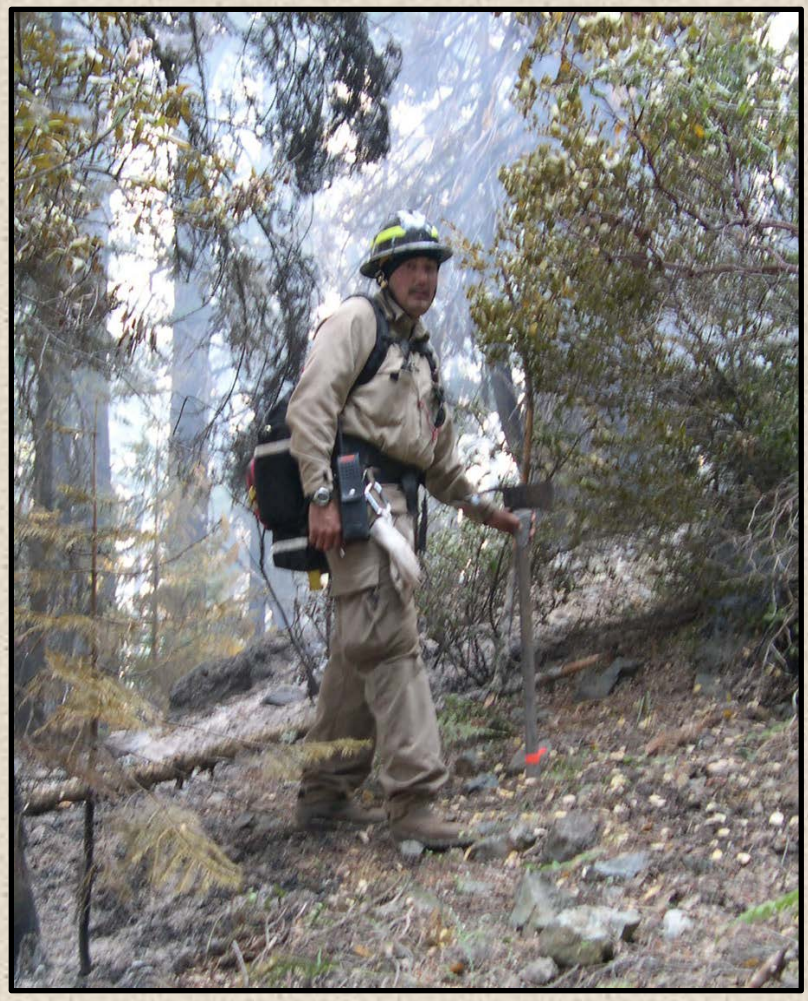
Replicating& Reintroducing Historical Tribal Ignition Patterns: Reviving the Cultural Fire Regime

- Frank K. Lake
- USDA Forest Service- PSW, Orleans/Redding, Ca.
- Fire and Fuels Program
- Traditional Ecological Knowledge and Ethnobiology

franklake@fs.fed.us

530-627-3276

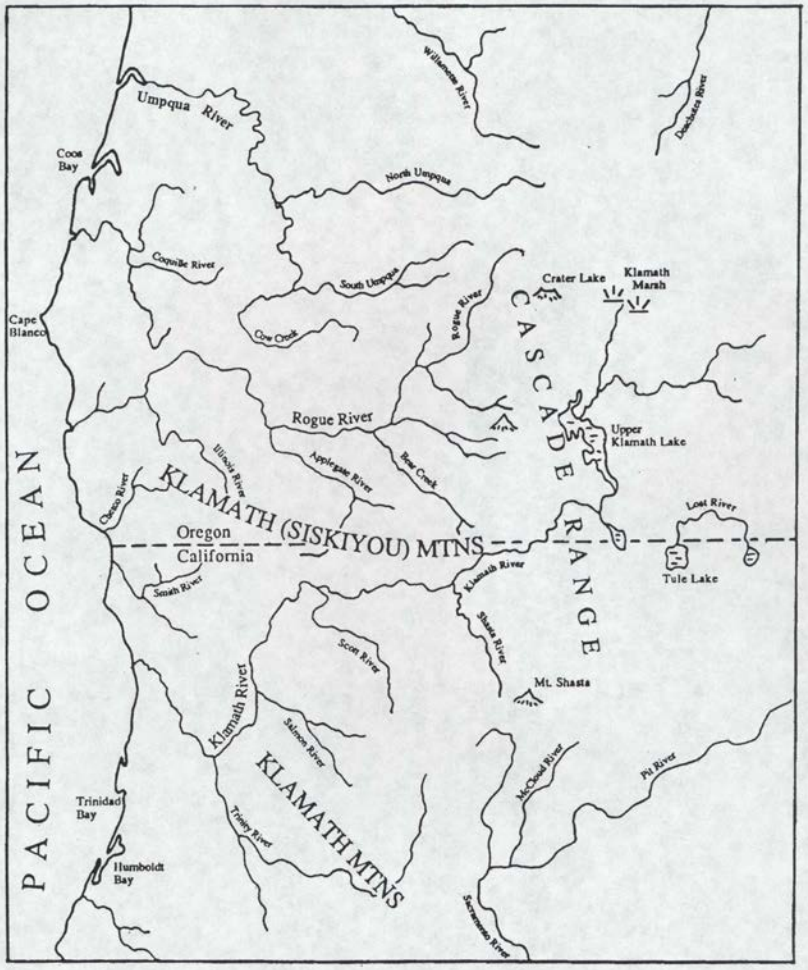


Overview: Tribal Fire Use Then and Now?

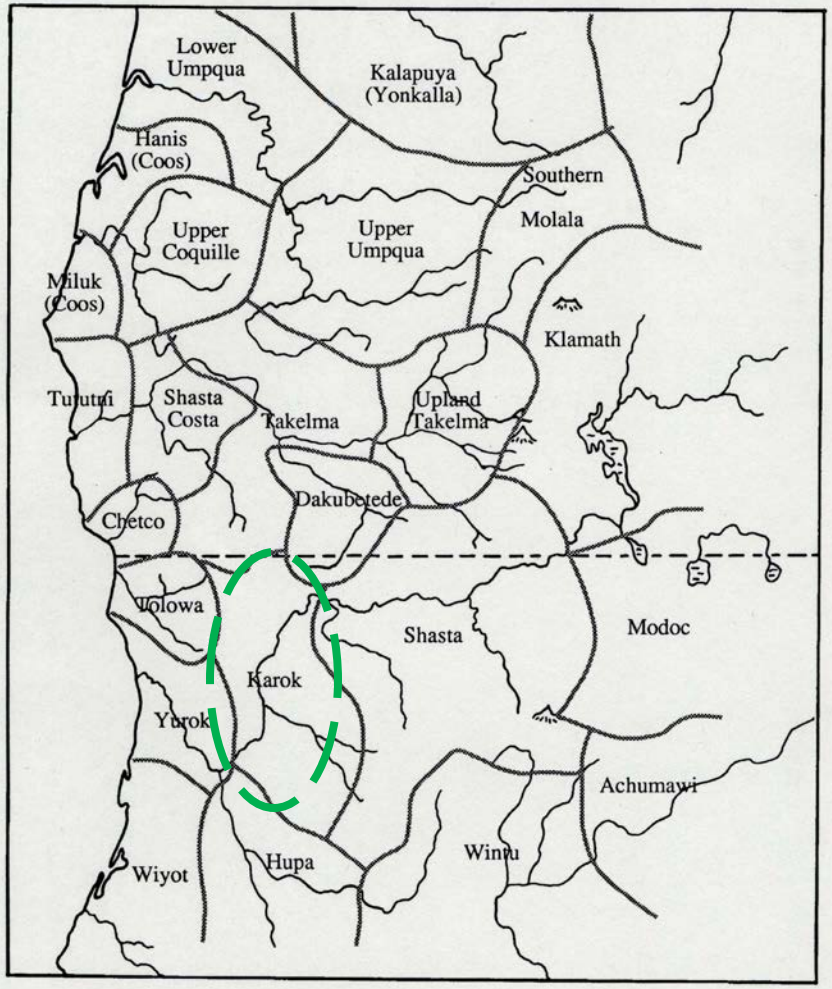
- Review of historical tribal burning practices
- Review of historical data for fire frequency, seasonality and extent
- Discussion of wildland fires then and now
- Multi-step approach to tribal management & fire applications

Photo: Orleans-Somes Bar Fire Safe Council-Ramsland/Adjacent to Lake Property, Oct. 19, 2010: WUI, and Tanoak Acorn Enhancement

Klamath-Siskiyou Region and Tribes



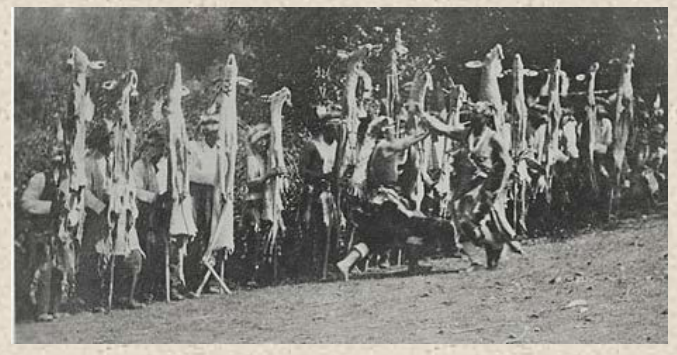
Map 1. Major Geographic Features of Southwestern Oregon and Northwestern California.



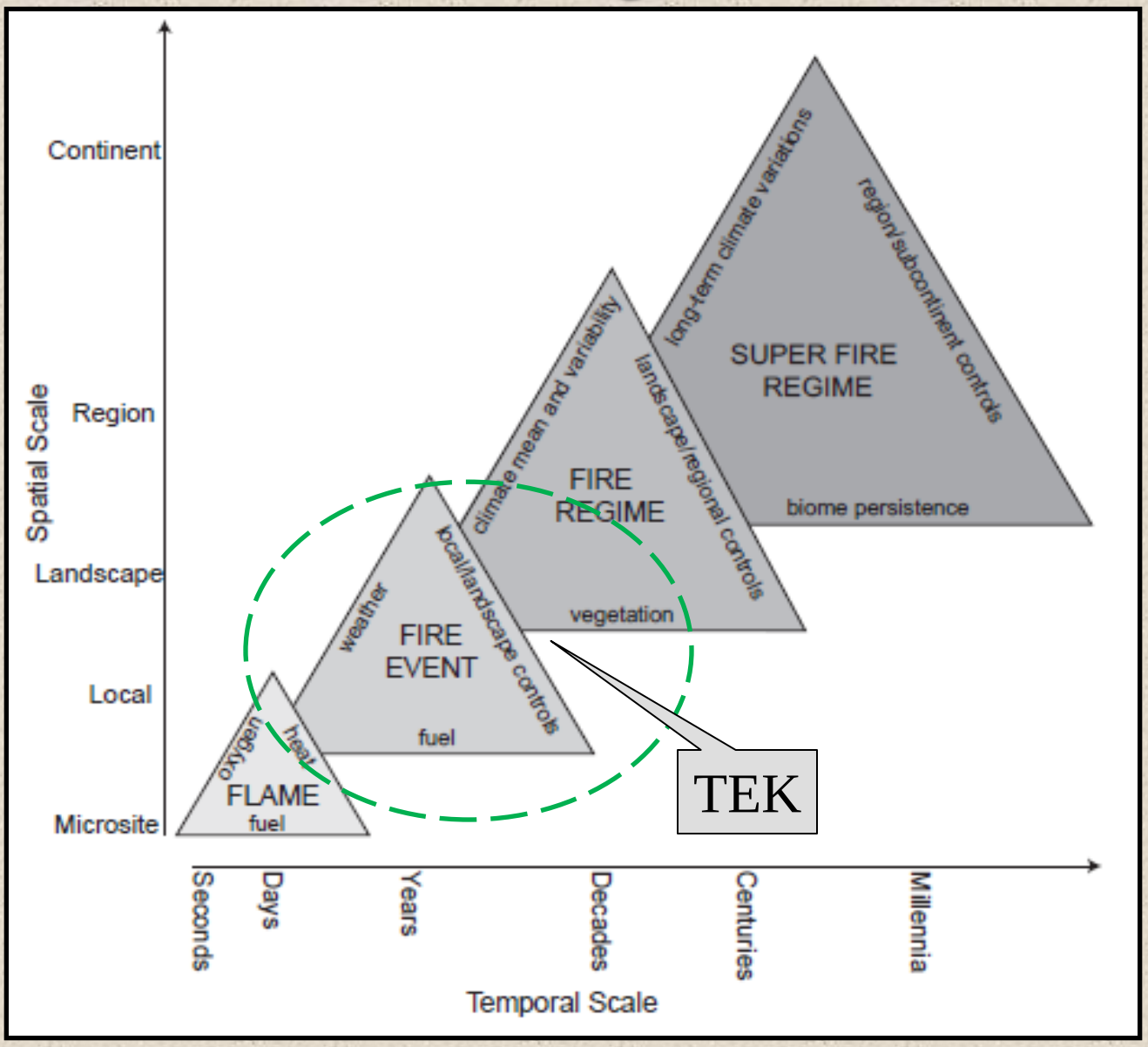
Map 2. Generalized Territories of Major Ethnographic Groups in Southwestern Oregon.

Figures/Maps: Jeff LaLande

Tribal Cultural Adaptations to Bio-physical Conditions and Ecological Processes



TEK, Fire Regimes and Climate



Whitlock et al. 2010 Paleoecological Perspectives on Fire Ecology: Revisiting the Fire Regime Concept

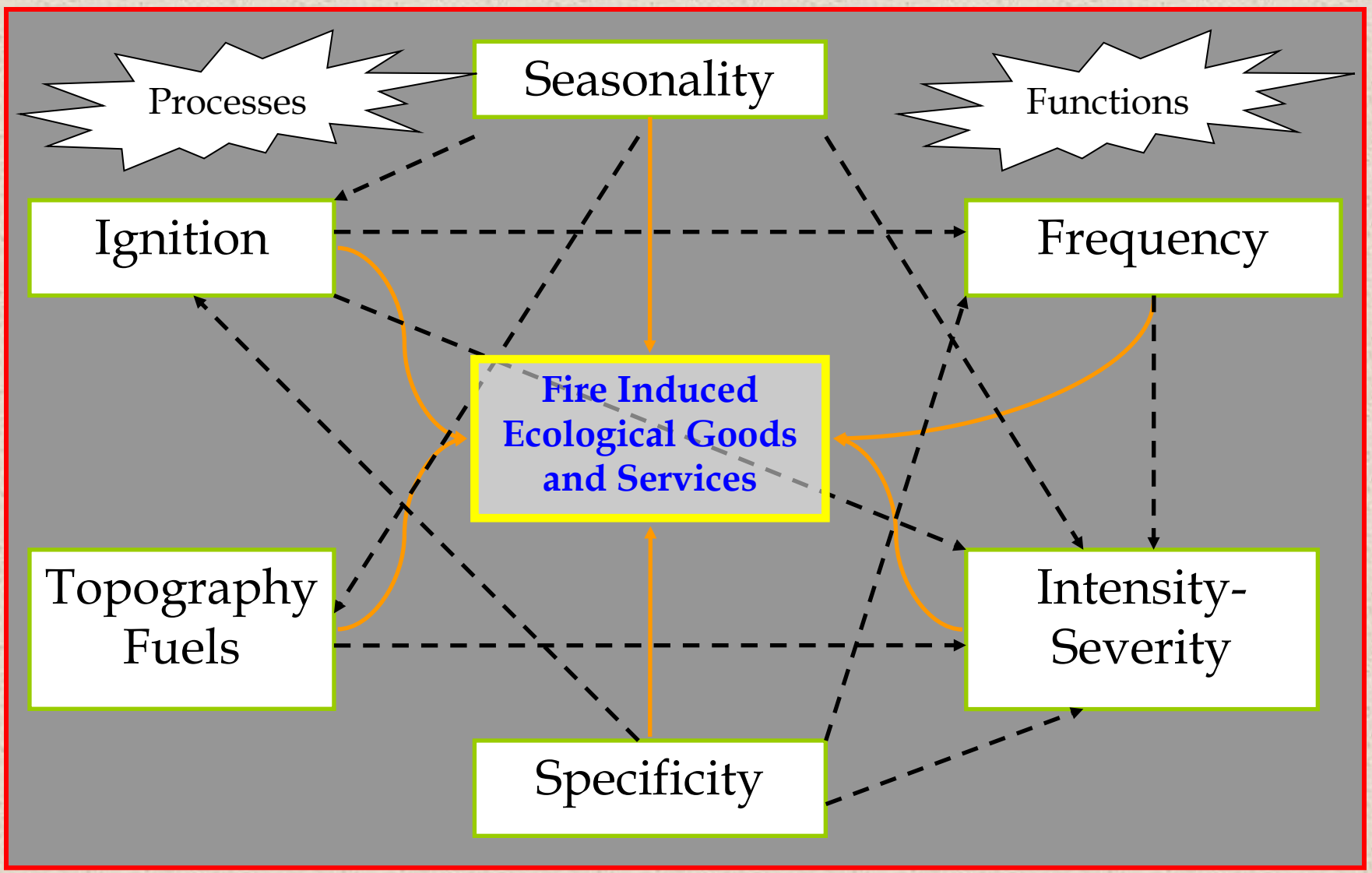
Indigenous/Cultural Fire Regimes

- Alternate seasons of burning for different kinds of settings.
- Frequencies w/ which fire are set and reset over varying periods of time at desired areas.
- Corresponding intensities w/ which fuels can be burned.

Indigenous/Cultural Fire Regimes

- Specific selection of sites fired and those that are not.
- A range of natural and artificial controls that humans employ in limiting the spread of fire: time of day, winds, fuels, slope, relative humidity, and natural/human fire breaks
  - Lewis 1982
- Ignition patterns to promote desired fire behavior and associated intensities.

Cultural Fire Regime and Fire Effects



First, Second and Third Order Fire Effects:

- Sequential order of fire effects on environmental conditions can be described as:
  - First order fire effects are physical
  - Second order fire effects are biological
  - **Third order fire effects are socio-cultural**

First, Second and Third Order Fire Effects:

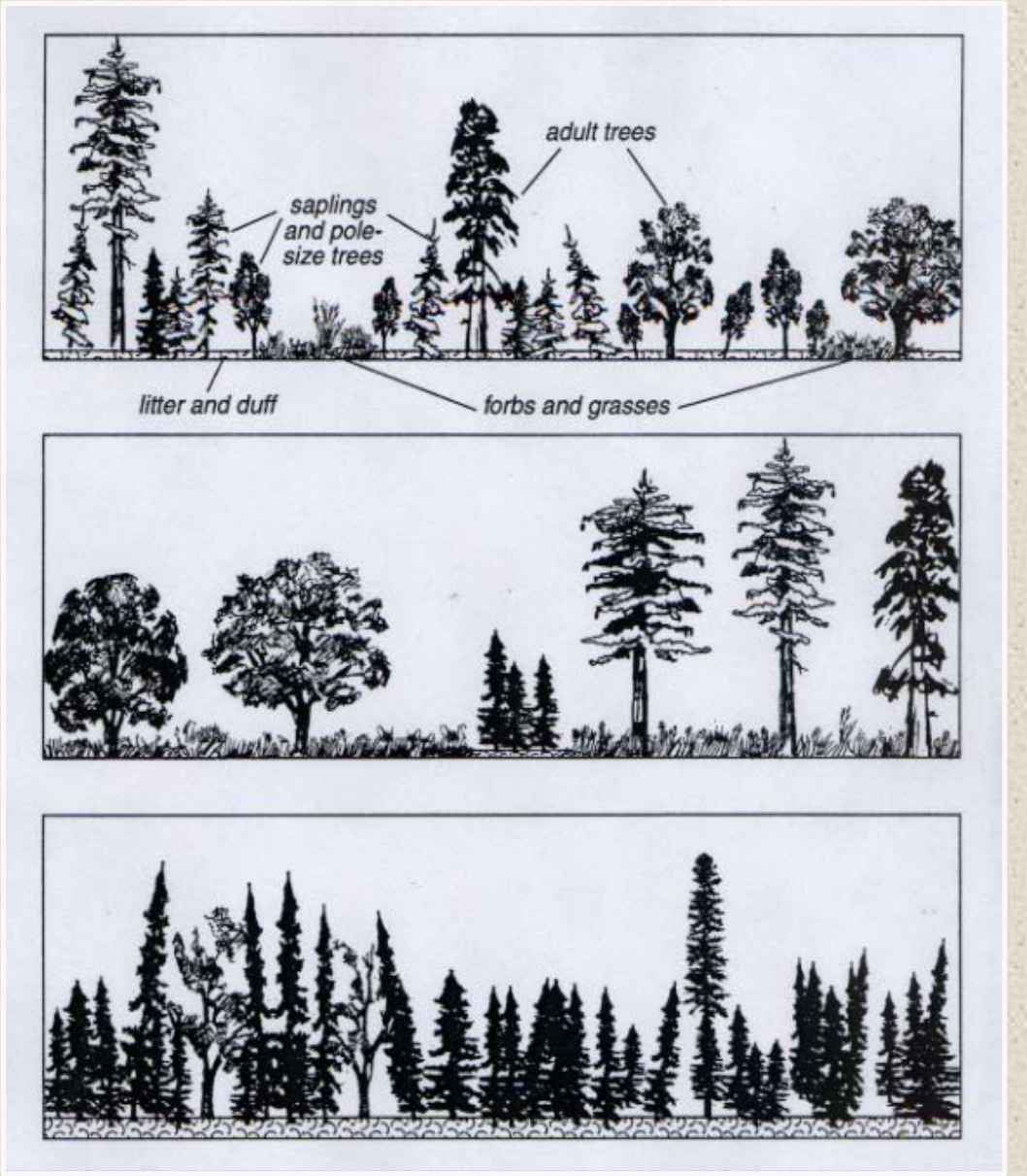
- **Third order fire effects are socio-cultural responses to environmental conditions created by first and second order fire effects.**

*See Kevin Ryan's (USFS-RMRS) new publication on this concept.

Indigenous land management practices on forest diversity

- Forest types and fire regime
- Composition, structure, function and productivity
- Interplay of lightning fires and indigenous burning
  - Top-lightning
  - Middle-lightning/Indian burning
  - Bottom-fire suppression

Anderson and Barbour 2002: Calif. Forests



Cultural and Natural Fire Regimes of the Klamath-Siskiyou Mountains

- Ethnographic and archaeological data about tribal burning practices and villages
- Paleoclimate and fire history data

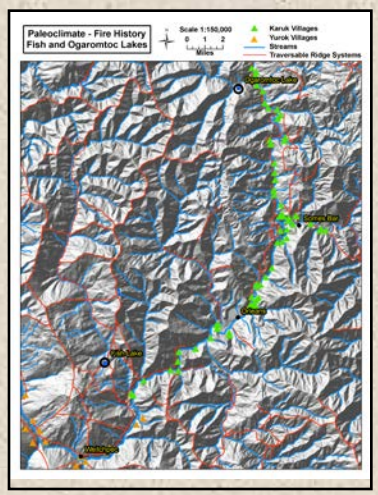


Photo: Kroeber
Karuk Village

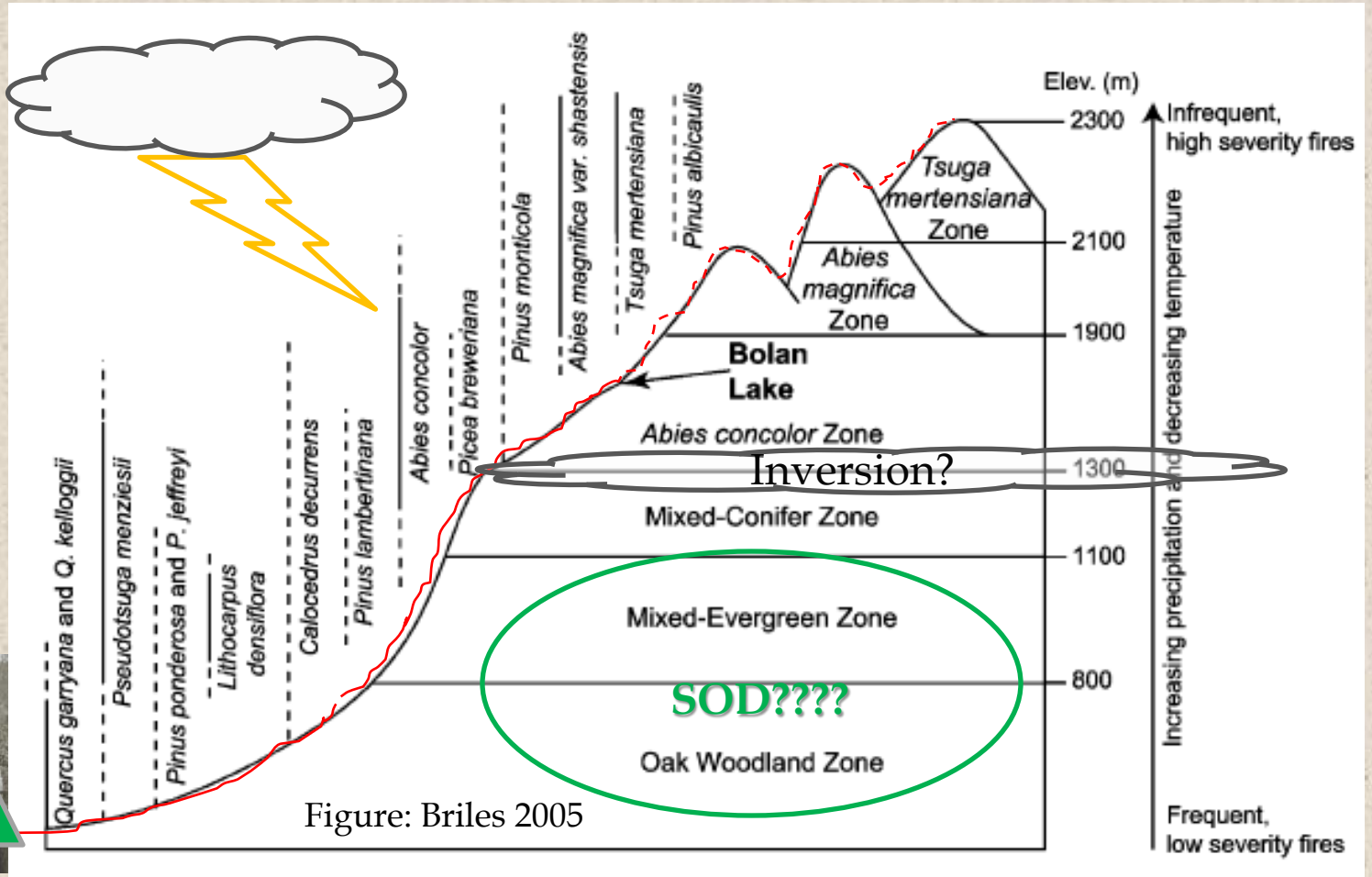


Figure: Briles 2005

Documented Reasons For Indian Fire Use

- Hunting
- Crop Management
- Pest Management
- Range Management
- Fireproofing
- Tree Felling/Fuel Wood
- Clearing Areas For Travel
- Clearing Riparian Areas
- Basket Materials

Williams 2000 (Modified from H. Lewis and Bonnicksen 2000) *For Klamath-Siskiyou Region see Pullen 1996, Busam 2005, Lake 2007.

Indian Burning Practices:

- **Firewood:** *Lake and Zybach
  - **Involves the movement of fuels to specific locations before burning, resulting in areas that contain relatively little (or stockpiled) large woody debris and designated spots of intense repeated and prolonged heat.**

Hupa wood packer: Erickson 1890s. Hoopa Valley

Indian Burning Practices:

Kepel Yurok Village area up-slope. Kroeber circa 1910-1920

Tribal burning patches were often smaller in extent and seral stage diversity than lightning ignited burn areas

- **Patch:**
  - **A specific application of fire to fuels within a bounded area for food maintenance, utility, or travel**

Indian Burning Practices:

- **Broadcast:**
  - **The practice of setting fire to the landscape for multiple purposes and with general boundaries**

Bald hills: Chilula/Yurok Tribal boundary trail. Goddard 1906

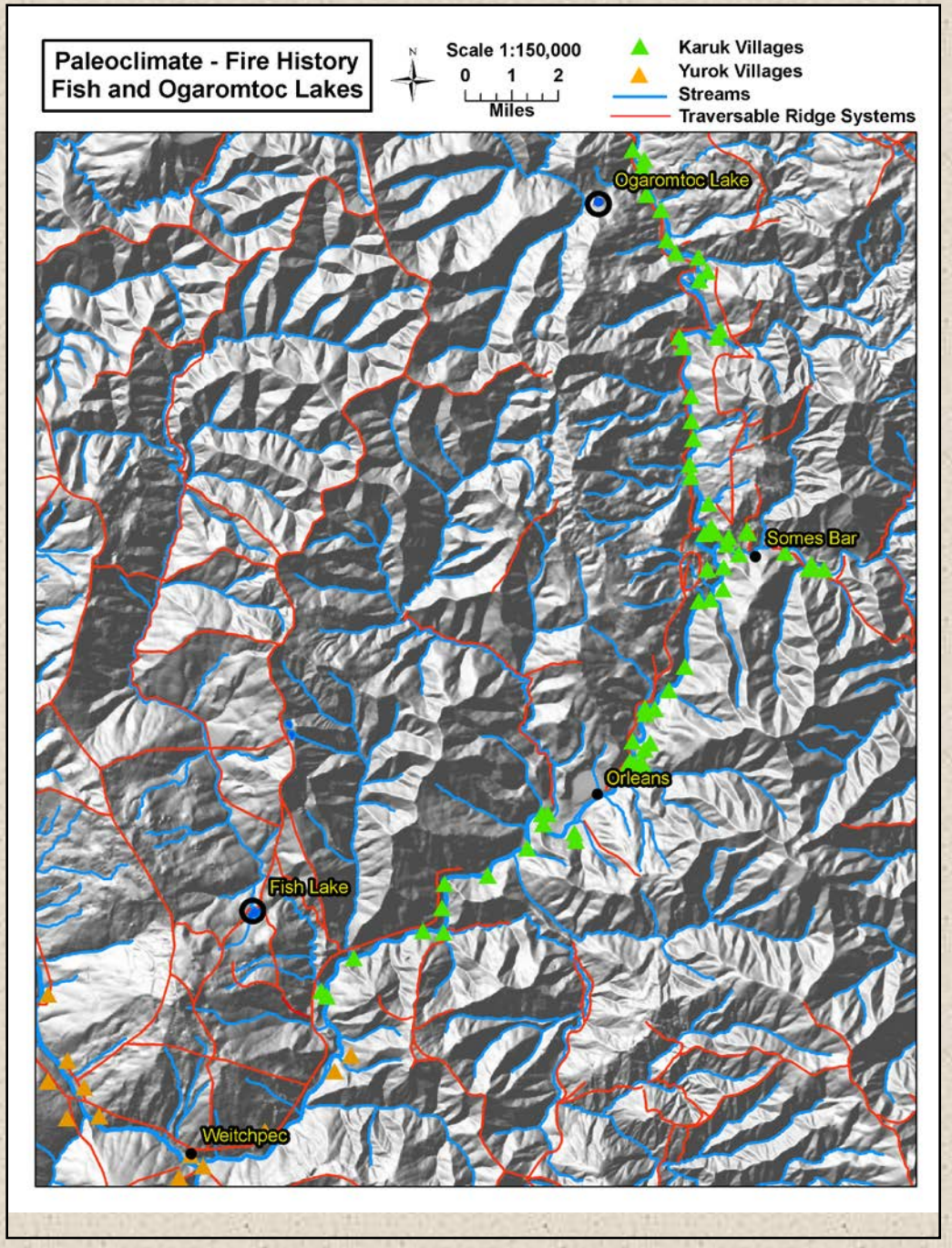
Tree Felling/Fuel Wood

- Indians used fire in different ways to fell trees.
- After fire swept through chaparral or woodland areas, branches were broken off for firewood.
  - Manzanita
  - Oaks
  - Other tree and shrub species

Photo: Beckham 1996 of Tututni-Lower Rogue River area woman

Clearing Areas For Travel

- Indians used fire to clear overgrown trails for travel.
- Ignition locations and fuel breaks were located along trails.
- Access to fire affective productive areas



Traversable ridge systems, Karuk and Yurok villages, and 1909 to 2005. Lake, Werren and Crawford (UN-R)

Basket Materials

- Most of the plant materials used in basketry required fire to promote desirable plant structure or health.

Photo: NAA, Smithsonian, Bright 1978

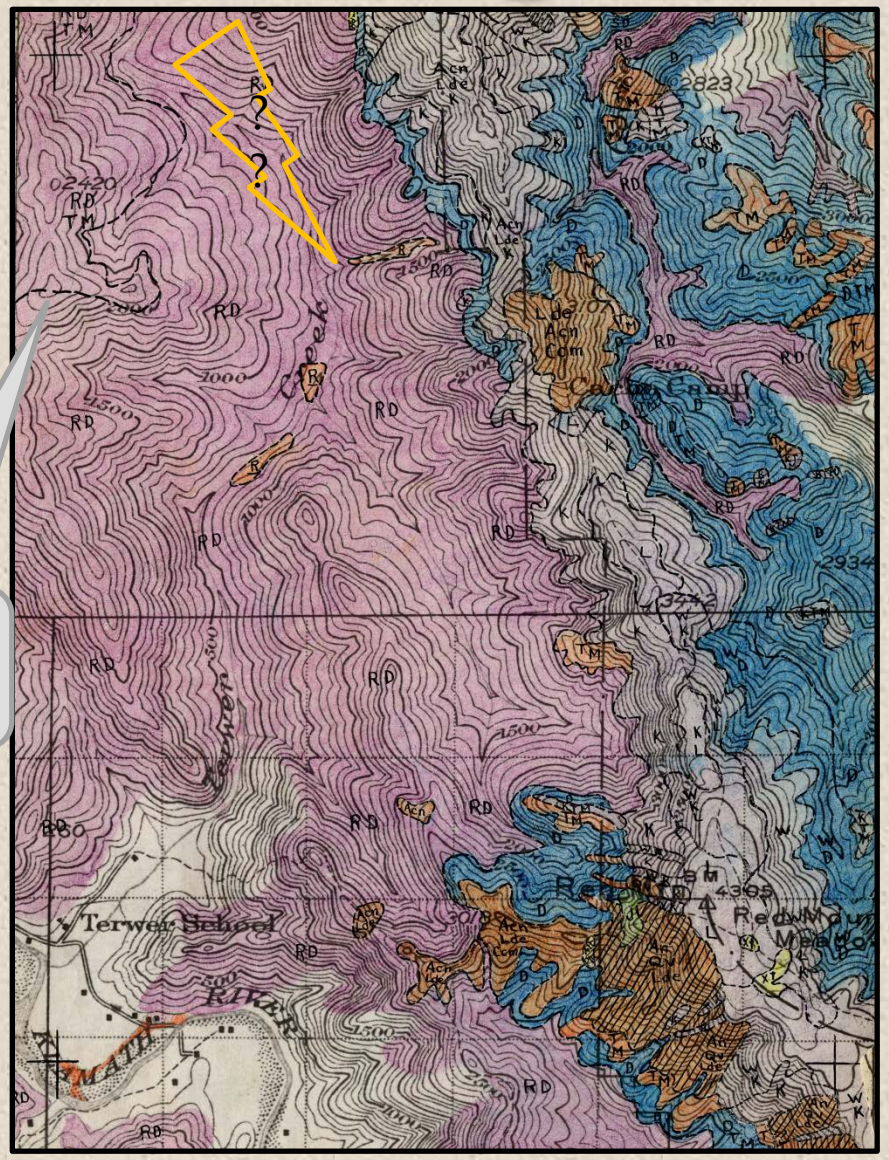
How to determine the extent of tribal burning for culturally significant areas?

- Ethnographic Material?
- Oral History interviews?
- Archaeological data/surveys?
- GIS analysis and mapping?
- Fire history studies?
- Modeling of ignition patterns and fuel types based on intergraded data sources?

Photo: Kroeber, Univ. of Ca. Archives

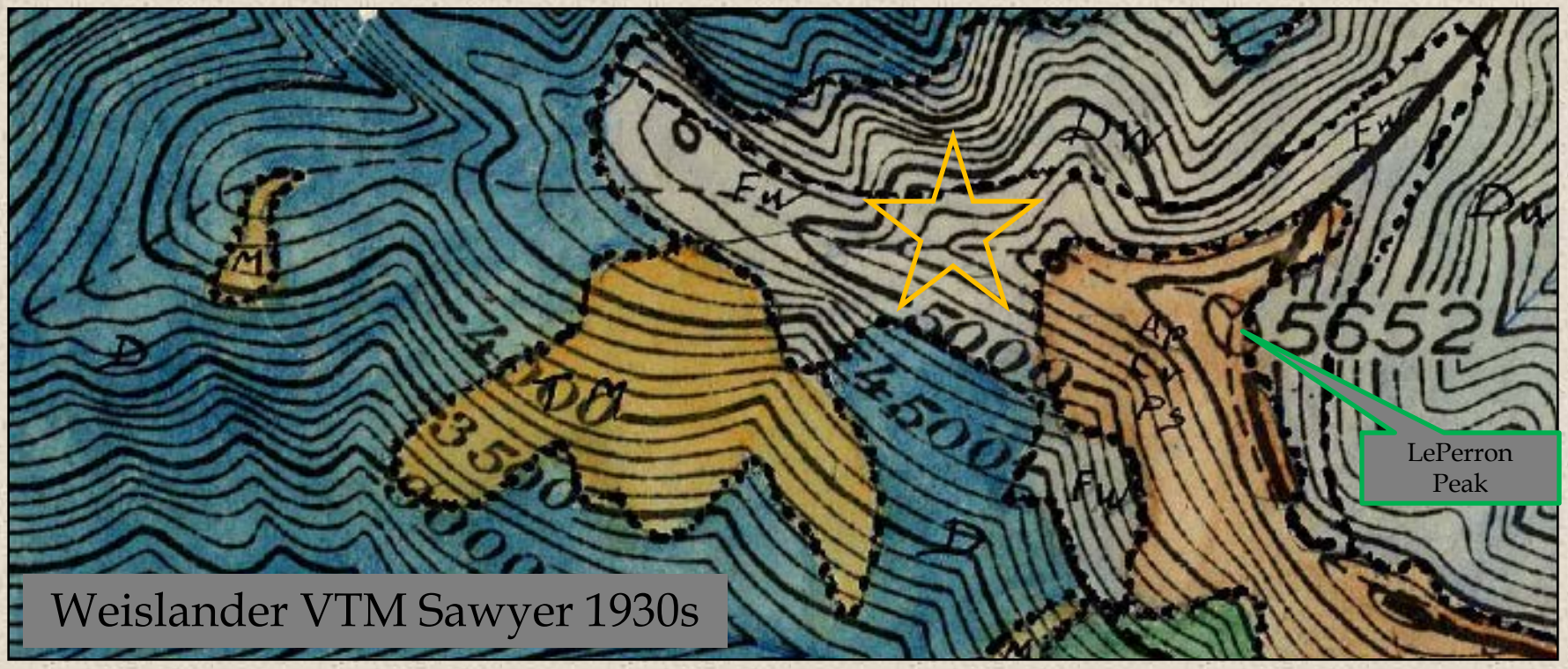
Using Historical Vegetation Surveys To Examine Fire Regimes

- Wieslander VTM
  - 1930s
- Landscape vegetation diversity which reflected remnants of former mixed fire severity regimes
  - Lower to higher elevational shifts
- Vegetation-Fire severity patterns influenced tribal subsistence patterns
  - Resource abundance couple with post-fire seral stage and severity



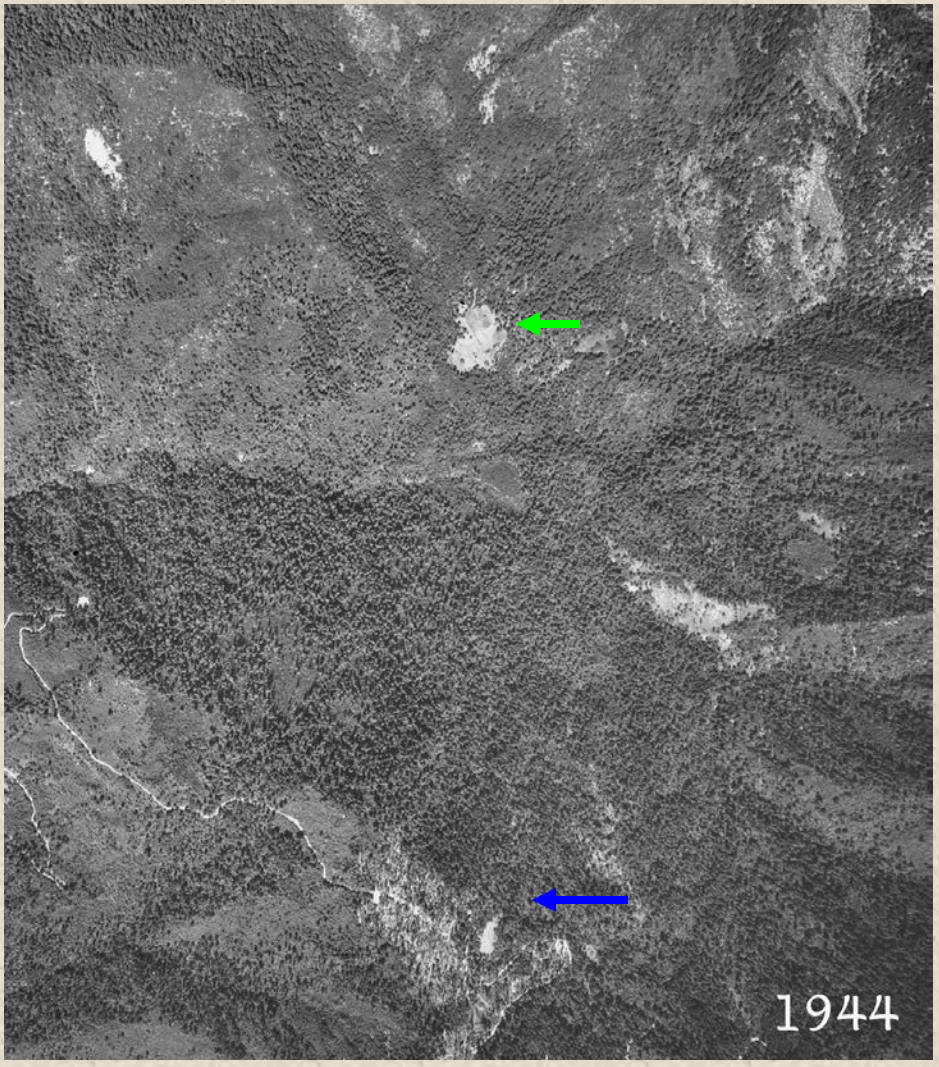
SRNFInterview-305, Karuk man in 70s. July 23, 1981

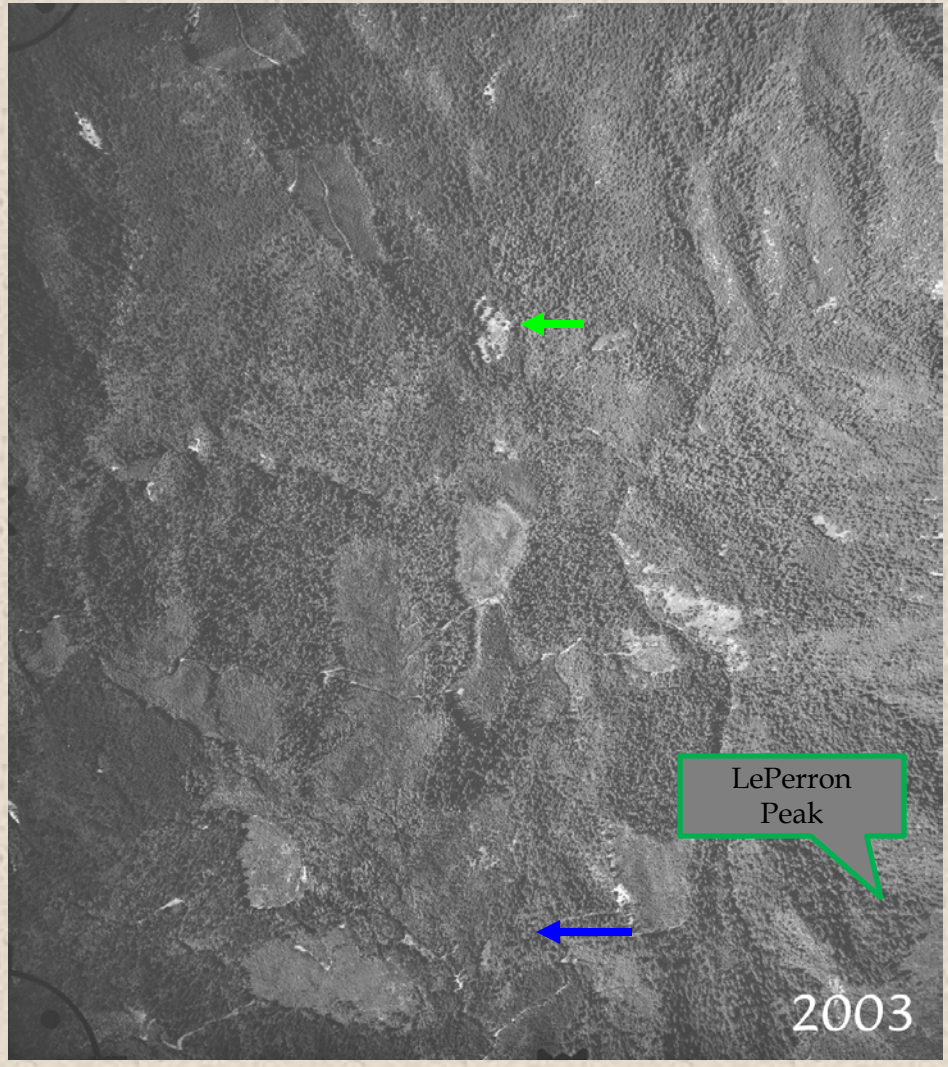
- Ran **cattle** on **Salmon Summit trail**. His family would **hunt** primarily **deer** and some **bear** around **Le Perron Flat**. He has walked many of the **trails**. One **trail** followed **Rattlesnake Ridge** down to Schnable's and on the **Mill Creek Gap**. The trails were used as **pack trails**. The Forest Service maintained and improved **existing trails**, and packers often improved the **Indian trails**.



Weislander VTM Sawyer 1930s

Historical photos: Aerial 1944 to 2003

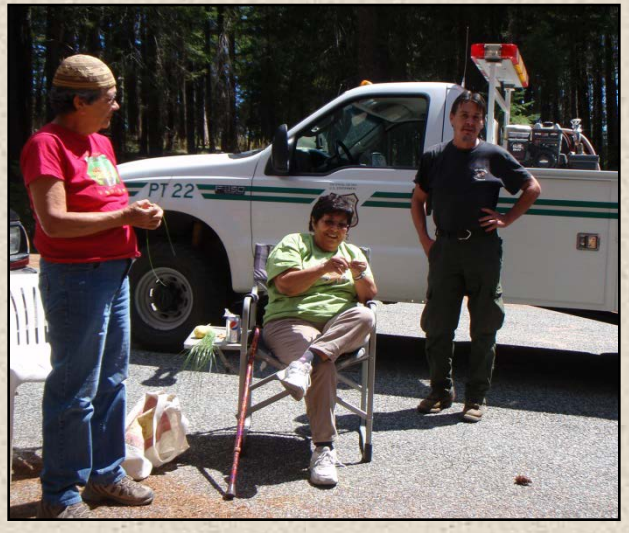




Short Ranch: Boise to Red Cap Creek, NE of Orleans, Cal.

Tribal community desire to continue traditional management practices

- Culturally significant habitats
- Access and potential for management
- Contemporary management systems to achieve desired ecological conditions



Objectives and Ignition Strategies

Historical tribal fires

- Objectives: Resources, Property for Life.
  - Resource specific: Food & Materials
  - Multiple benefits: Food, Materials, Diversity
- Ignitions
  - Ridgelines/trails
  - Aspect/Slope
  - Backing/strips
    - Grass bundles
    - Pitch sticks

Contemporary Rx fires

- Objectives: Life, Property, and then Resources
  - Resource specific: Economics & WUI
  - Multiple benefits
  - Disease, pathogens and pests reduction/prevention.
- Ignitions
  - Property boundary/roads
  - Treatment history
  - Backing/strips
    - Drip torch, propane, etc.

Oak Tree Condition and Acorn Quality Assessment

Ecological Characteristics		Socio-Cultural Elements	Metrics
Region	Weather: Precipitation, Temperature, Diseases	Tribal need for acorn-Ceremonies and Meals	Snow Water Equivalent, Palmer Drought Index, Disease/Pathogen Infection rates; Tribal population consuming acorn products.
Landscape	Disturbance (Fire) regime	Gathering access and locations	Fire-Return Interval, Severity, Extent; Tribal gatherers' opportunities
Habitat	Competition, Community Assemblage, Wildlife use	Relationship with and Land-use history, ownership, Knowledge of suitable places	Proportion to oak to other tree species, TES species-Critical habitat; Number of experienced practitioners/tribe
Patch/Stand	Elevation, aspect, % slope [site access], Basal area, dominate tree age, canopy cover, fuel loading [mobility], disturbance/fire history [fire exclusion, timber harvesting, thinning, burning], understory diversity		Proportion of oaks burned with desirable fire effects, number of other harvestable cultural-use species, distance from road, fuel load
Tree	Age, height, canopy volume, condition, acorn size, number of acorns	Understory conditions, topography [access], tree phenology, density of canopy and fallen acorns, acorn quality and size, other wildlife use	Diameter, height, presence of pathogens/evidence of disease, acorn development or masting, proportion of good (white top) to bad (brown top/insect holes) acorns
Acorns	Size, presence of infection/infertile or mold, nut meat quality, moisture content, tannins and nutrient content		Amount of edible nut meat

The Multi-Step Approach-The next prescribed fire?

- Current condition of planning unit
  - Untreated, Thinned, Thinned and pile burned, or broadcast burned?
  - SOD-Infected or high risk areas?
- Landowner/Neighbor relations
  - Prioritized treatments
  - Size of treatment area
- Schedule of treatments
  - Workforce training & education
  - Winter Thinning/Pile burning
  - Spring or Fall prescribed fire

Effective use of landscape to reduce undesired wildfires

- Strategic treatments at various locations in the landscape. [SPLAT]
  - Land ownership
  - Elevational range
  - Slope position/Aspect
  - SOD-probable infection routes?
- Objectives of the treatments/Rx burns.
  - To protect Life, Property, (enhance?) Resources
  - Reduce non desired diseases, pathogens and pests

Oak Tree & Acorn Pest Life History

Annual Indian Burning Cycle (inner circle) Under California Black Oaks (*Quercus kelloggii*) Compared with Annual Life Cycle of the Oak Filbertworm (*Cydia latiferreana*) (outer circle)

Larvae complete development in acorns on the ground, emerge from acorns, and pupate in the debris beneath the tree

OCTOBER – FEBRUARY

Moths emerge from pupal cases in litter beneath trees

APRIL – JUNE

Spring Rx Fire

Moths fly and mate

MAY – JULY

Moths deposit eggs on acorns on tree

JULY – SEPTEMBER

Indians knock acorns or gather acorns from the ground and discard wormy ones

SEPTEMBER – NOVEMBER

Indians burn duff and insect-infested acorns under black oak trees

OCTOBER – NOVEMBER

Fall Rx Fire

Infested acorns begin to drop early from trees

AUGUST – SEPTEMBER

Eggs hatch and larvae bore into and feed on acorn embryos

AUGUST– OCTOBER

"These insects invade acorns while on the tree, and the insects continue to develop as the acorns fall. In fact, insect-infested and diseased acorns tend to drop earlier than sound acorns. Eventually, the larvae exit the acorn and overwinter as pupae in the duff beneath oak trees. If you were to burn off the duff and old acorns in the fall, you would destroy most if not all of the infested acorns as well as pupae that are in the duff. This would greatly reduce the number of filbert worm and filbert weevil adults that emerge in the following year, which would reduce the level of infestation in the acorn crop. If you were to do this every year, or even every couple of years, I would think that you would end up with a pretty clean crop of acorns, with relatively low losses due to insects. However, you would have to keep burning pretty regularly, because there will commonly be a few insects that are missed by the burn, and adults could also move in from beyond the burned area."

(Ted Swiecki, pers. comm. 2004).

Source: K. Anderson, NRCS

After the smoke clears–Collecting acorns & maintaining culture

- Clearer understorey
- Reduced surface and ladder fuels
- Bad acorns burnt, good acorns easy pick'ns

Lake Property–During and After the Burn. 17 June 2013

Question: Did the Spring/Early Summer prescribed fire treatment achieve the objective of reducing the acorn insect pest-Filbert Weevil and Moth infestation levels?

Post burn ground surface sampling of charred acorns revealed that moths were in larvae to pupae case stage.

Lake Property Acorn Tree #4
"Spring Burn" 17 June 2013 [2pm-5pm]

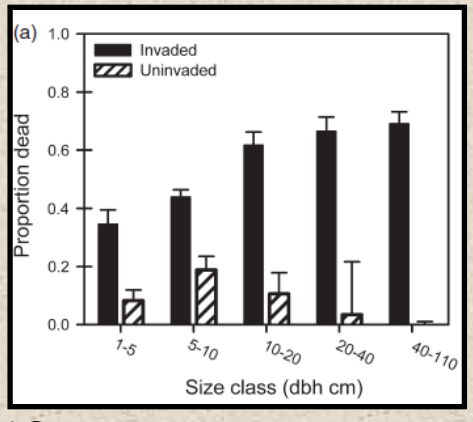
Above: Pre-burn looking N/NE at Tree # 4
Right: Post-Burn, looking E/SE at Tree # 4

Research with Arielle Halpern, U.C. Berkeley and Stanford Univ. Bird Lab, NSF Exploratory grant

Environmental Diversity and Tribal Socio-Cultural Adaptive Responses

- Climate influences regional and watershed level processes
- Tribal cultures adapt to bio-physical conditions and resources productivity
- Fire management is a major process and influence on biodiversity and tribal adaptive strategies
- How do pathogens [SOD] affect tribally valued habitats and resources?
- What are some applications of scientific methods, models and the utility of such data for examining various scales?

Applicable Models– What can they help us understand?



- Keyser. 2008 (Revised May 9, 2013). Klamath Mountains (NC) Variant Overview, **Forest Vegetation Simulator Model** [FVS]. Fire and Fuels Extension
- Includes Tree species, diameter, height, and basal area.
- Allows for evaluation of how forest composition and structure are receptive to wildland fire effects.
- Klamath Codes: 175 = LIDE3-UMCA/VAOV2, Tanoak-California laurel/California huckleberry; 483 = LIDE3-UMCA, Tanoak-California laurel; 476 = LIDE3-SESE2 Tanoak-coast redwood

- Cobb et al. 2012. **Epidemiological Model**-SOD-Tanoak dominated forests
  - …populated with tanoak, bay laurel and epidemiologically unimportant species among which redwood is predominant
  - epidemiological state (Susceptible (S) or Infected (I)) and tanoak size class (i = 1,..,4),
  - Tree size and community composition affected tanoak infection and mortality rates
  - Understory tanoak, generally trees <10 cm d.b.h., had greater risk of infection compared with tanoak in the overstorey