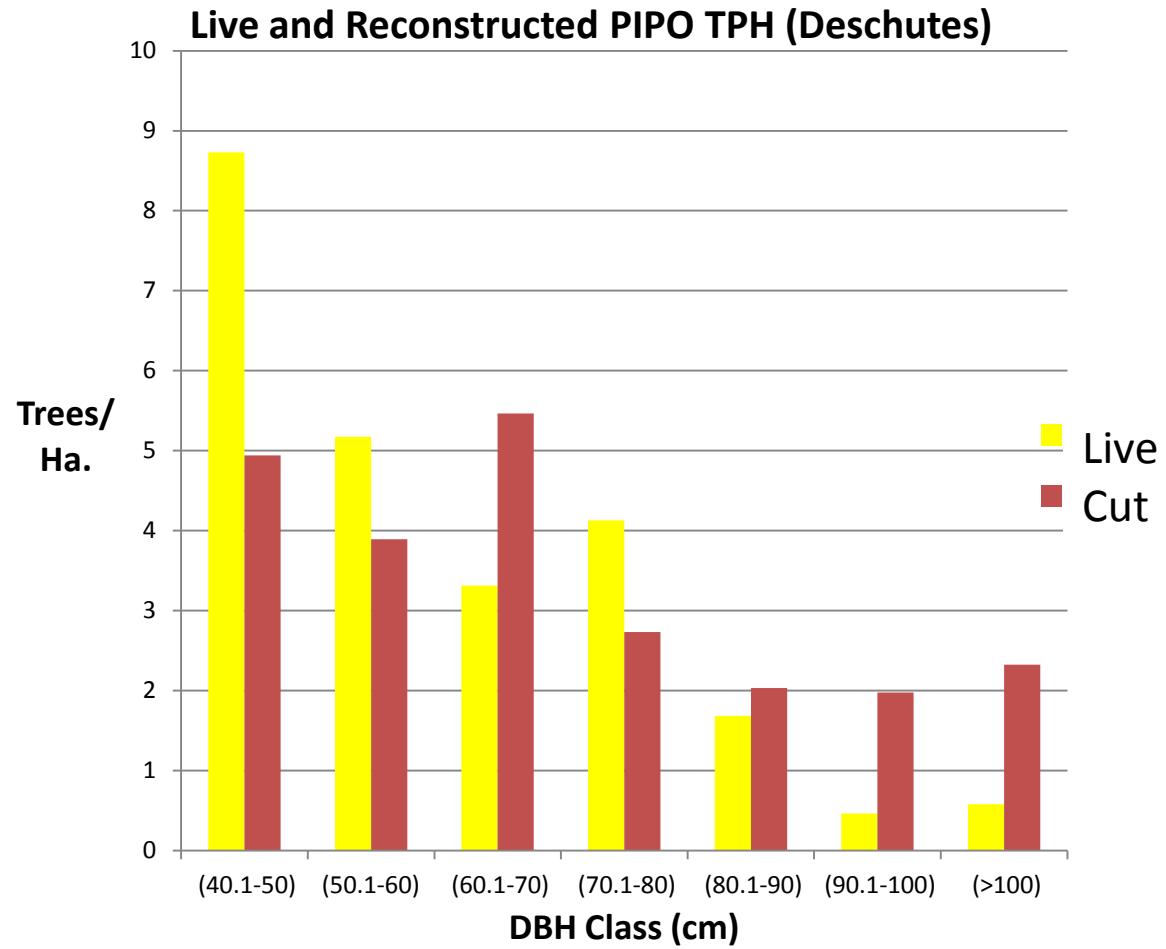
Courtesy of David Peterson

# Synchrony of surface fires in the inland Northwest



Heyerdahl et al. 2008 Int J. Wildland Fire

# Ghost pines In older mixed conifer stands



**70% decline in density of  
Pines > 80 cm (32 in) in current  
Old-growth stands**

# Present vs. Historic Density of Old-growth Trees



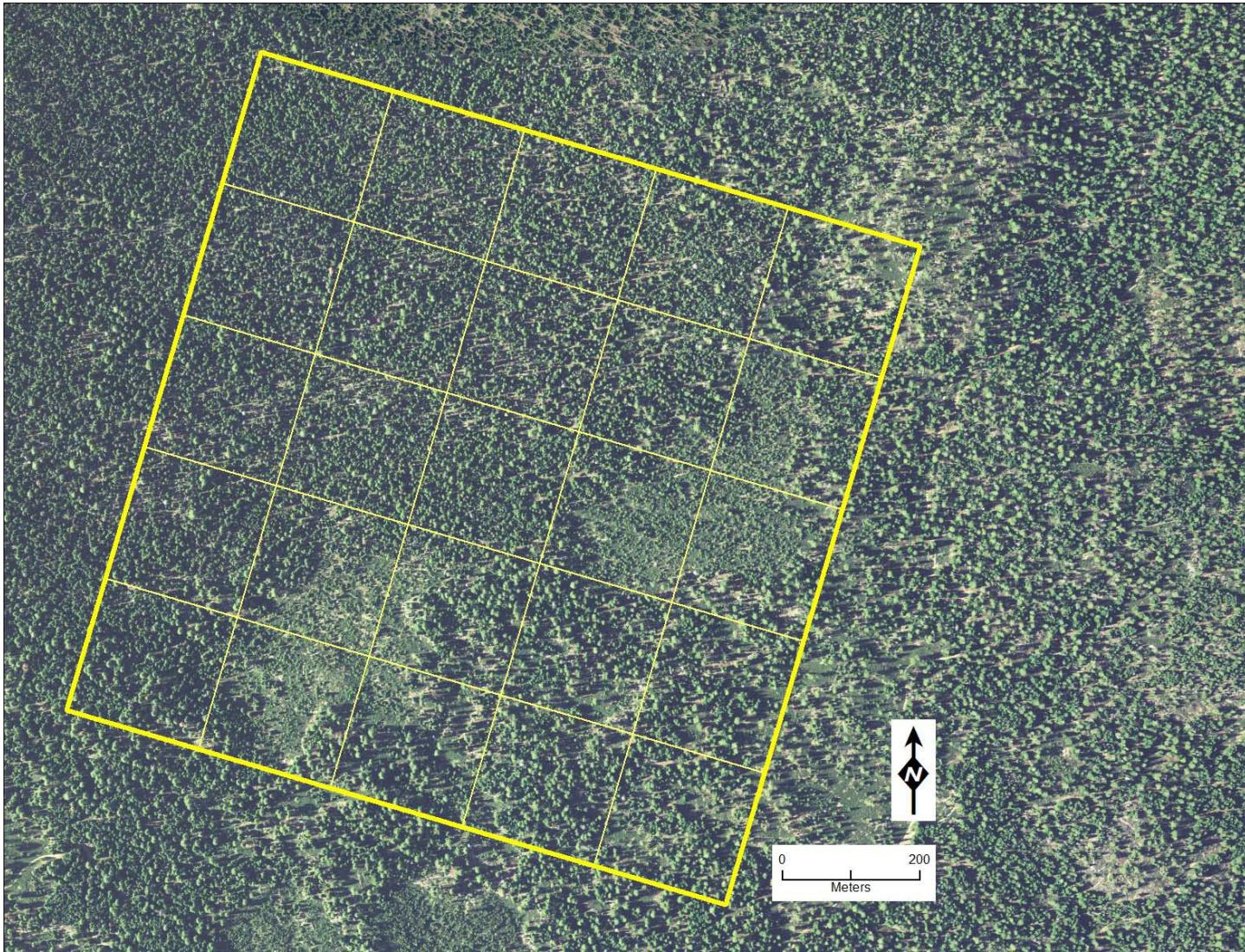
Present vs. Historic Density of Old-growth PIPO (TPH>75cm DBH)

Study Region	Present Day	Historic	% Removed
South Deschutes	5.6	14.0	60.4
North Deschutes	6.3	13.7	53.8
West Ochoco	3.4	7.5	54.9
East Ochoco	4.5	7.7	41.9

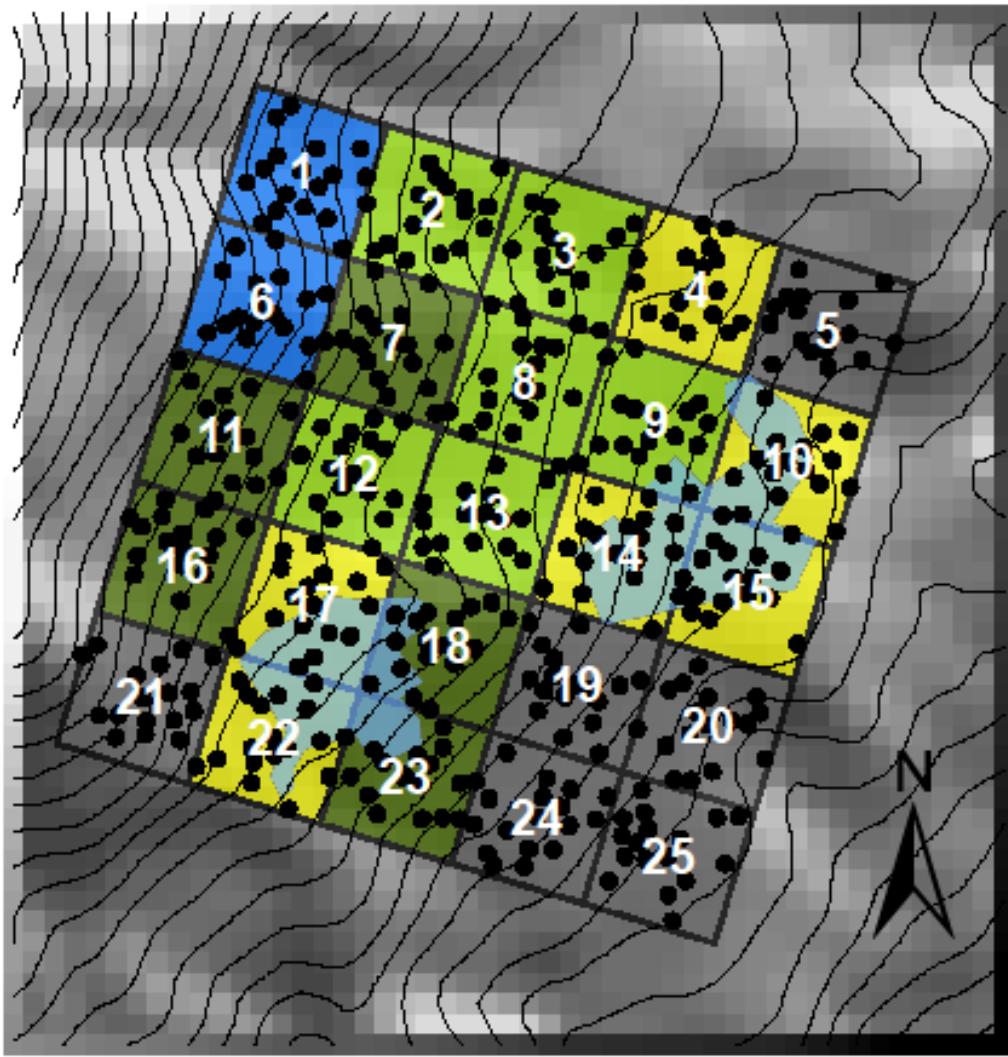
Present vs. Historic Density of Old-growth PSME (TPH>75cm DBH)

Study Region	Present Day	Historic	% Removed
South Deschutes	3.5	3.8	7.4
North Deschutes	0.9	2.9	68.2
West Ochoco	1.2	2.0	41.2
East Ochoco	0.7	1.8	60.0

# Mt Sheridan Intensive Plot



# Mt. Sheridan Intensive Plot Composition



## Structure and Composition

### Zone Type

- ABGR,TSME/ABGR,TSME
- ABGR,PIPO,PIMO,PICO/ABGR,TSME
- PIPO,PICO,PIMO/EarlySeral
- PIPO,ABGC/ABGC
- ABGC,PIPO/ABGC

### Plot Locations

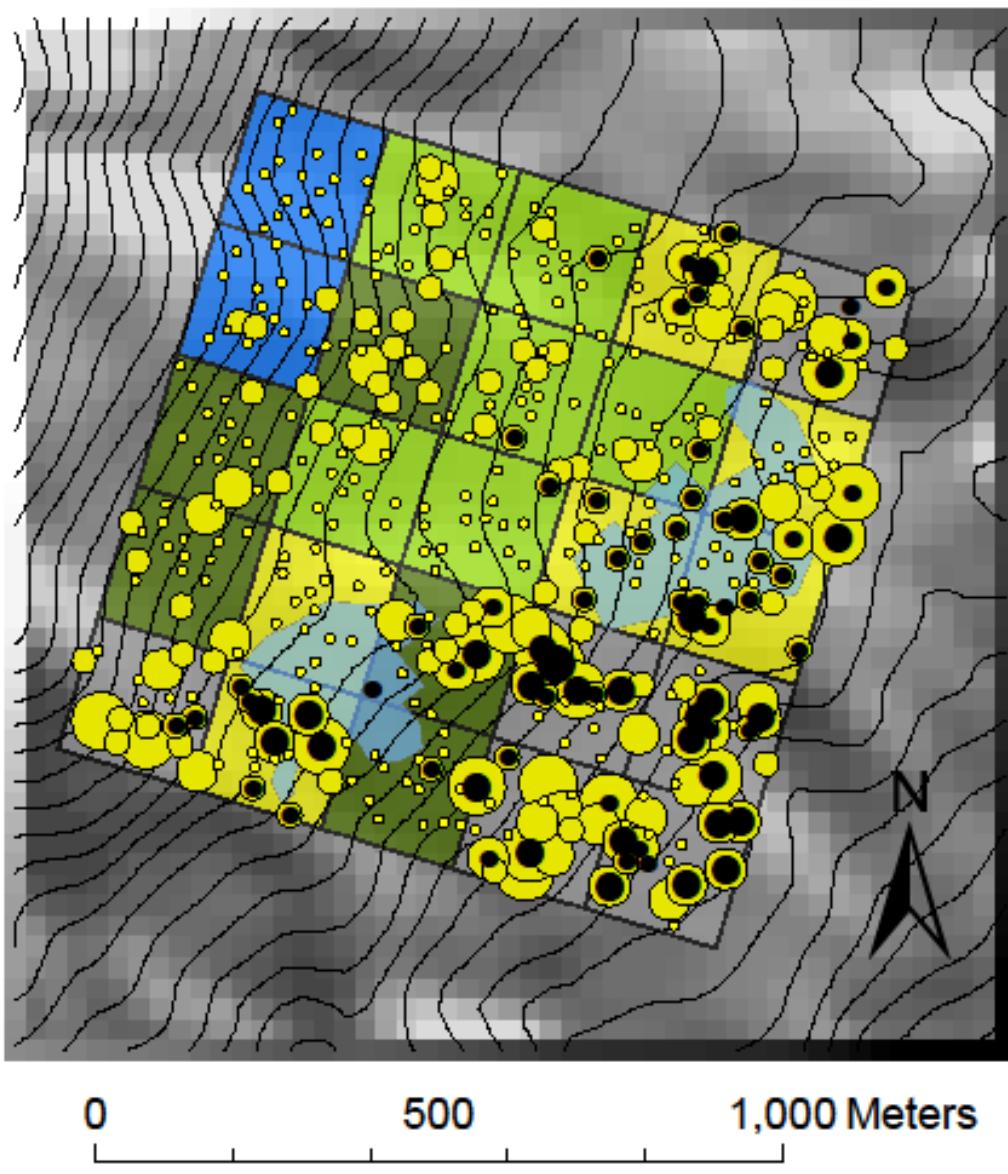
Patch Cut Area

30m elevation contour

0 500 1,000 Meters

Elevation Range-1560m-1740m

# Mt. Sheridan Intensive PIPO Distribution



## Structure and Composition

### Zone Type

- ABGR, TSME/ABGR, TSME
- ABGR, PIPO, PIMO, PICO/ABGR, TSME
- PIPO, PICO, PIMO/Early Seral
- PIPO, ABGC/ABGC
- ABGC, PIPO/ABGC

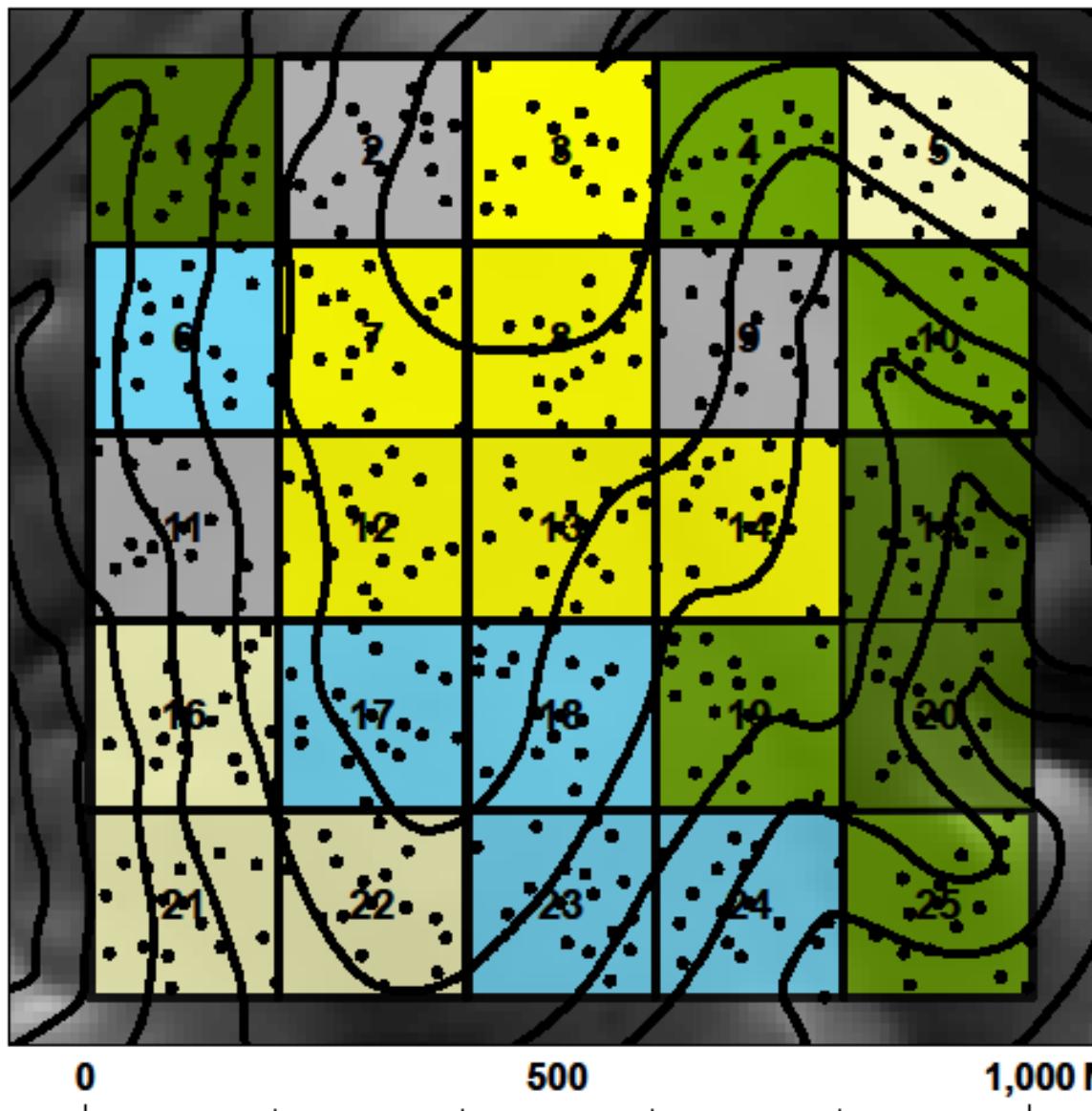
### Ponderosa Pine >50cm DBH

- 0
- 1
- 2-3
- 4-6

### Ponderosa Pine Cuts

- 0
- 1
- 2-3
- 4-6

# McKay Intensive Plot Composition



## Structure and Composition

### Zone Types

- Moist PIPO/ABGC,PSME
- Slope PSME,PIPO/PSME, PIPO
- Ridgetop PIPO/PIPO,PSME
- Mixed PIPO/PSME/ABGC
- SW Slope PIPO/JUNIPER
- Managed PIPO/PSME,PIPO,ABGC

• Plot Locations

— 30m Elevation Contour

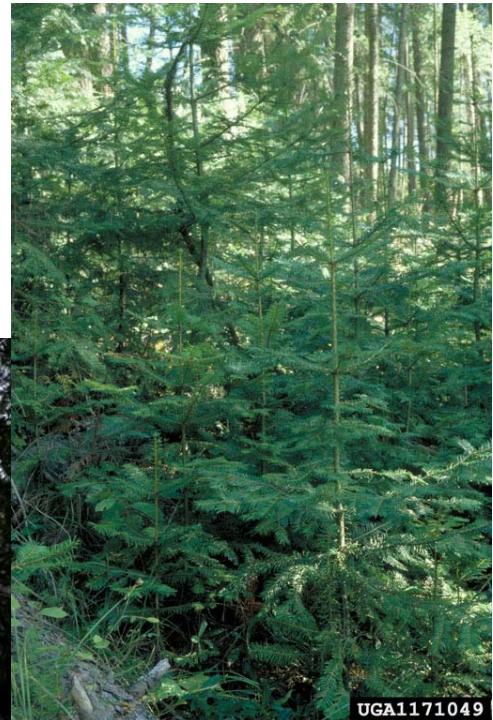


# Challenges For Restoration/Management

- Defining goals
  - Spatially and temporally dynamic reference
  - Pattern/Structure vs Process
    - Structure vs fire regime
  - Elements vs entire community
    - Big pines or entire mosaic
  - Owl habitat vs ecosystem goals
    - Right balance?

# Challenges For Restoration

- Landscape inertia/mass effects

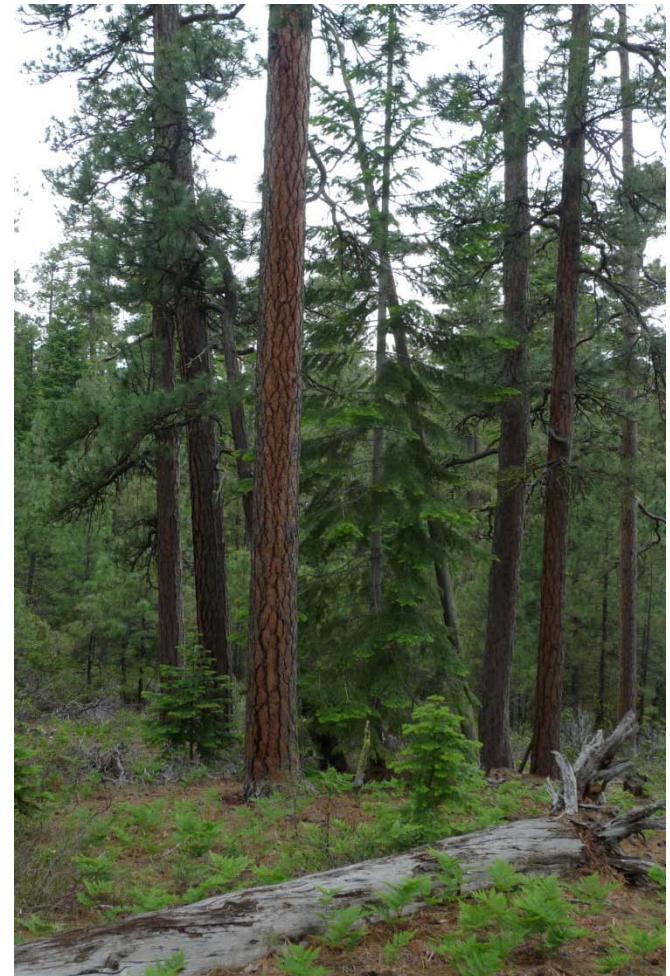


# Management

- Variability also means opportunity for trying different things
- Prioritize by existing structure, topography and landscape
- Reduce densities of understory and some canopy shade tolerants (Age vs Size)
- Create spatial heterogeneity and large enough openings to favor pine regeneration
- Prescribed mixed-severity fire??

# Conclusions

- All mixed up in many senses:
  - Environment
  - Structure/composition
  - Spatial pattern
  - History
  - Goals for species or ecosystems



# Conclusions

- Mixed-conifer forest ecology is a work in progress
- Uncertainties remain about rates and pattern of succession, disturbance regimes and role of fire, climate and humans

# Conclusions

- Multiple reasons for restoring or managing for ecological goals including
  - Reducing risk of high-severity fire
  - Rebuilding populations of large pines
  - Managing successional patterns and trajectories
  - Creating resilience in face of insects, disease and climate change

