

Quantifying oak woodland loss to conifer encroachment: A new research project in the North Coast

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Today's presentation

- Background
 - What is conifer encroachment?
 - Why does it matter?
- New research project: *Tools for a changing landscape: Understanding disturbance and vegetation dynamics in N. CA oak woodlands*
 - Project goals and plans



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



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

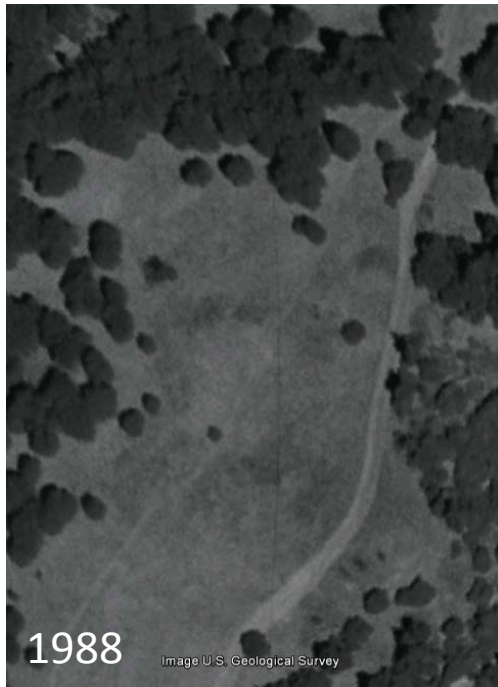
Encroachment of woody vegetation into frequent-fire adapted community types is **common in the absence of fire**



Photos: Redwood National Park staff

Conifer encroachment

In the North Coast, **native conifer encroachment** is a widespread result of fire suppression



Conifer encroachment



With a nearby seed source, young Douglas-fir can quickly colonize a site

Conifer encroachment



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



Highway 299





Highway 36



Alderpoint Road



Kneeland Road



Redwood National Park



Photo: Redwood National Park staff

What do we know?

- **Encroachment is widely recognized throughout the North Coast and the Pacific Northwest**
- Past research
 - Extent of encroachment at Redwood National Park (Sugihara and Reed 1987)
 - Relationship between encroachment rates and site-level factors in Sonoma County (Barnhart et al. 1996)
 - Age and stand structures of oaks and encroaching conifers in Sonoma County and Oregon (Barnhart et al. 1996, Gilligan and Muir 2011)
 - Impacts on understory plant diversity in Washington (Thysell and Carey 2001)
 - Changes in fuelbed characteristics and flammability/fire regime in Redwood National Park (Engber et al. 2011)
 - Impacts on post-wildfire response of encroached black oaks near Somes Bar, CA (Cocking et al. 2012)



What don't we know?

- Most existing research has been limited in scale (single study areas)
- **We don't have a good understanding of issues at a landscape scale**
 - Rate and extent of encroachment across time and space
 - Future patterns of encroachment based on climate and other factors
 - Relationships of physical, environmental, and human (management) factors to stand/age structures, understory diversity, and encroachment rates





Upcoming research

- New project funded by UC Agriculture and Natural Resources
 - ***Tools for a changing landscape: Understanding disturbance and vegetation dynamics in northern CA oak woodlands***
- Collaborative team:
 - **Yana Valachovic and Lenya Quinn-Davidson, UC Cooperative Extension**
 - **Rick Standiford, Maggi Kelly, and Matthew Potts, UC Berkeley**
 - **Rosemary Sherriff, Humboldt State University**
 - **Morgan Varner, Mississippi State University (formerly with Humboldt State University)**

Tools for a changing landscape

Key Questions

- What are the rate, extent, and health effects of conifer encroachment in North Coast oak woodlands, and what variables determine rates of encroachment?
- What oak stand structures and age structures are present within encroached areas?
- How will encroachment rates and patterns shift under changing environmental and climate scenarios?
- How can we help inform and prioritize restoration strategies?



Tools for a changing landscape

- Study will look at white and black oak woodlands in Humboldt and Mendocino counties
- **Two-tiered approach:**
 - Spatial analysis of the rate and extent of encroachment
 - Field-based analysis of stand and age structures, understory diversity, and other site-level factors





Tools for a changing landscape

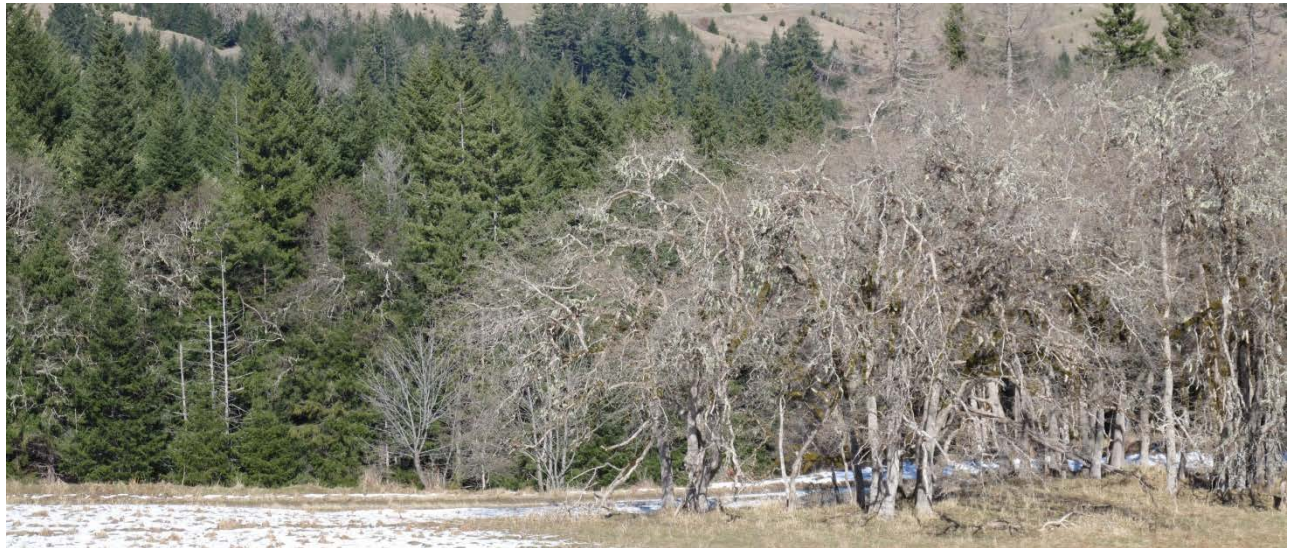
Spatial analysis

- Use existing datasets (e.g., CRA, FRAP) to select potential study regions across latitudinal and longitudinal gradients
- Use historical air photos and management histories to narrow focus and choose specific study areas
- Quantify rate and extent of conifer encroachment since early 20th century for each study area
- Identify factors that influence encroachment rates
- Ground truth spatial analysis with field plots

Tools for a changing landscape

Field study

- Randomly select plots within larger study areas to cover spectrum from not encroached to severely encroached
- Core oaks and Douglas-fir to determine age structure by species
- Assess understory diversity and oak health



Tools for a changing landscape

Outreach and extension

- Integrate project results with existing habitat and map data to create a web-based decision support system
- Organize workshops and webinars focused on project results and oak woodland research/management in general
- Develop policy briefs and management recommendations
- Set the stage for future research



Any questions?



Feel free to contact me!
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