Silvicultural experiments exploring linkages between stand structural diversity and ecological variables in California

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Outline

• **Blacks Mountain Interdisciplinary Ecological Study**
  Ecological effects of stand structural complexity

• **Goosenest Adaptive Management Area Study**
  Ecological effects of treatments designed to accelerate growth of large trees
  Ecological effects of treatments for reducing fire hazard - FFS
• Fire Regime: Frequent Fires of Low Intensity

• Large interdisciplinary studies of reducing fire hazard and restoring or maintaining old forest conditions through silvicultural treatments.

• Approximately 6000 acres of treatments.
Stand Structure & Species Composition
Changes over 20th Century

Fire exclusion has helped lead to increasing stand density.
Blacks Mountain study

Objective: understand ecological ramifications of within-stand structural complexity

High diversity
~ 10-15% of stand untreated,
~ 10-15% in 0.25-2ac gaps,
~ thin from below - large trees retained

Low diversity
large trees removed,
intermediates evenly spaced
Blacks Mt Stand Structure

Trees/Acre

RNAs 1934

Ritchie et al. 2008
Zhang et al. 2008
Stephens & Gill 2005
Oliver 2001
Small Mammals

- Yellow pine chipmunk, golden-mantled ground squirrel, and the deer mouse were the most common species found at Blacks Mountain (over 80%).

- Yellow-pine chipmunks and deer mice decreased as basal area (m$^2$ha$^{-1}$) increased, but the opposite occurred with the golden-mantled ground squirrel.

- Golden-mantled ground squirrels more abundant in high structural diversity (HiD) treatments, yellow-pine chipmunks more abundant in low structural diversity (LoD) treatments.
Birds

- Few differences in occupancy of bird species and no differences in species richness were found between structural treatments.

- Estimates of species-richness ranged from 17 to 37 (mean=24 ± 1se), regardless of structural treatments or prescribed fire.

- Treatments did not change snag densities and cavity availability. Snag retention may partially explain why there were no substantial shifts in species richness.
Old Growth – RNA’s

• Over a period of about 65 years, the condition of large old trees at Blacks Mountain deteriorated substantially. There was an influx of young poles and saplings and a substantial decrease in density of large trees > 24 inches in diameter.

• Prospects for the largest trees are bleak in these unthinned stands as reduced growth rates and increased mortality are continuing.

• Treated stands have much lower rates of mortality and higher growth rates, increasing the numbers of large trees.
Silviculture

- Low structural diversity (LoD) treatments showed slightly higher growth for basal area, and a significantly higher diameter increment, than did high structural diversity (HiD) treatments.

- The reduction in stand density did not affect species composition (50:40:10 ponderosa and Jeffrey pine: white fir: incense-cedar).

- Cover and number of species of understory vegetation showed no difference between structural treatments.
Cone Fire

A. No Treatment
B. Thinned – No RxBurn
C. Thinned with RxBurn
Goosenest Adaptive Management Area study

- **Objective**: accelerate development of large tree component of late-seral stands

- **Treatments**: pine emphasis, pine emphasis w/ fire, large tree emphasis, control
  - Pine emphasis: all dom/codominant pines >12” retained; leave trees spaced based on dbh; 15% of area in 0.5-3ac group openings - planted
  - Large tree emphasis: thinning from below keeping largest trees, even spacing

- **100 acre units + buffer; implementation completed 2001**

- **Multidisciplinary** – wildlife (birds, small mammals), tree growth, understory veg. etc.
South Cascades FFS
vs.
Beaver Creek Pinery

![Graph showing tree distribution by DBH category and treatment (Control, Thin only, Thin & Burn, Burn only, and Beaver Creek Pinery).](image)
Some lessons learned

• Marking – challenges posed by non-standard prescriptions

• Wildlife studies require large units
  – trade-offs with replication / statistical power
  – Expensive

• Questions are long-term, but difficult to secure long-term funding for studies
Thank You