GTR 220: Integrating wildlife habitat and forest resilience with fuels reduction –
Ecosystem management concepts for mixed conifer

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Talk Outline

1) Background

2) Motivation for a new forest management strategy in the Sierra Nevada

3) Problems to overcome

4) Using topography as a template for forest management

"There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know".
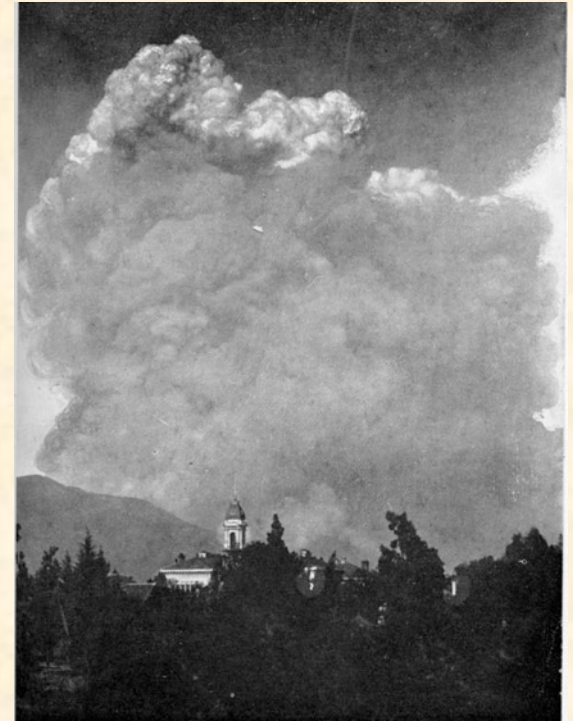- Donald Rumsfeld

5) An application of the guidelines

6) Response: Scientists and Managers

7) Conclusion

Background: California context

2008 wildfire

Sept. 22 1900 fire plume in the San Gabriel Mountains, Los Angeles County (taken 25 miles from the fire).

- For 1950-1999 average annual total burned by wildfire was 250,000 ac
- In 2008, 1,400,000 ac burned
- Before 1800, estimated annual total of 4,500,000 ac of which about 1,200,000 ac was forest
- Area annually treated in CA for fuels reduction (50-65,000 ac) is well below USFS goal of 125,000 ac/yr.

Source: Stephens et al. 2007. Forest Ecol. & Man. 251: 205–216

Increasing and compelling evidence that fuels treatments, which reduce ladder and **surface fuels**, can be highly effective

'Tested' fuels treatments in the Sierra include Angora, Brown, Sugarloaf, Power, Pittville, Milford, Antelope-Wheeler, Moonlight, American River Complex, Piute, Rich, Grass Valley, Cone, and Calpine

Untreated

Fire Direction

Thinned and Prescribe Burned

Cone Wildfire, N. Calif.

Sugarloaf Fire: Treated (above) and Untreated (below) forest within 200 m.
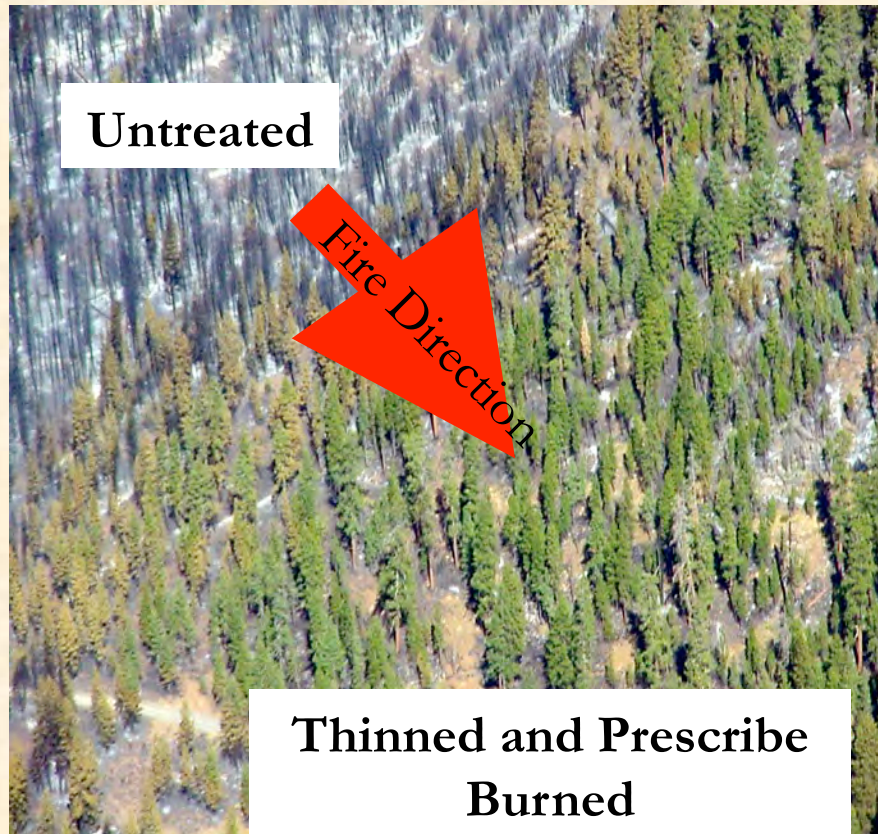
Why are Fuels Treatments Stalled? Problems: 1) Economics

• Almost 50% of the US Forest Service's budget is used for fire fighting and training, leaving little for preventive measures like fuels treatments.

• The large-scale fuels treatments which are needed will never occur unless most of them can 'pay for themselves'.

• Thinning merchantable trees, however, rarely affects potential wildfire intensity, and can create the perception and problems associated with 'getting the cut out'.

• The most effective fuels treatments reduce surface and ladder fuels—costs are often $800-2,500/ac

Problems: 2) Wildlife Habitat

• Fuels treatments are repeatedly stalled due to litigation

• A recent analysis found one of the most common reasons was the lack of sufficient provisions for threatened and endangered species (TES) habitat

• One of the perceived conflicts is the association of some TES with forest conditions that have high surface and ladder fuel loads and high canopy cover.

Pacific fisher, northern goshawk and California spotted owl

Problems: 3) Increasing forest heterogeneity

Current Fuels Treatments tend to be systematic and homogeneous
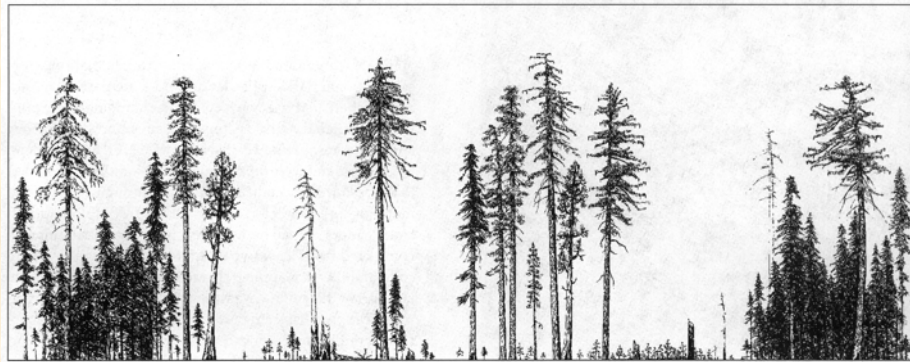
Defense zone treatment

SPLAT

- **Defense or Defensible Fuel Profile Zones (DFPZs):** Key strategic areas often near homes
- **Strategically Placed Area Treatments (SPLATS):** generally reduce stem density, ladder fuels and sometimes surface fuels to slow rate of spread

Problems: 3) Increasing forest heterogeneity

• Under changing climate conditions and inevitable fire events, forest resiliency is more likely retained with variable forest and fuel conditions

• Management which applies the same treatment across the landscape will also reduce habitat heterogeneity

• The problem has been to identify where and how forest conditions should vary

Forest structure in an active-fire stand structure (Yosemite)

A 'tidy' German forest

Sierra Nevada: Annual acreage treated, untreated (what would have historically burned minus treated), and the backlog (total acreage needing treatment)

Background: How this paper began

- Could creating variable forest conditions meet the objectives of fuels reduction, forest restoration and the provision of wildlife habitat?

- One treatment area, The Kings River Project attempted to use a silvicultural strategy based on fuels reduction and uneven-aged management; for 17 year it failed to pass public scrutiny and even after mediation was litigated

- In 2007, USFS Region 5 asked PSW Research to summarize the science on fuels treatment, TES, and forest restoration, and provide recommendations for a scientifically defensible approach.

Background: How this paper began

• Would fire science, forest ecology, and wildlife biology research provide contrasting or complimentary management concepts?

• Could complimentary concepts be translated into silviculture practices?

• Each discipline's research findings coalesced around the importance of variable forest structure and fuels conditions for ecological restoration, forest resilience, and wildlife habitat.

• The crux was defining a method for managers to implement that variability and for stakeholders to assess forest practices management
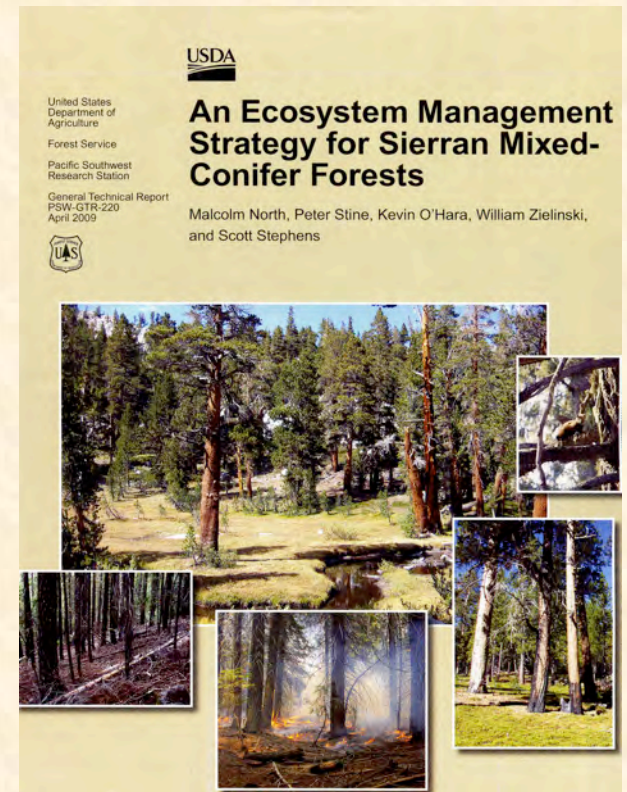
Proposed Strategy: Premises

The paper examines and summarizes science in 5 areas to develop management recommendations and silvicultural guidelines:

1) Fuel Dynamics

2) Ecological Role of Fire

3) Climate Change

4) Sensitive Wildlife Habitat

5)Forest Heterogeneity and Resilience

6)2nd edition with an addendum is now published

http://www.plantsciences.ucdavis.edu/affiliates/north/Publications.html

Proposed Strategy: Using Topography

• Active fire regimes likely produced forest heterogeneity as fire intensity and extent was affected by topography.

• Different fuels reduction and resulting forest structure could be produced using micro- and macro- topography as a guide.

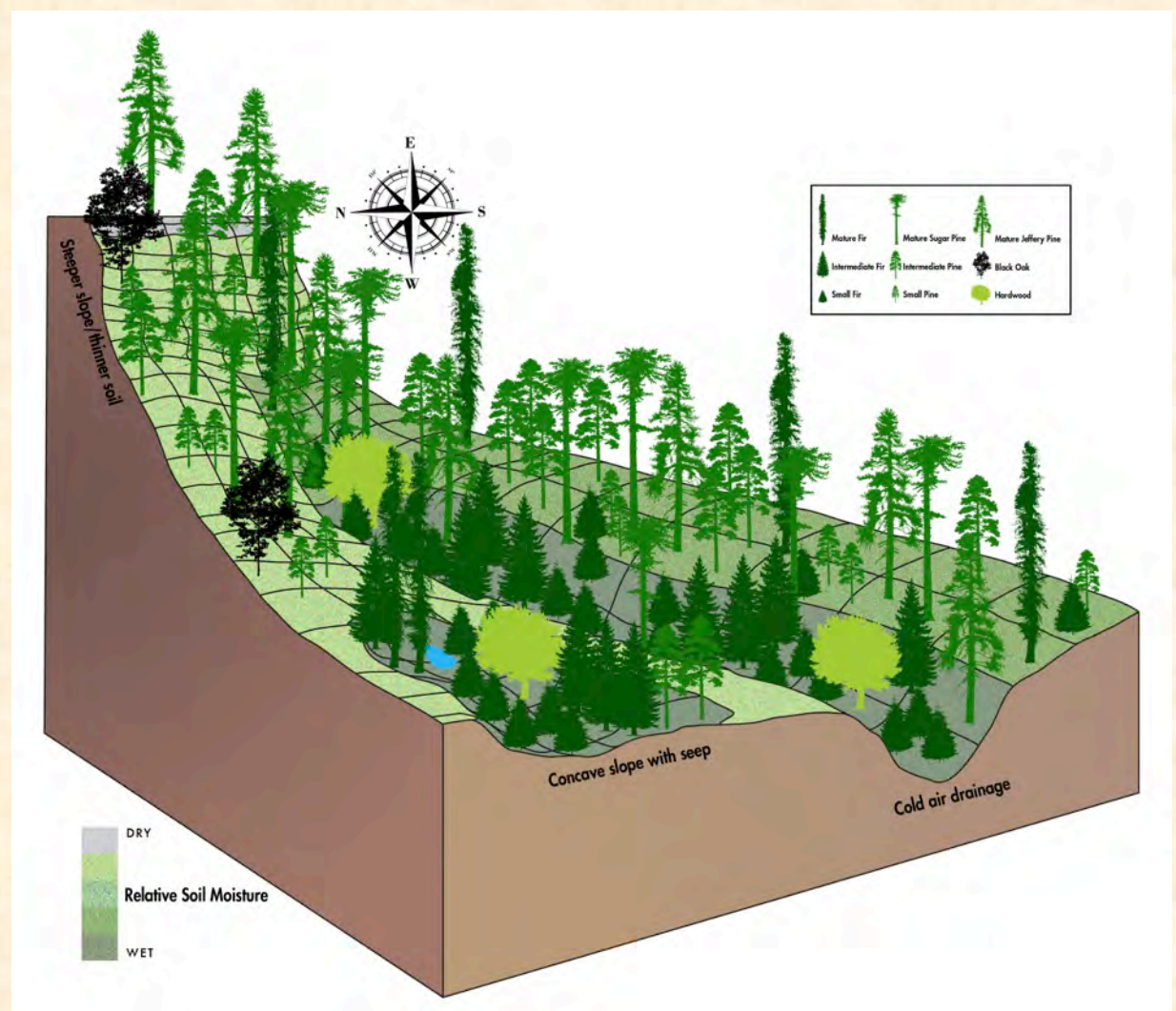# Proposed Strategy: Using Topography
Stand Level
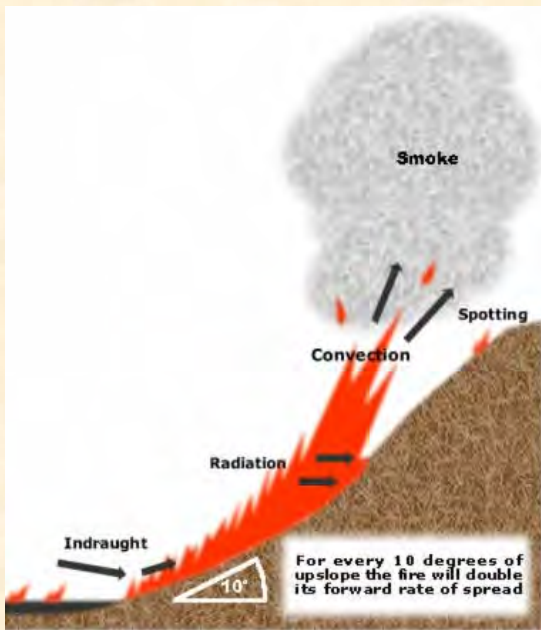
Low density of pine on upper slope shallow soils

Active-fire stand structure in Aspen Valley, Yosemite NP: Note dense group of hardwoods in drainage

Proposed Strategy: Using Topography

Stand-level schematic of how forest structure and composition would vary by small-scale topography after treatment. Cold air drainages and concave areas would have high stem densities, more fir and hardwoods and could provide TES habitat. With increasing slope, stem density decreases and species composition becomes dominated by pines

Proposed Strategy: Using Topography
Landscape Level

Main influences on fire intensity:

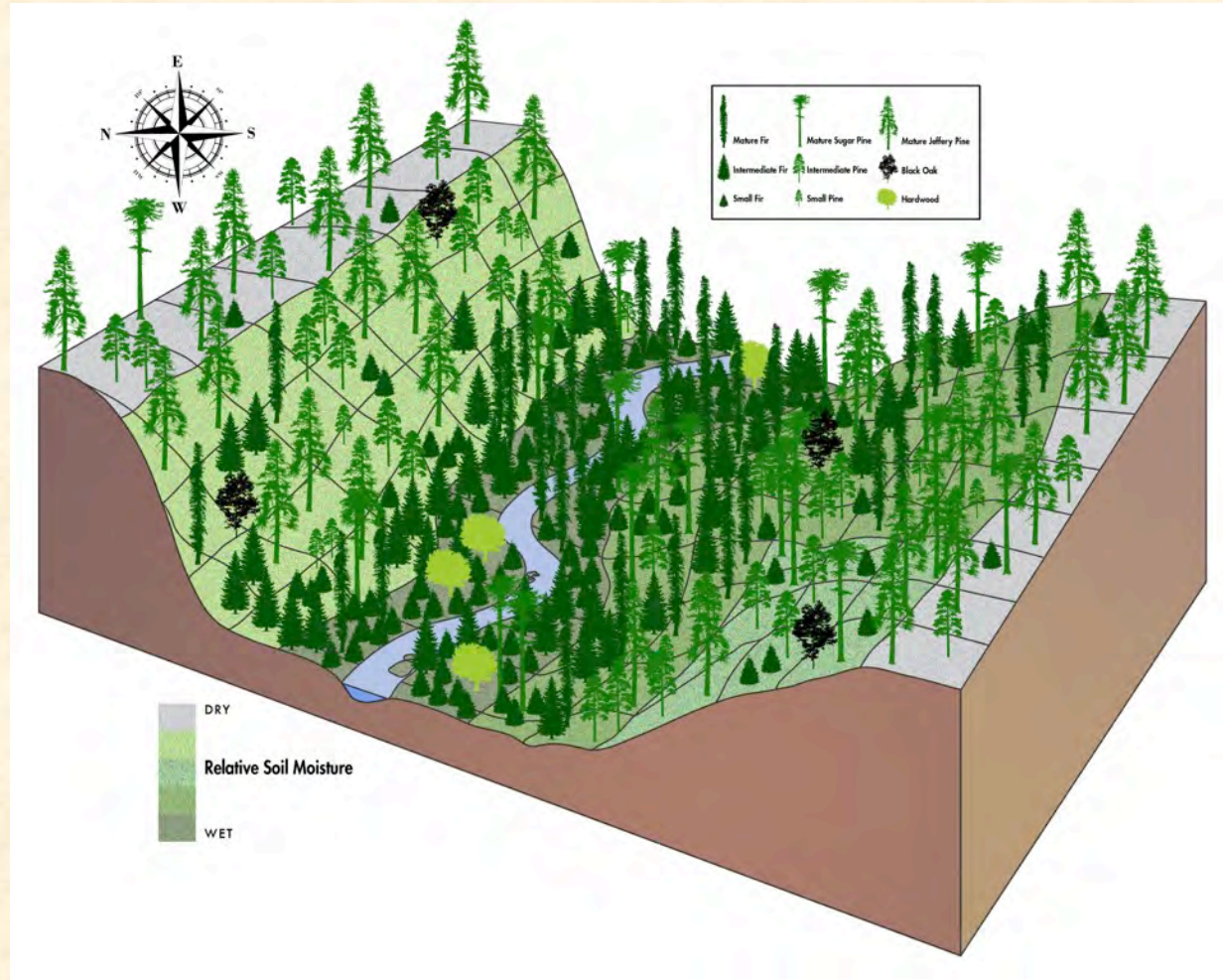• Slope position

• Slope steepness

• Aspect

Topography's influence on burn intensity producing different forest structures and fuel loads.
Moonlight fire, Lassen NF

Proposed Strategy: Using Topography

Landscape schematic of variable forest conditions produced by management treatments that vary by topographic factors such as slope, aspect, and slope position. Ridgetops have the lowest stem density and highest percentage of pine in contrast to riparian areas. Midslope forest density and composition varies with aspect: density and fir composition increase on more northern aspects and flatter slope angles. Riparian forest provide high canopy cover movement corridors.

Making Fuels Treatments Economically Viable: Thinning merchantable trees

Criteria for thinning 20-30" trees:

• Species: preferentially remove shade-tolerant, fire sensitive species (firs and cedar)

• Mid to upper slope topographic position where fire probably maintained lower large tree densities

• Ladder fuel trees: larger trees can still ladder fire if their canopy extends close to the ground

• Reduce drought stress and beetle mortality in leave trees

White fir 20-30" dbh with ladder fuel potential

Economics: Coupling Treatment Areas
Many high-value areas (sensitive species habitat, riparian forest) requiring lighter treatment will not get treated unless they are economically supported with the higher revenue from restoration treatments of upper slopes and ridge tops
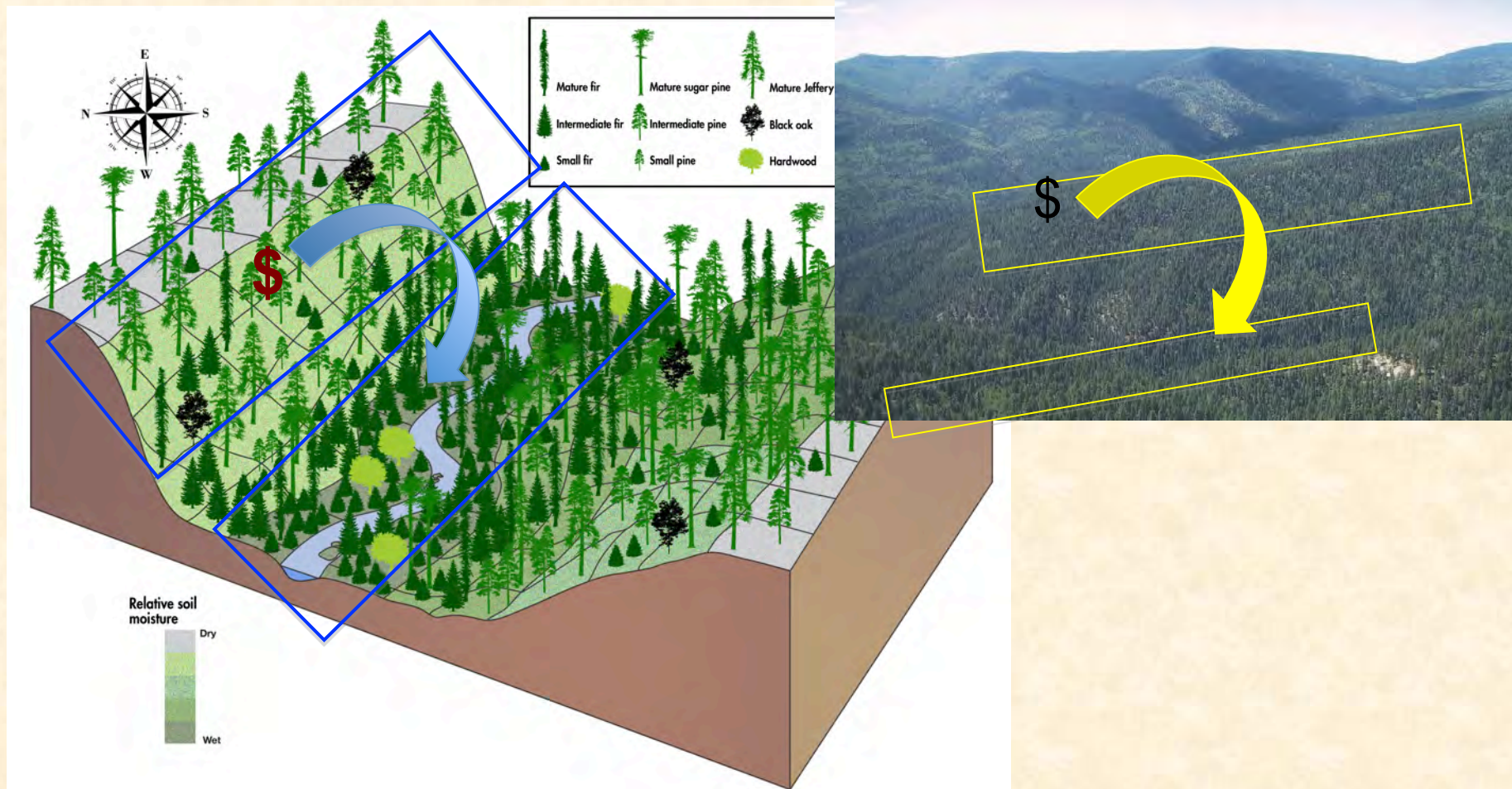
Other Concepts in the GTR

• Historic stands probably achieved crown separation by having tree clusters separated by gaps. Current forests often lack these gaps.

• Topography is not a mandate—it's the concept of variability that's being stressed. Managers have to work with the forest conditions they've got.

• Need to retain 'defect' trees

• Riparian forests should be a priority for fuels reduction

Gaps and tree groups produced by an active-fire regime in ponderosa pine at The Beaver Creek Pinery

Test of GTR 220 ideas: Are TES species associated with topography that supports higher canopy cover and tree density?
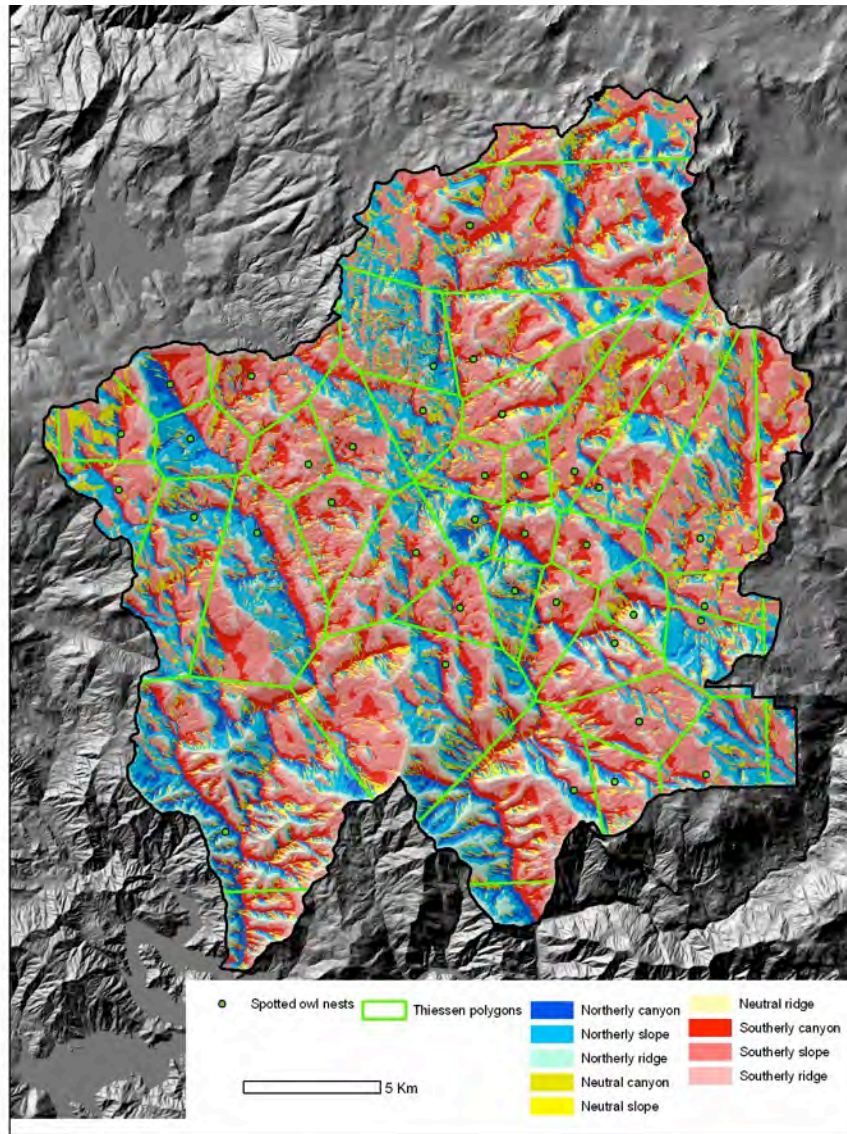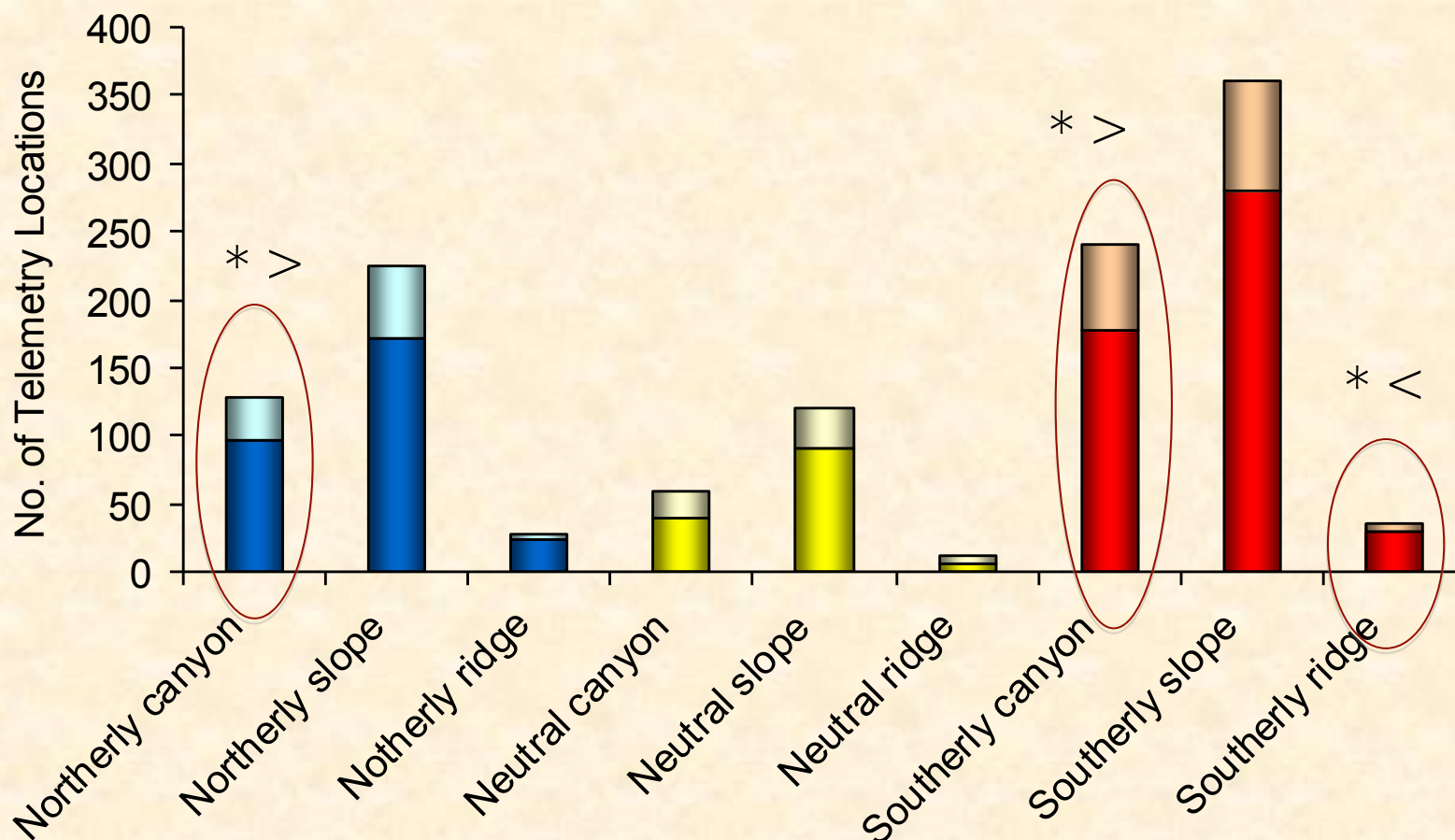

Spotted owl nests & LMUs
(Landscape Management Unit)

	Canyon	Slope	Ridge
Northerly	3	5	1
Neutral	1	2	0
Southerly	11	12	2
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Underwood, E.C., J.H. Viers, J.F. Quinn, and M. North. 2010. Using topography to meet wildlife and fuels treatment objectives in fire-suppressed landscapes. Journal of Environmental Management 46: 809-819.

Number of Pacific fisher telemetry locations recorded in each LMU (n=1209)

Darker blue, yellow, red = Female
Lighter blue, yellow, red = Male
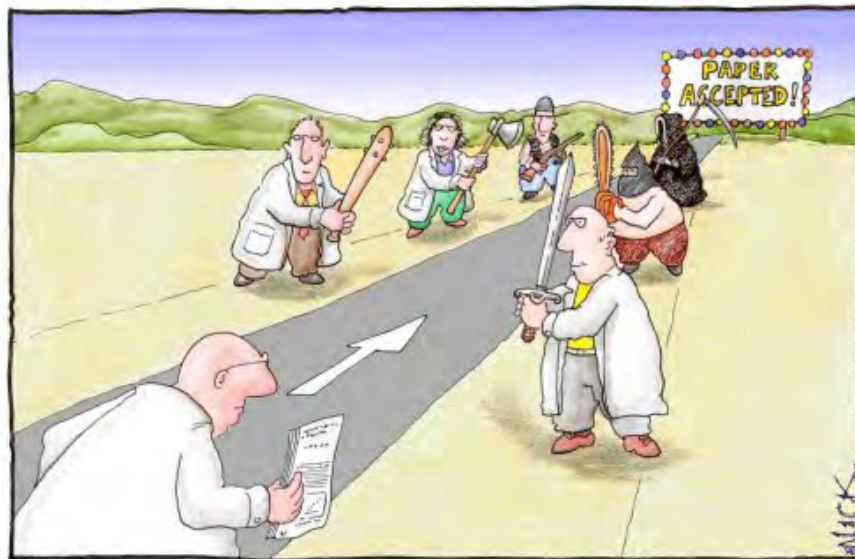
Data provided by Craig Thompson

Underwood, E.C., J.H. Viers, J.F. Quinn, and M. North. 2010. Using topography to meet wildlife and fuels treatment objectives in fire-suppressed landscapes. Journal of Environmental Management 46: 809-819.

Response: Science Peer Review and Future Directions

• Manuscript went through more than 40 reviews of which 7 were blind peer reviews

• "Considering the creativity of the authors involved in this report I would have expected some new ground be broken"

Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'

• Management may be better served by science that doesn't break new ground, but that is well accepted.
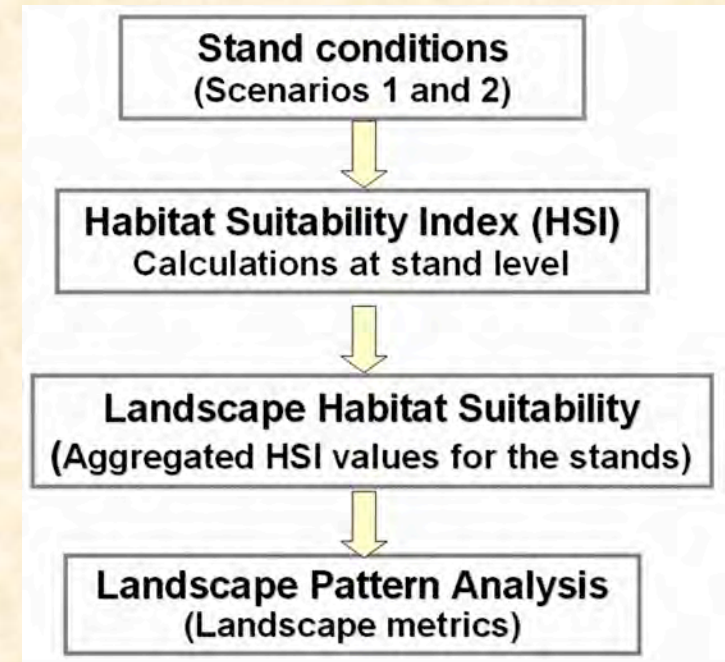
Forest Management Response
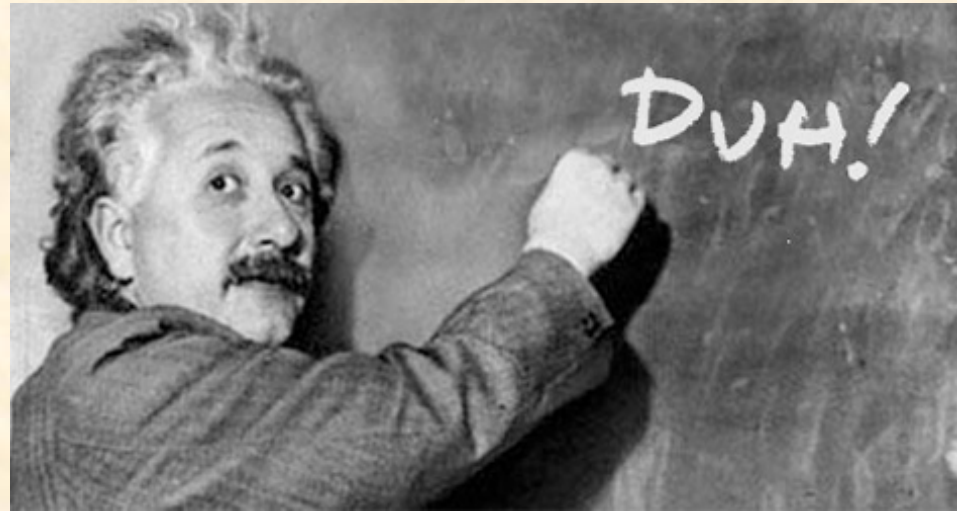
- In some cases this approach is much like how forests are already being managed
- Fuels treatments are rarely uniformly applied on the ground despite what might be planned
- In some treated areas, stand structure varies by on-site conditions and across watersheds

The Role of Science: Provide a Comprehensive Management Theory

• Its been difficult for foresters to communicate how they create variable forest conditions or for stakeholders to evaluate management practices.

• One piece that has been missing is how TES historically thrived in frequent-fire conditions.

•The GTR may help provide a conceptual framework for defining a desired, future condition

•For stakeholders, this approach can also help with **transparency and verification**

Stand conditions
(Scenarios 1 and 2)

Habitat Suitability Index (HSI)
Calculations at stand level

Landscape Habitat Suitability
(Aggregated HSI values for the stands)

Landscape Pattern Analysis
(Landscape metrics)

Traditional FRAGSTATS method of calculating habitat in a landscape that does not provide a concept of TES habitat allocation or how the pieces might function together

Current Use of GTR Concepts:

• The Dinkey Creek Project part of the Kings River Area, used the GTR and is finally going forward. They also won a Forest Landscape Restoration Grant to plan and treat >100,000 ac.

• Currently all new Forest Service projects on 9 Sierra Nevada National Forests are based on the GTR.

• The Forest Service is using GTR concepts as a basis for their next round of 10 year forest plans.

Conclusions:

• In fire-prone forests, the risks of carefully considered active management are lower than the risks of inaction.

• The best means of providing TES habitat in fuels treated landscapes, may be to produce the variable, resilient forest structure that these species evolved with.

• This can only happen IF we can reach some common ground allowing fuels treatments to be widely implemented AND make them economically viable.

• There has to be a conceptual framework or landscape blueprint for how forest conditions should vary.
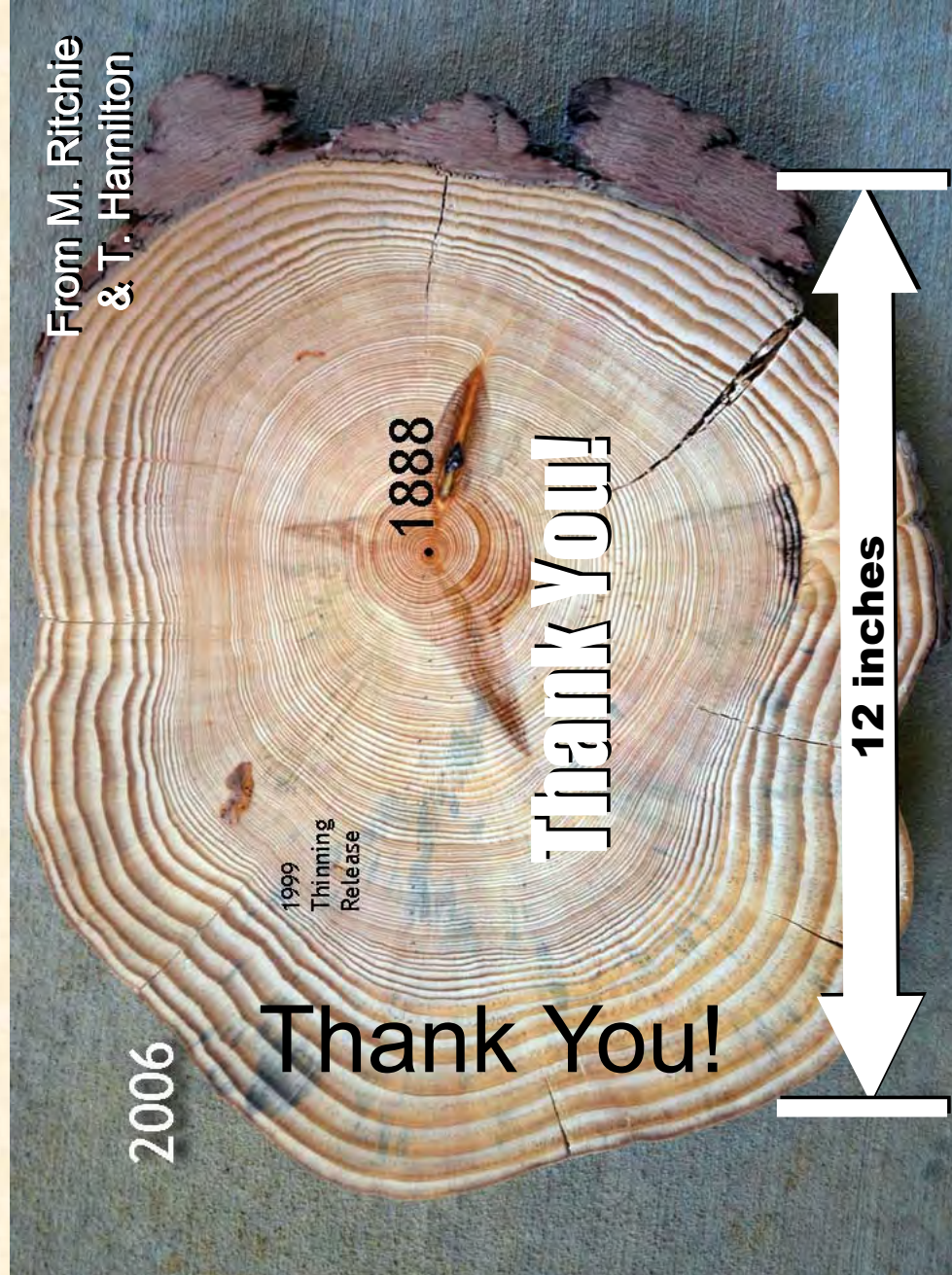
Radial growth release on a leave tree in a fuels treatment