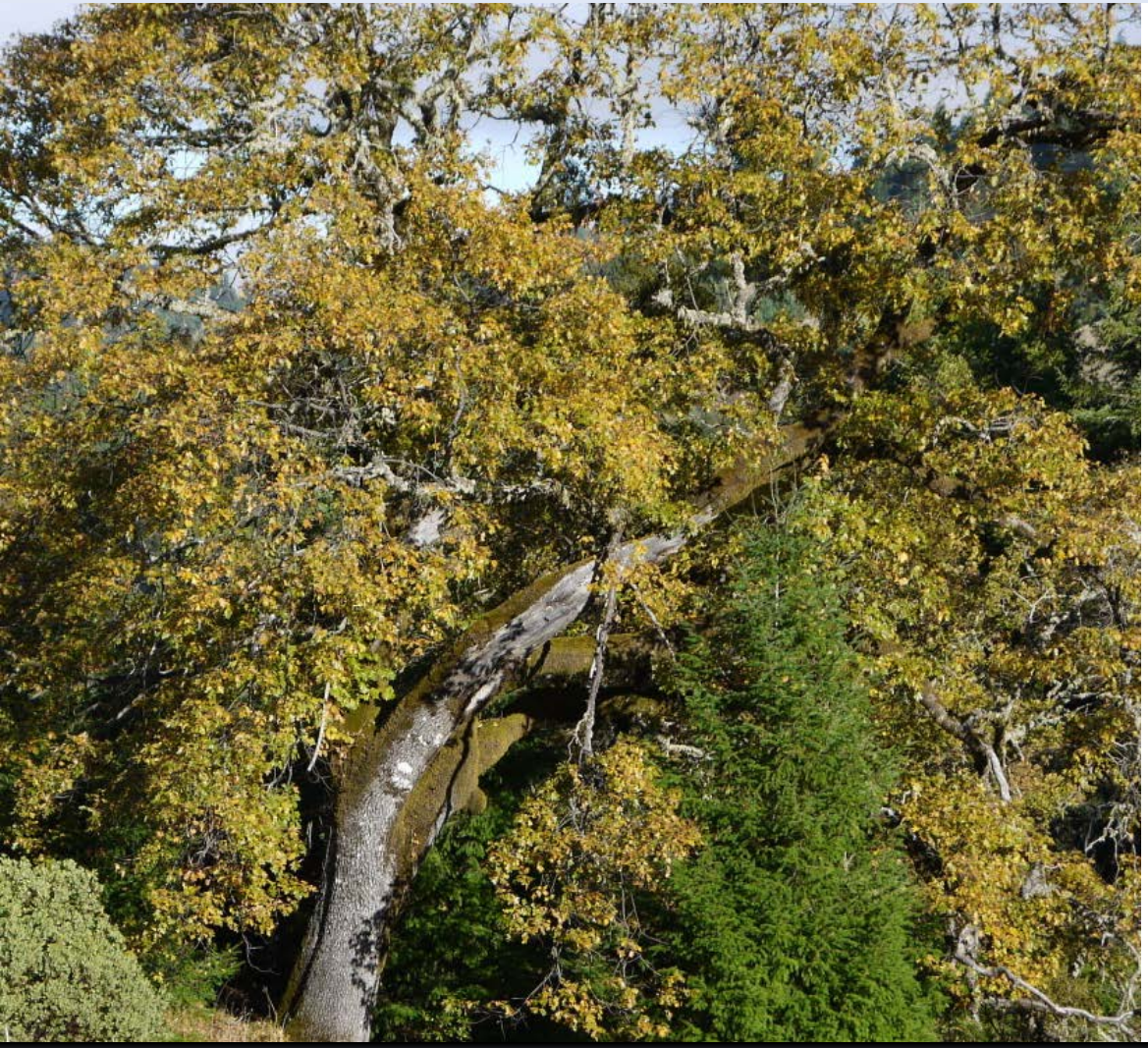
Oregon white oak and California black oak woodland loss to conifer encroachment



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Today's presentation

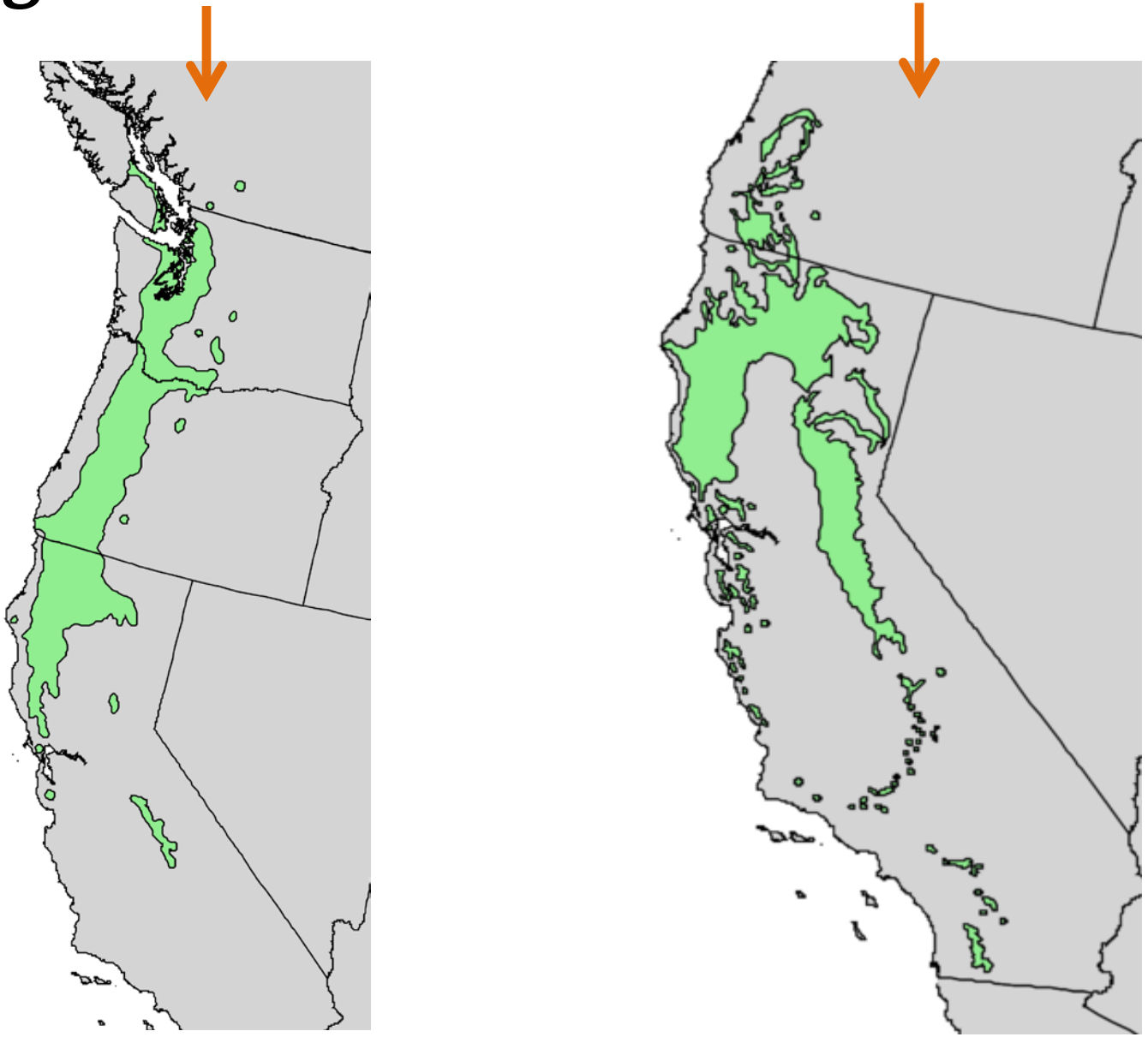
- Background
  - What is conifer encroachment?
  - Why does it matter?
- New research:
  - Age structure in encroached stands
  - Basal area
  - Diameter distributions
  - Regeneration
  - Time to conifer dominance
- Future research
- Policy opportunities

Oak woodlands

Oak woodlands are unique and valuable ecosystems

- Support very high levels of biodiversity
- Provide valuable food sources and habitat for wildlife
- Cultural landscapes: deeply connected to Native American tradition and culture
- Working landscapes: valued by ranchers and other landowners

Oregon white oak and California black oak



Conifer encroachment

Plant communities are constantly competing for resources and space

- Relative success dictated by many factors:
  - Climate
  - Site conditions
  - Disturbance/management regimes

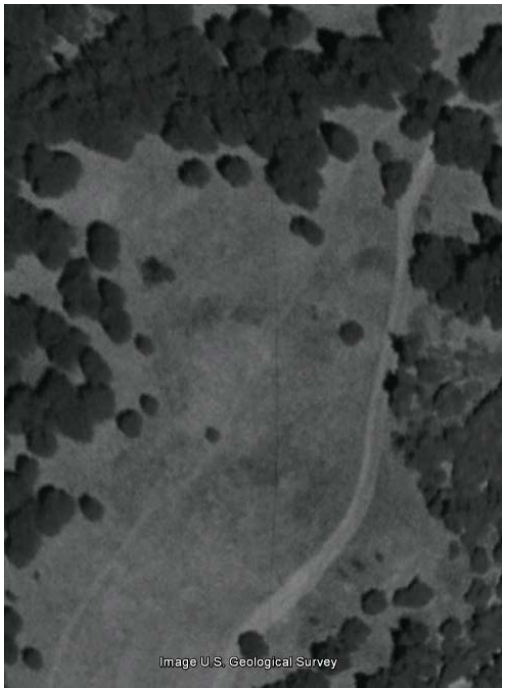
Conifer encroachment

Encroachment of woody vegetation into frequent-fire adapted community types is **common in the absence of fire**

Photos: Redwood National Park staff

Rapid conifer encroachment (24 years)

Native conifer encroachment is a widespread result of fire suppression



Douglas-fir grows quickly, eventually overtopping the oaks and competing for sunlight and other resources

Conifer encroachment

Encroachment triggers significant ecosystem-level changes:

- Greatly reduces herbaceous plant diversity and cover
- Dampens fuelbed flammability, and shifts fire regime away from frequent, low-severity patterns
- Compromises oak health, and may make oaks more vulnerable to wildfire and other threats
- Ultimately leads to oak mortality and type conversion to conifer forest

Sources: Thysell and Carey 2001, Engber et al. 2011, Cocking et al. 2012, and others

Research needs

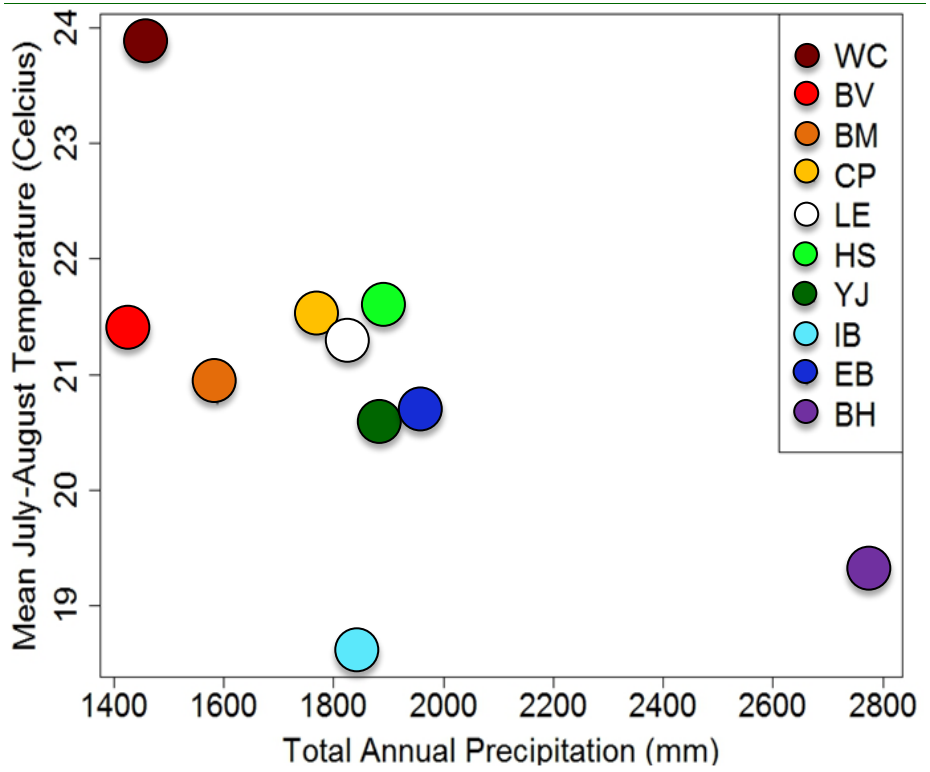
- Most existing research has been limited in scale (single study areas)
- Our project looked at the issue on a regional scale (10 sites across 2 counties)
  - Stand and age structure: How old are the trees? Are oaks really older than conifers?

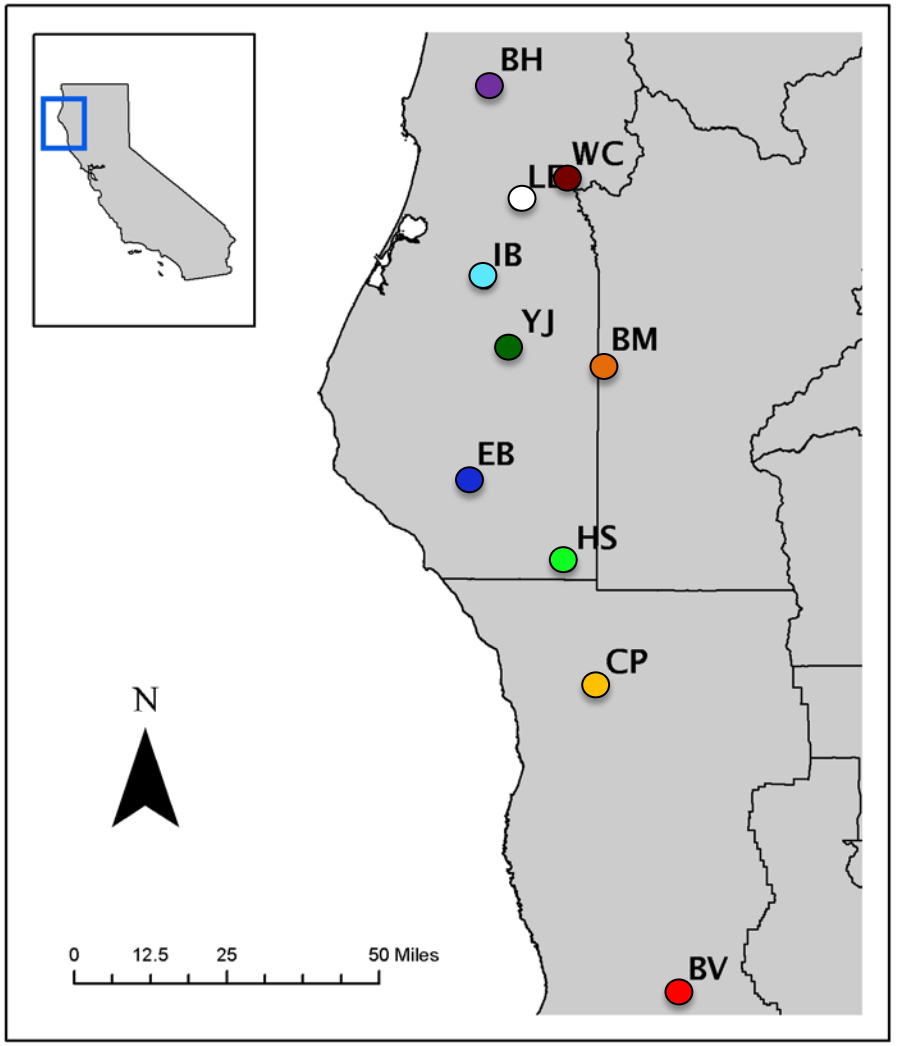
Study area

Study locations rated by climatic conditions

Xeric (warm, dry)

Mesic (cool, wet)





Field methods

<u>10 field research sites</u>

9 (0.1-ha or 0.25-ac) plots/site

encroachment evaluated by:

- 3 early
- 3 mid
- 3 late

Data collected

- 10 closest oaks and firs were cored /plot (*n* = 1747 trees)
- Seedlings, saplings, snags
- Understory vegetation
- Oak health
- Slope, aspect, etc

Species composition

Early Stage

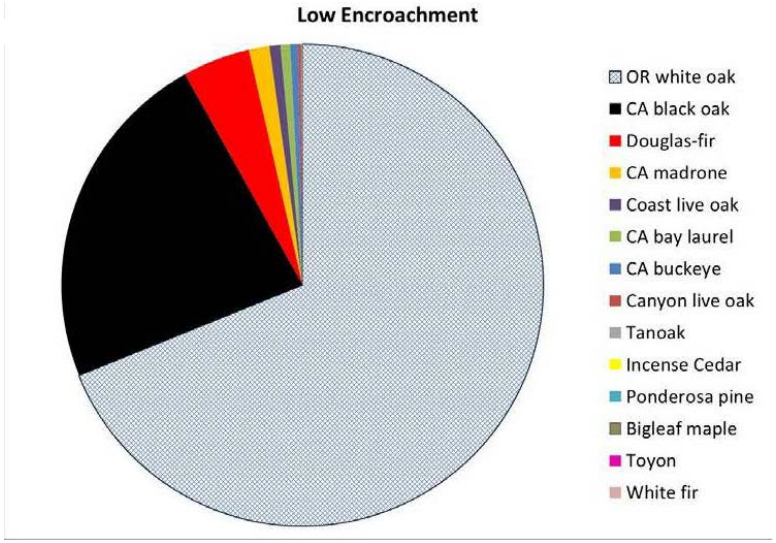
- 65% White oak
- 20% Black oak
- 10% Douglas-fir
- 5% Evergreen hardwood

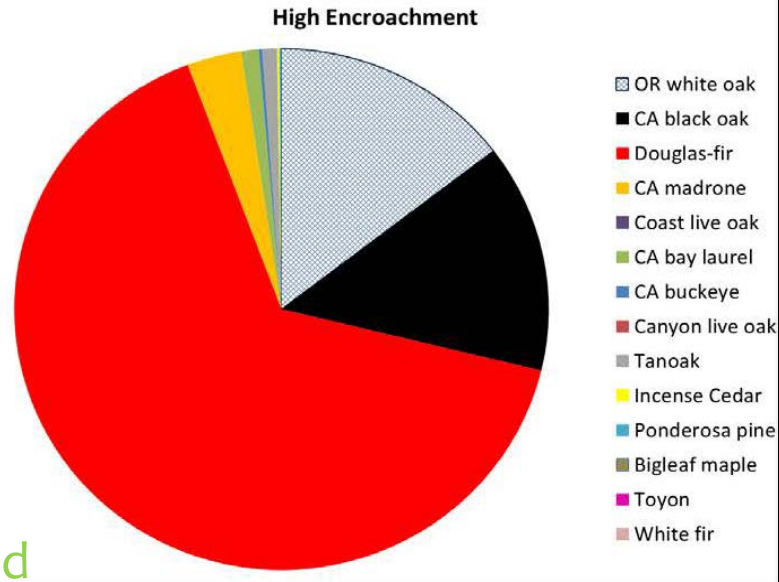
Mid Stage

- 32% White oak
- 10% Black oak
- 48% Douglas-fir
- 10% Evergreen hardwood

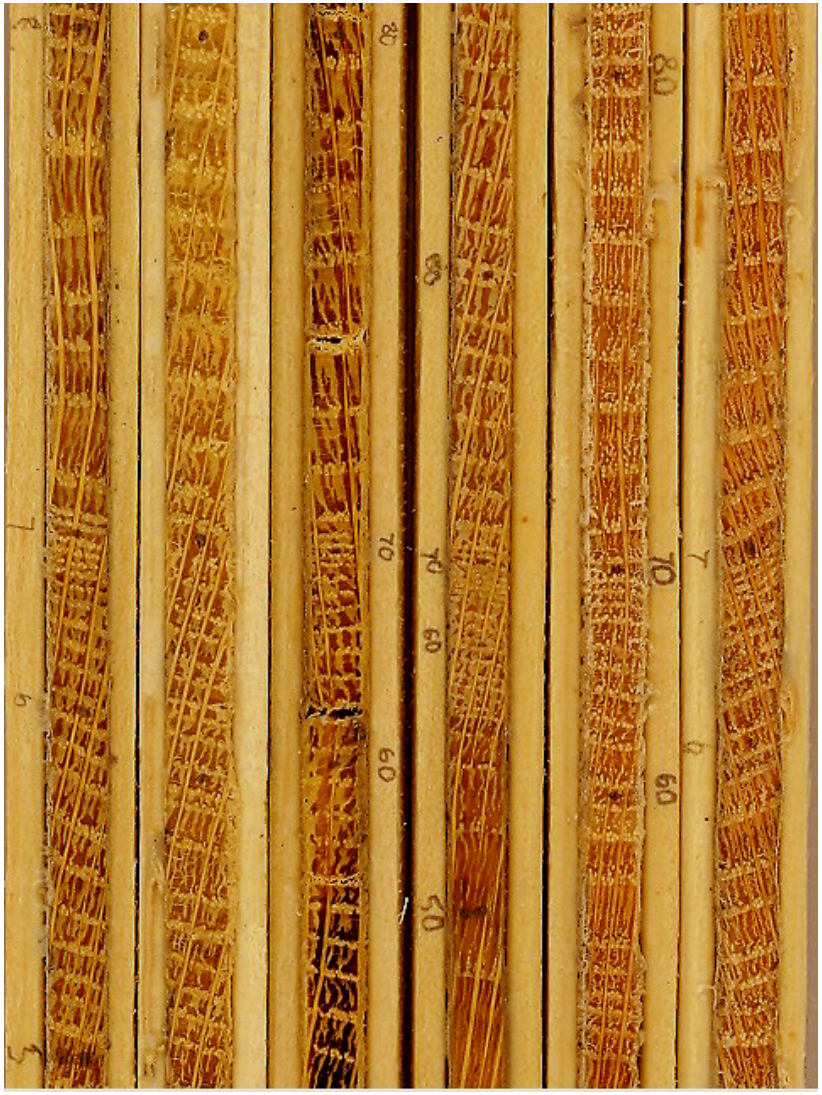
Late Stage

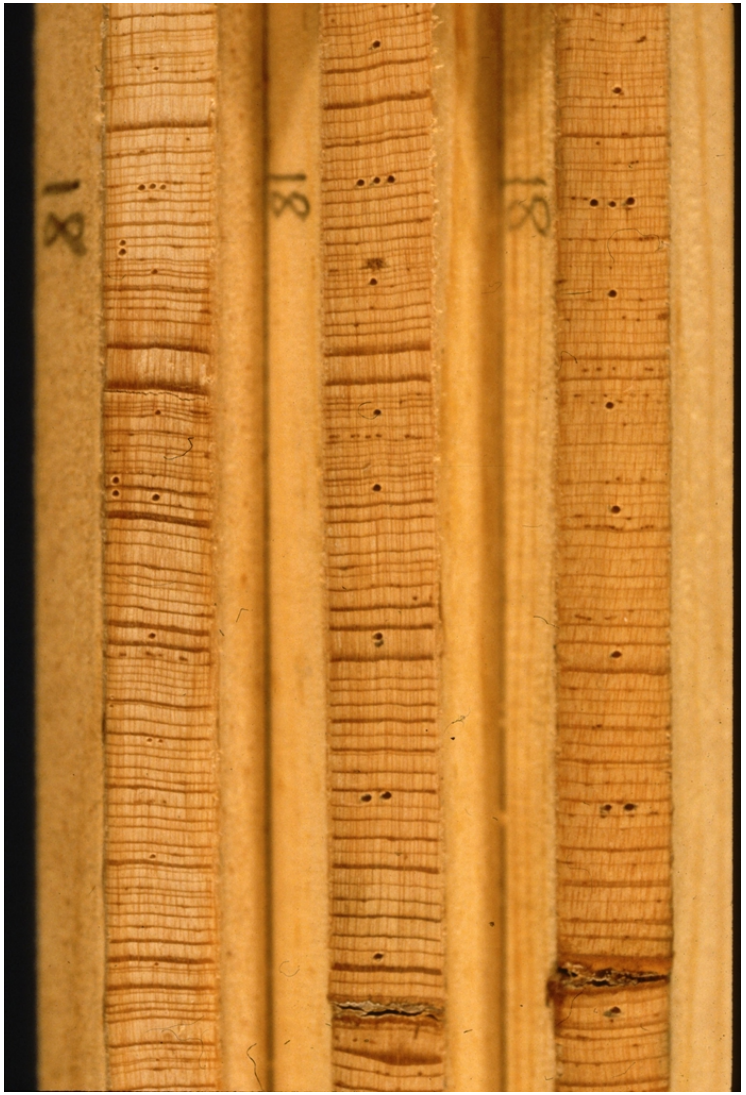
- 15% White oak
- 9% Black oak
- 68% Douglas-fir
- 8% Evergreen hardwood



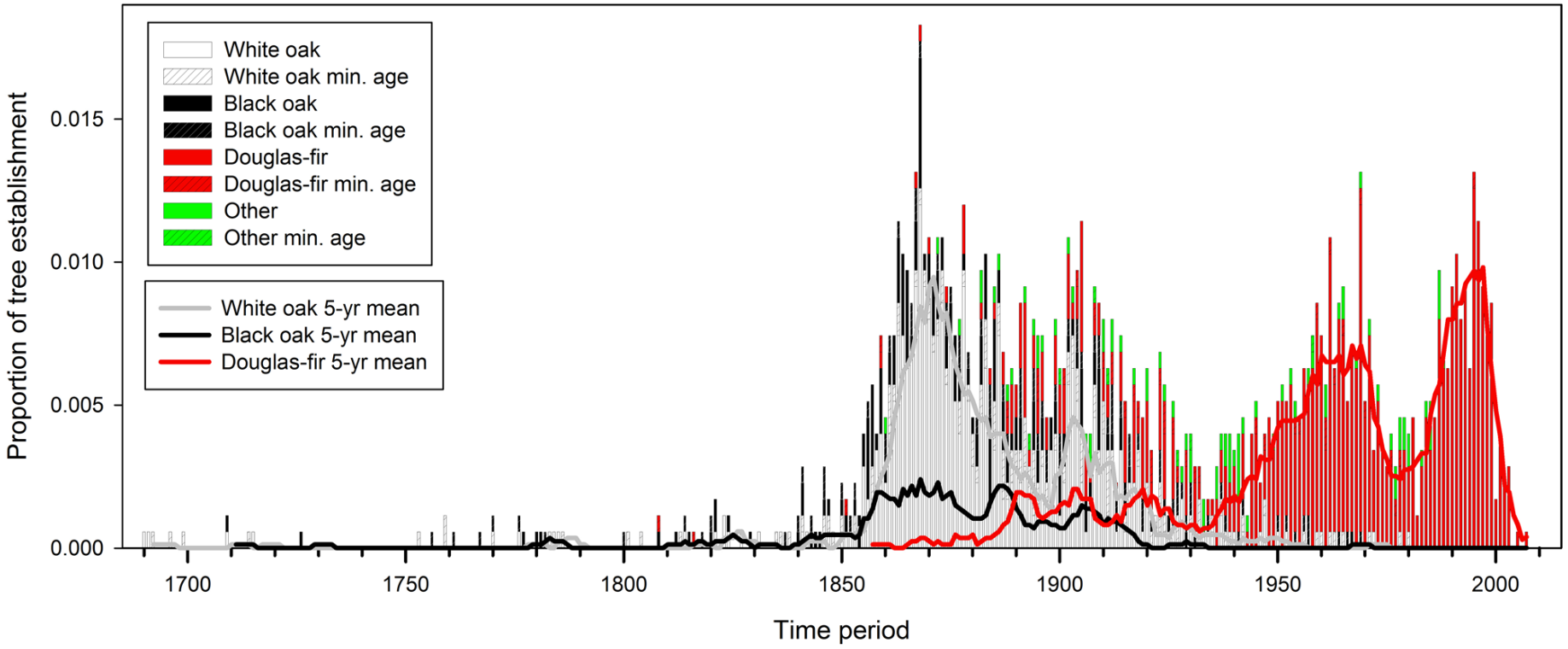


Cores: Oak and Douglas-fir



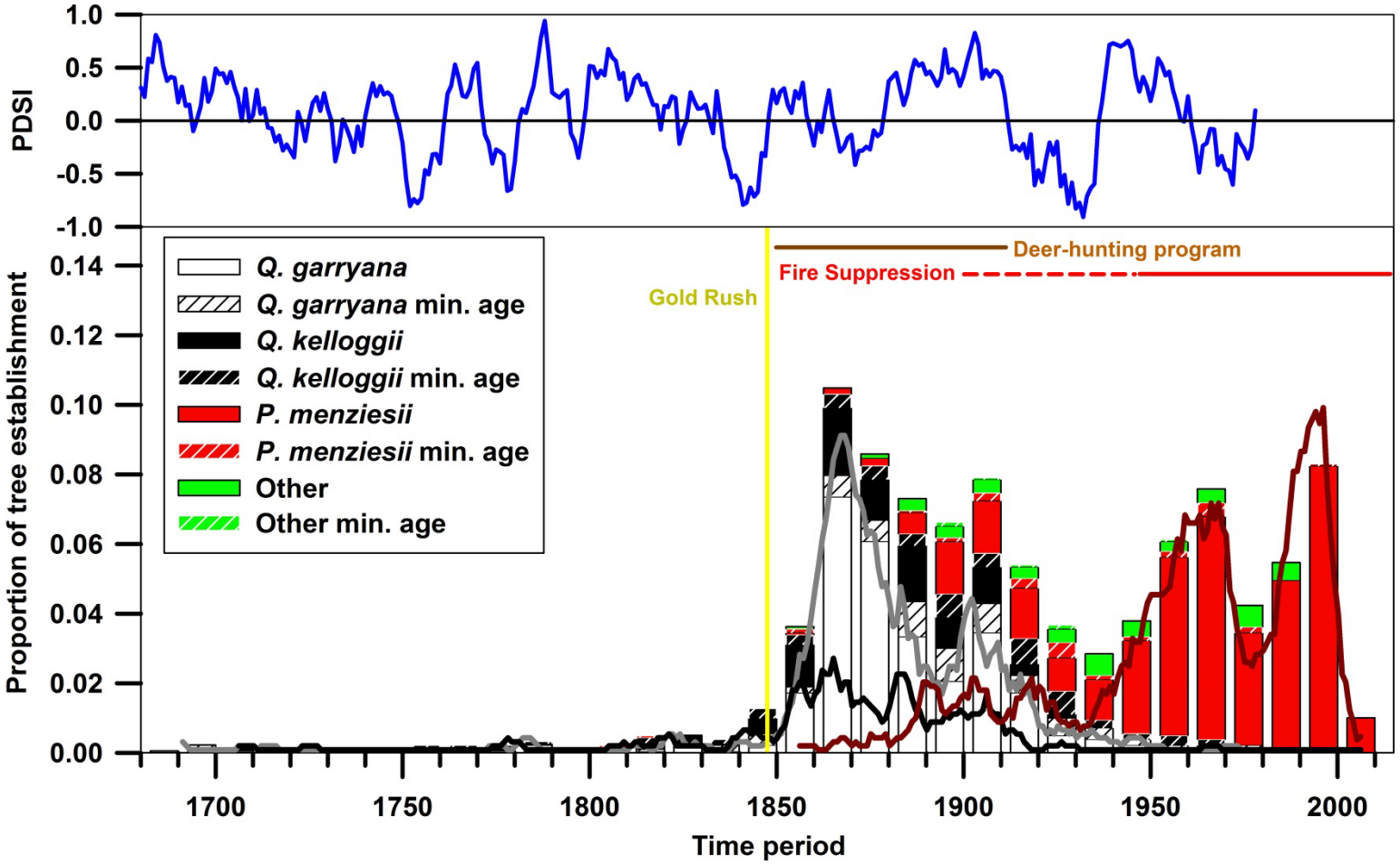


Age distributions

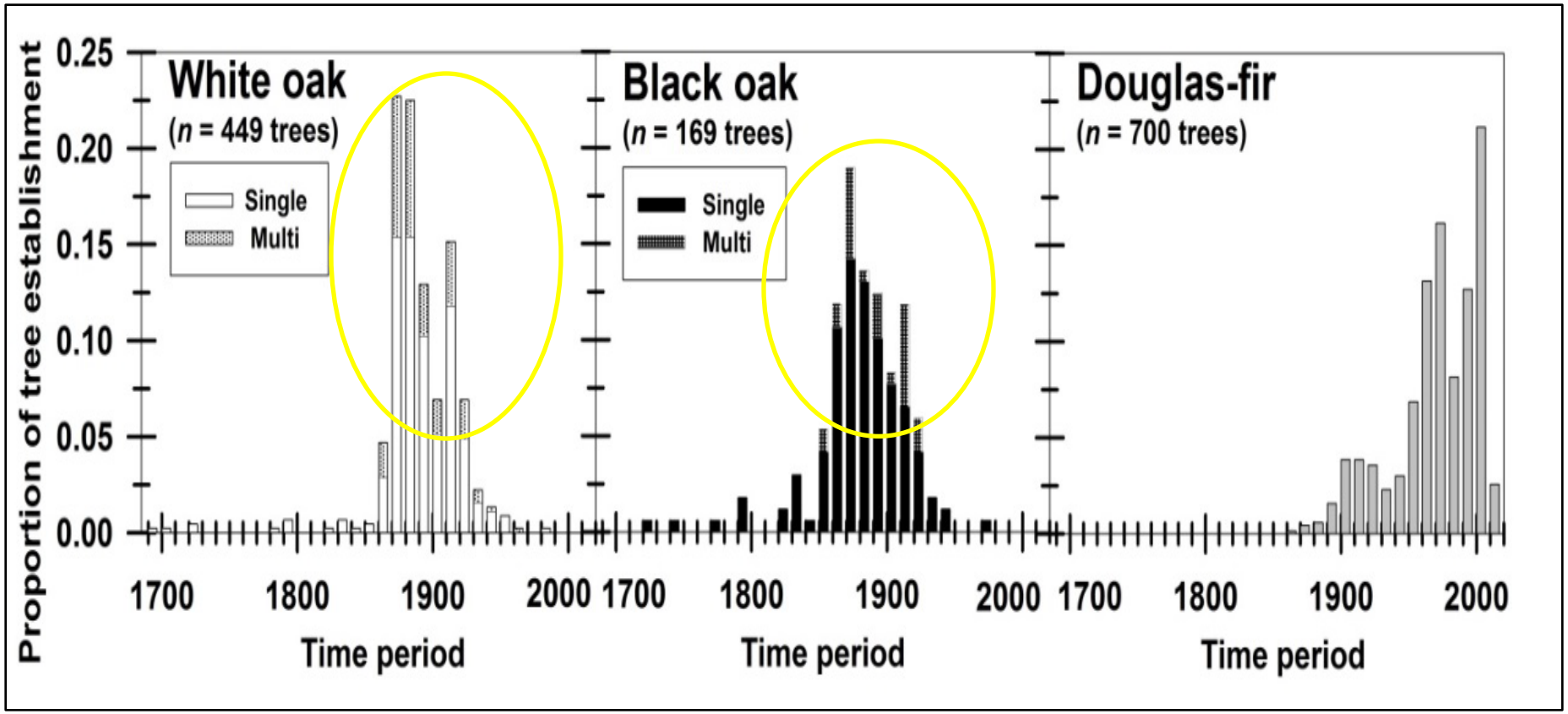


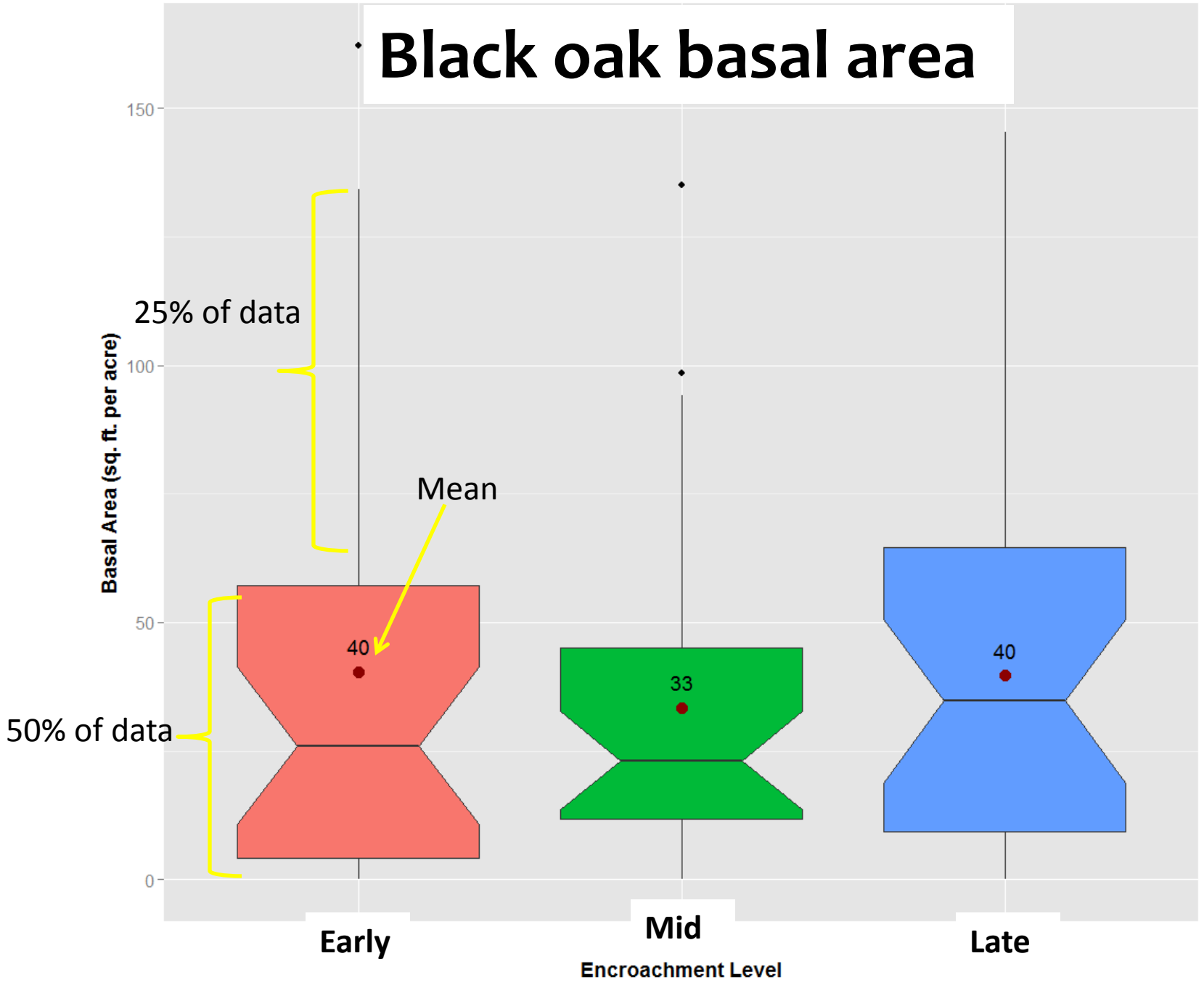
The proportion of tree ages of Q. garryana, Q. kelloggii, P. menziesii, and other tree species sampled from 10 mixed oak-conifer woodland sites (n = 90 plots) in northwestern California. The 5-year smoothing averages (solid horizontal lines) of tree establishment trends for each species is overlaid .

Historical variables

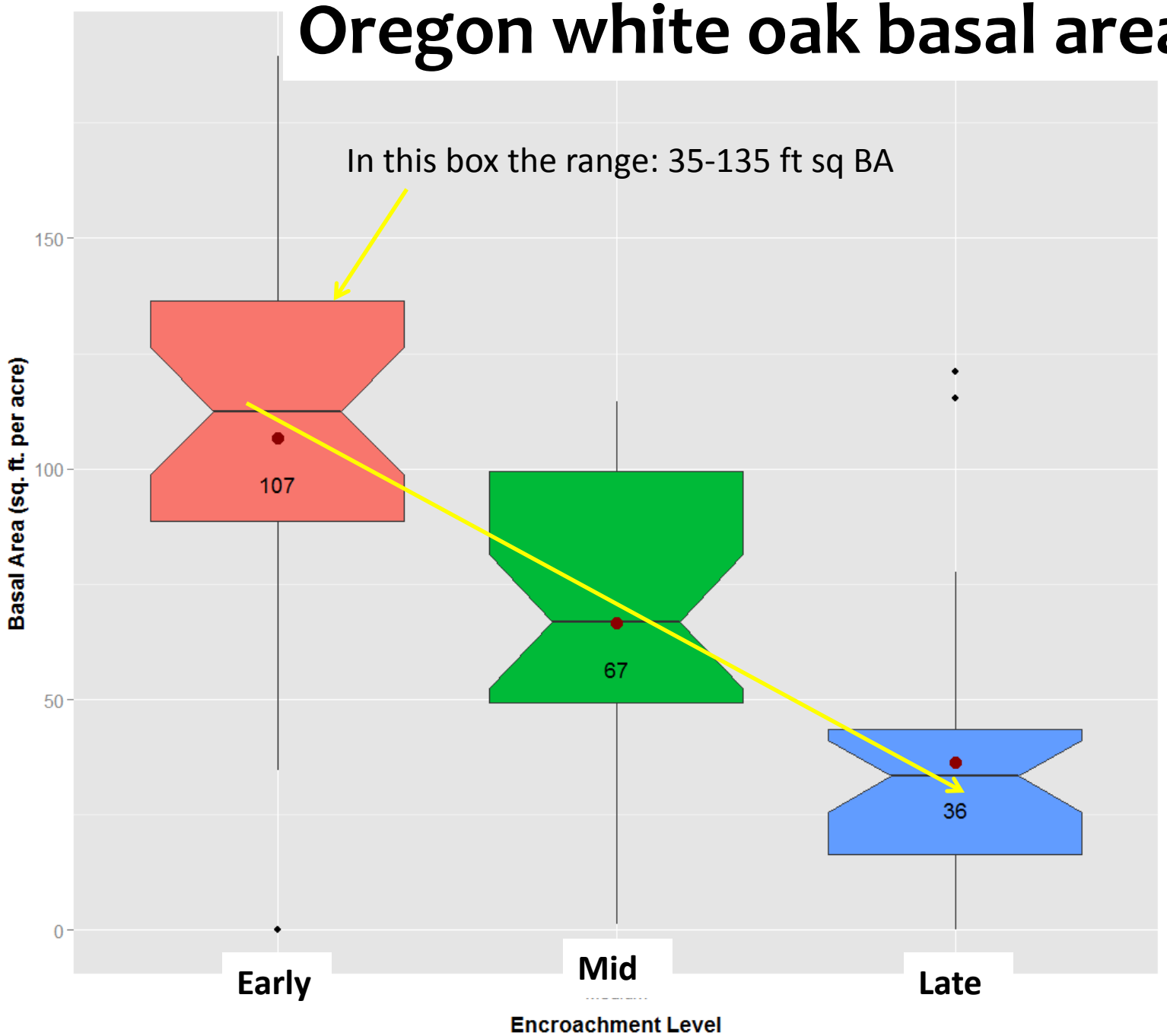


Multi-stemmed oaks are common

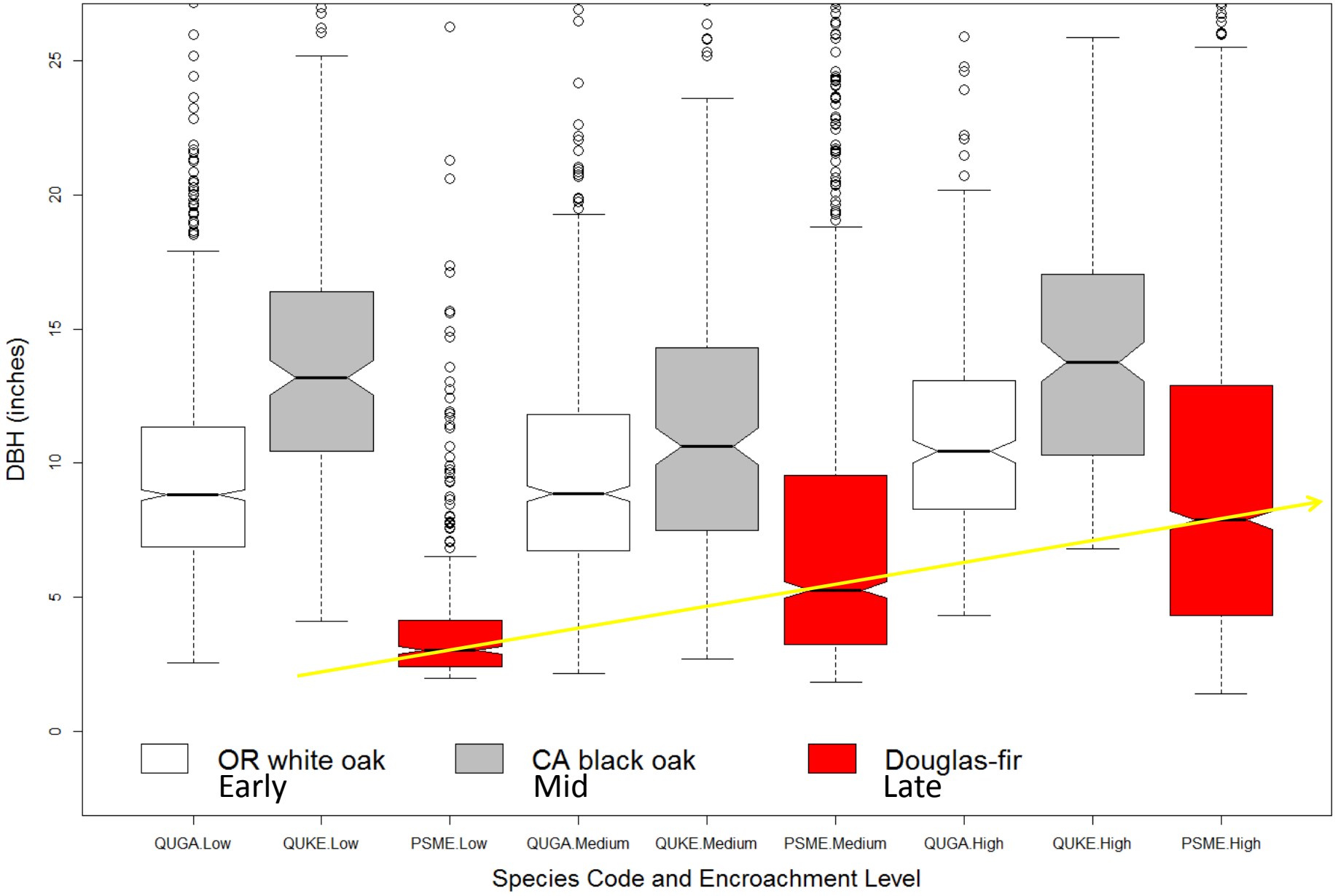



Black oak basal area
150
100
50
0
Basal Area (sq. ft. per acre)
25% of data
50% of data
Mean
40
33
40
Early
Mid
Late
Encroachment Level

Oregon white oak basal area



Diameter distributions



Regeneration Across Sites

	Seedlings	Saplings
Early Stage		
• White oak	78%	< 1%
• Black oak	14%	< 1%
• Douglas-fir	5%	95%
• Bay Laurel	2%	2%
Mid Stage		
• White oak	36%	< 1%
• Black oak	20%	0%
• Douglas-fir	21%	55%
• Canyon live oak	4%	17%
• Bay Laurel	10%	14%
• Tanoak	3%	2%
Late Stage		
• White oak	9%	< 1%
• Black oak	39%	0%
• Douglas-fir	15%	45%
• Canyon live oak	6%	31%
• Bay laurel	13%	9%
• Tanoak	16%	9%

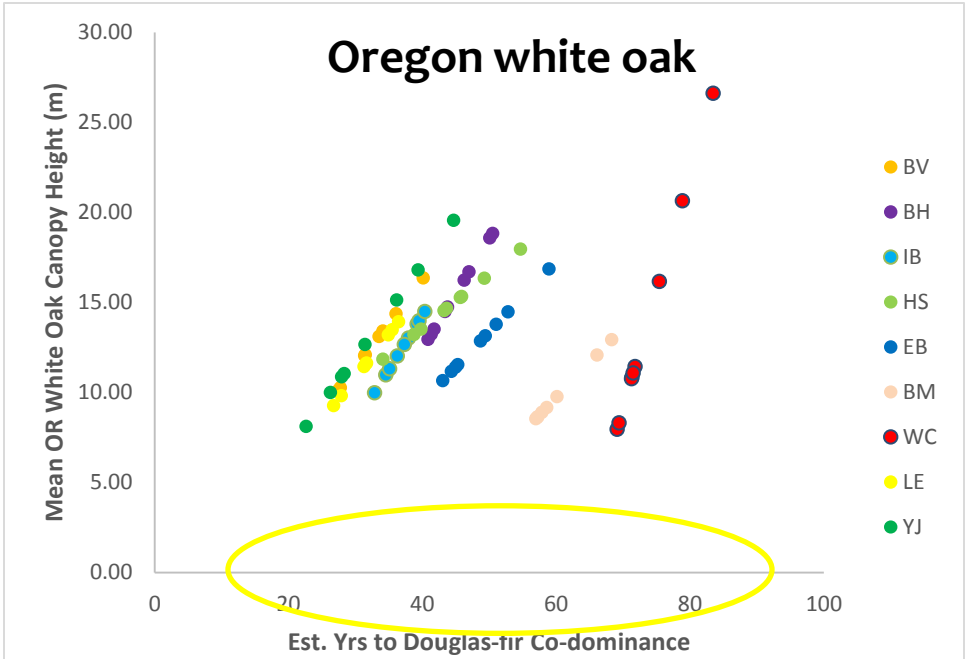
Time to conifer dominance

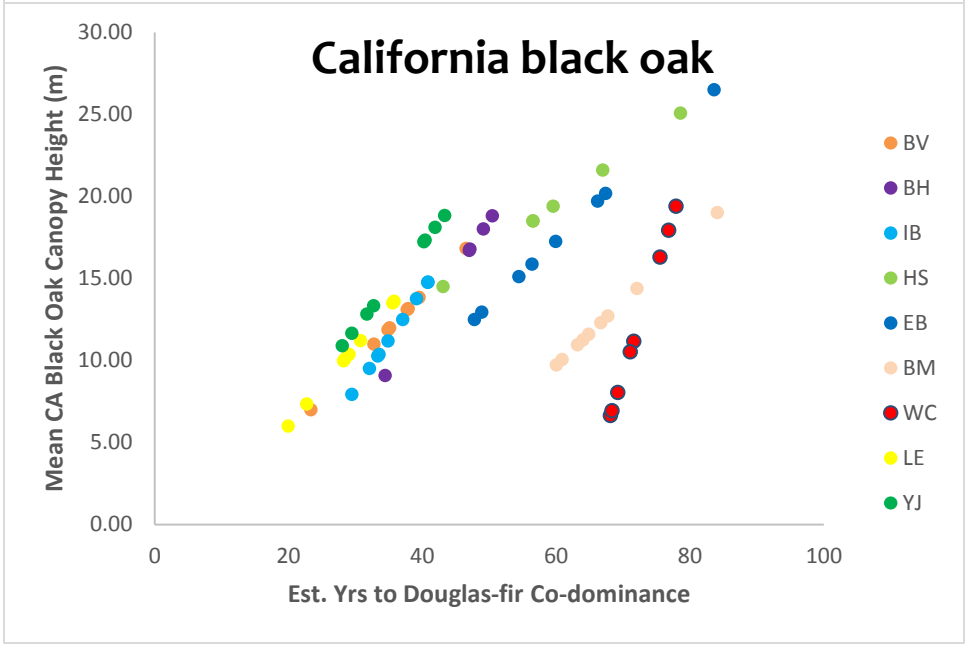
Range 20-80 years

Xeric red

green

Mesic purple





Future Research

- Treatment effectiveness
  - Cost effectiveness
  - Tree-level response
  - Understory response
  - Wildlife habitat

Conclusions

- Oaks are declining rapidly with conifer encroachment
- Oaks are older and larger in diameter than the Douglas-fir, many oaks are multi-stemmed
- Oak basal area is variable but on average range is from 25 sq. ft. to 150 sq. ft.
- Oak regeneration is occurring, but seedlings do not advance in size
- Time to conifer dominance ranges from 20-80 years and is happening more rapidly on wetter sites
- Oak release has been observed in other research projects, and will be the focus of our next efforts

Policy changes for restoration

- Oak policy statement
- Special prescription
- Exemption
- Options
  - Limit to group B deciduous oak species
  - At least coast and northern districts
  - Sites needs to have *Quercus garryanna* or *Q. kelloggii* present
  - Need revenue to support restoration,
  - Strategies vary by size of the conifers:
    - ✓ hand-fall for small diameter
    - ✓ commercial thinning
    - ✓ Rx fire for maintenance
  - Issues: NTMPs, THPs, cost-share projects (no CEQA document)

Coast and Northern districts

Total *Quercus* basal area