Black Oak: How Traditional Ecological Knowledge Can Inform Restoration and Resilience

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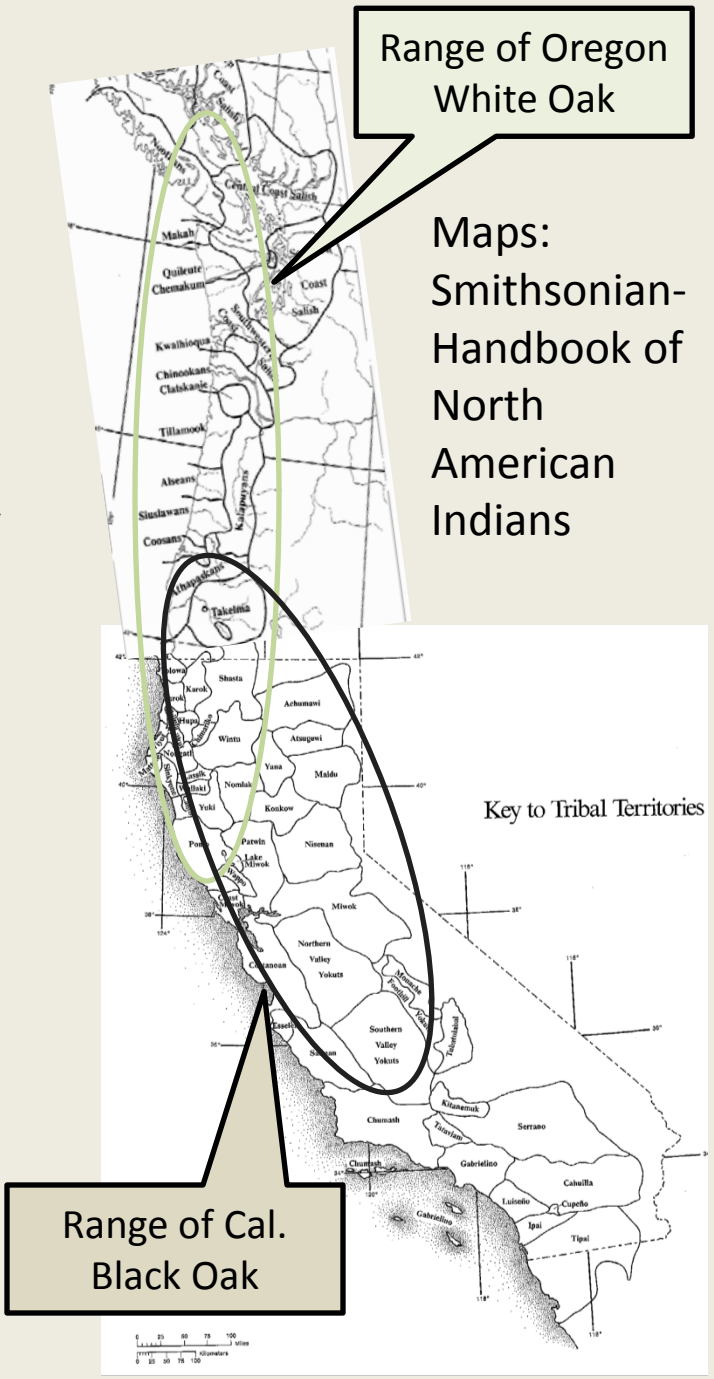
Overview of Tribes and Oak Habitat:

- Many tribes across the Pacific Northwest to California have lived for millennia [>8, 000 yrs.] with oak dominated habitats.
- Over time, with changing climate regimes many tribal cultures have adapted to and evolved with oak habitats.
- Many oak dominated habitats are legacies of tribal management/use.



Examples of Pre-Historical Tribal-Oak Regimes

- Oregon White Oak
  - Archaeological and Oak genetic research
    - See Lepofsky and Lertzman 2008 Documenting ancient plant management in the northwest of North America: Botany 86: 129-145

- California Black Oak
  - Archaeological research of tribal acorn caches and villages
    - See Morgan 2008 Reconstructing prehistoric hunter-gather foraging radii… J. of Arch. Sci. 35: 247-258

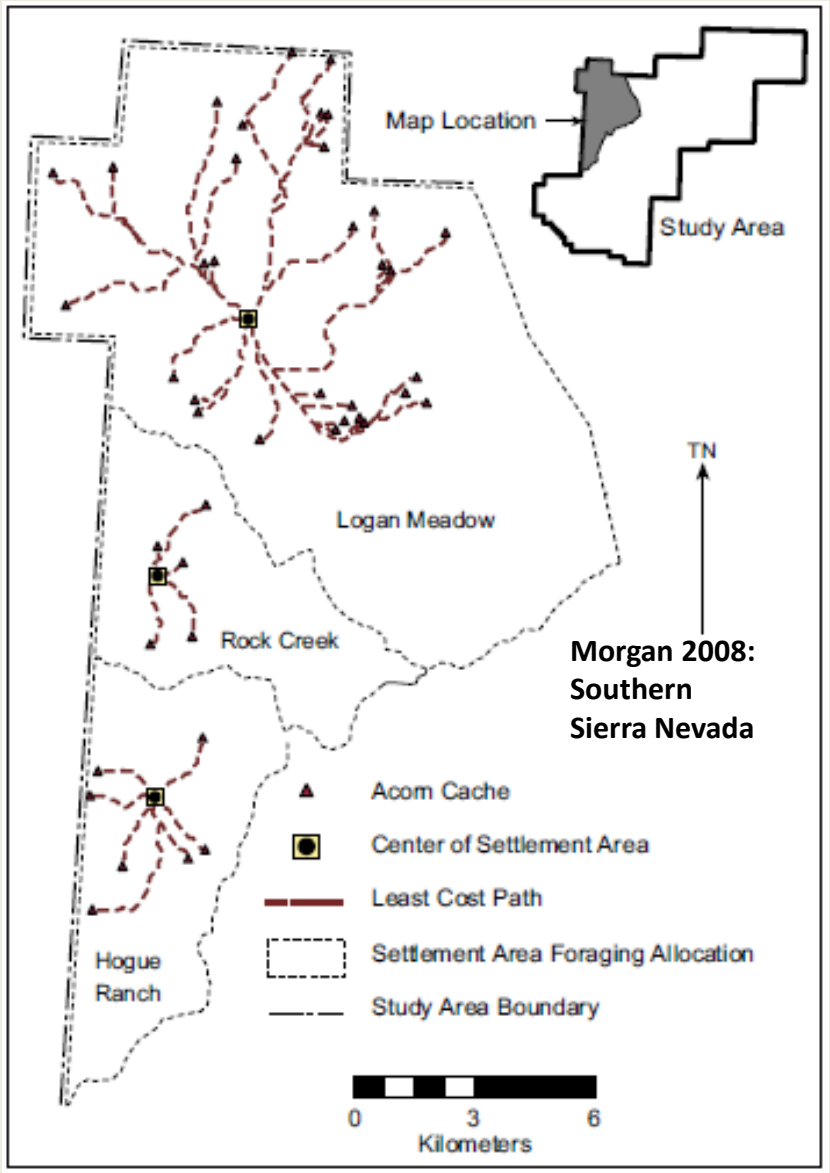


Fig. 5. Map showing least cost paths to acorn caches and settlement area foraging allocations.

Tribal Traditional Ecological Knowledge: Oaks and Cultural Practices

- Genesis of Tribal TEK derived from Creation accounts.
- Lessons or guidance for oak management from Creator's or Natural Laws.
- Intergenerational adaptive learning coupled with oak habitat, species, and tree products about stewardship and use

Tribal TEK: Oak Management and Uses

- Observations
  - Tree phenology and masting cycles linked to weather and climate
  - Tree response to fires and horticultural management
  - Wildlife use of and effects on tree and acorn abundance and quality
  - Intergenerational place based human-oak relationships linking biophysical and socio-cultural systems in oak-dominated habitats
- Spiritual/ritual practices
  - First Acorn ceremonies
  - Prayers for acorn abundance
- Knocking/collecting
  - Facilitated gathering of ripe acorns
  - Reduced competition from wildlife (birds, squirrels).
- Burning oak dominated habitats
  - Reduce acorn pests
  - Reduce surface and ladder fuels around desired oaks
  - Improved gathering efficiency and acorn quality.

Black Oak Acorn Research Overview-Integration of Tribal and Scientific Knowledge

Black Oak Forest and Fire

Forest-habitat type distribution

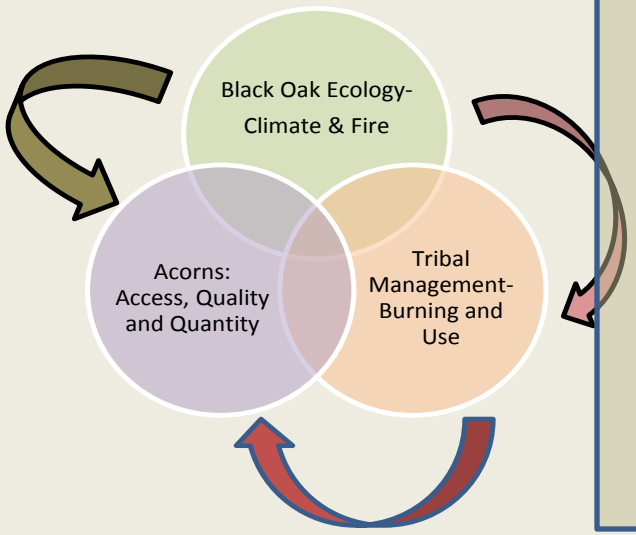
Research: Sierra Nv. Mountain Site conditions

Climate-Fire disturbances

Research: Thresholds/limits Tolerance levels, severity, magnitude

Black Oak Acorn Masting-Cycles

Research: Weather factors and Site conditions for acorn production



Acorn Tribal Management-Use

Tribal burning practices & regime

Research: Ethnographic/TEK of tribal practices NW Cal. Tribes

Acorn gathering sites (biophysical)

Research: Cultural use quality of habitats. Soil types, elevation, aspect, slope position, etc.

Acorn gathering practices

Research: Selection criteria for gathering sites and acorns

Acorn storage/processing

Research: Techniques/styles

Acorns to food conversion

Research: Techniques/styles

Acorn consumption practices

Research: Nuts to meals-serving portions. Historical vs. Contemporary use

Black oak Acorn Pest Life History & Ecology

Pests and Predators' Acorn Consumption (Animals)

Filbert Weevil (*Curculio occidentis*)

Weevil life cycle: Tree, Acorn, Ground

Research: Life stages to be affected by burning or management

Filbert Moth/worm (*Cydia latiferreana*)

Moth life cycle: Tree, Acorn, Ground

Research: Life stages to be affected by burning or management

Fuel load, fire frequency & severity, and pests' infestation of acorns

Research: Link pests' life stages affected by burning or management to climate, fire regime, and masting cycles

Animals: Birds and Mammals

Consumption rates & dispersal

Research: Tribal TEK of animal acorn use and seeding (regeneration) success

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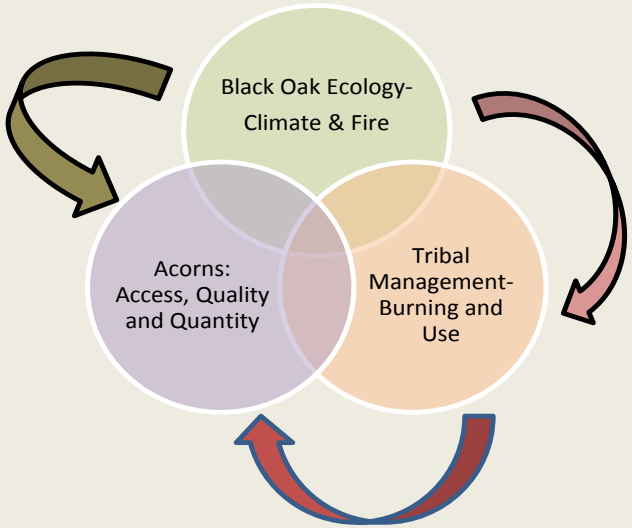

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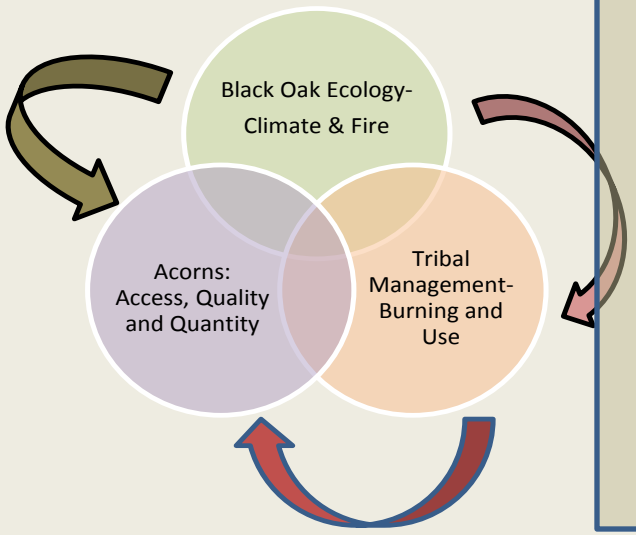

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Oaks as a Cultural Keystone Species:

- Many tribes have a high dependency on oaks for food (acorns) and cultural products.
- Oak habitats and associated species provide food, materials, medicines, and spiritual renewal/sustenance for tribes.
- Oaks as a cultural identity factor for many tribes.

Photo: Ron Goode, North Fork Mono. Poster of how other plants, animals, and fungi are associated with California Black Oak.

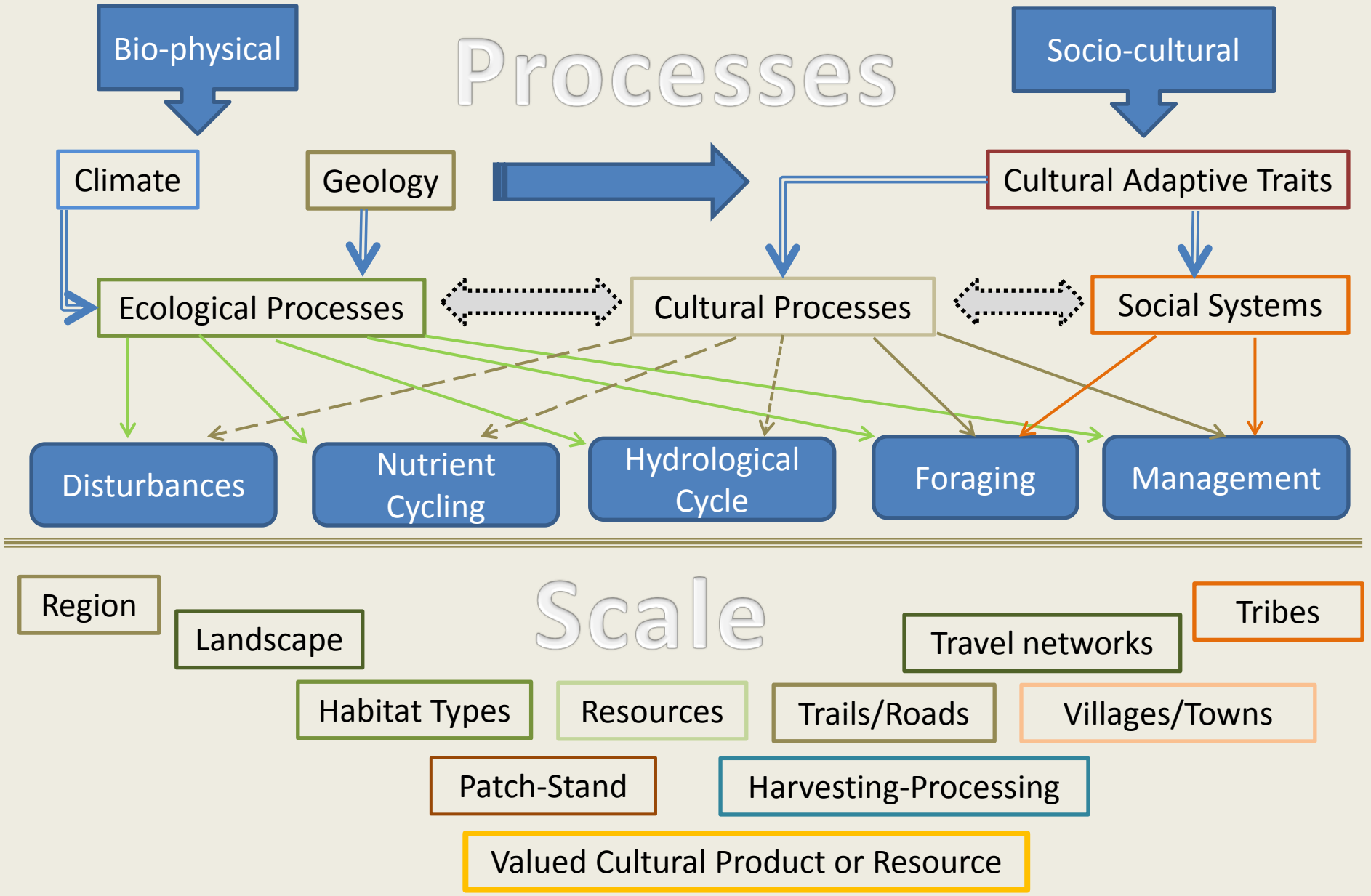
Cultural Keystone

Intensively used (hundreds of pounds of acorns per family)	**Featured in legends and festivals**
Multiple uses (food and wood products)	**Habitat for culturally important animals**
Preferred species not easily substituted	**Important trade item**

Lois Conner with black oak on family ranch near North Fork, Ca.

Slide and photo source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Linking Ecological and Socio-Cultural Processes Across Scales to Evaluate Tribal Cultural Use Quality



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

Frequent burning and tending by Native Americans produced benefits

Ethnoecology research by Kat Anderson [NRCS]

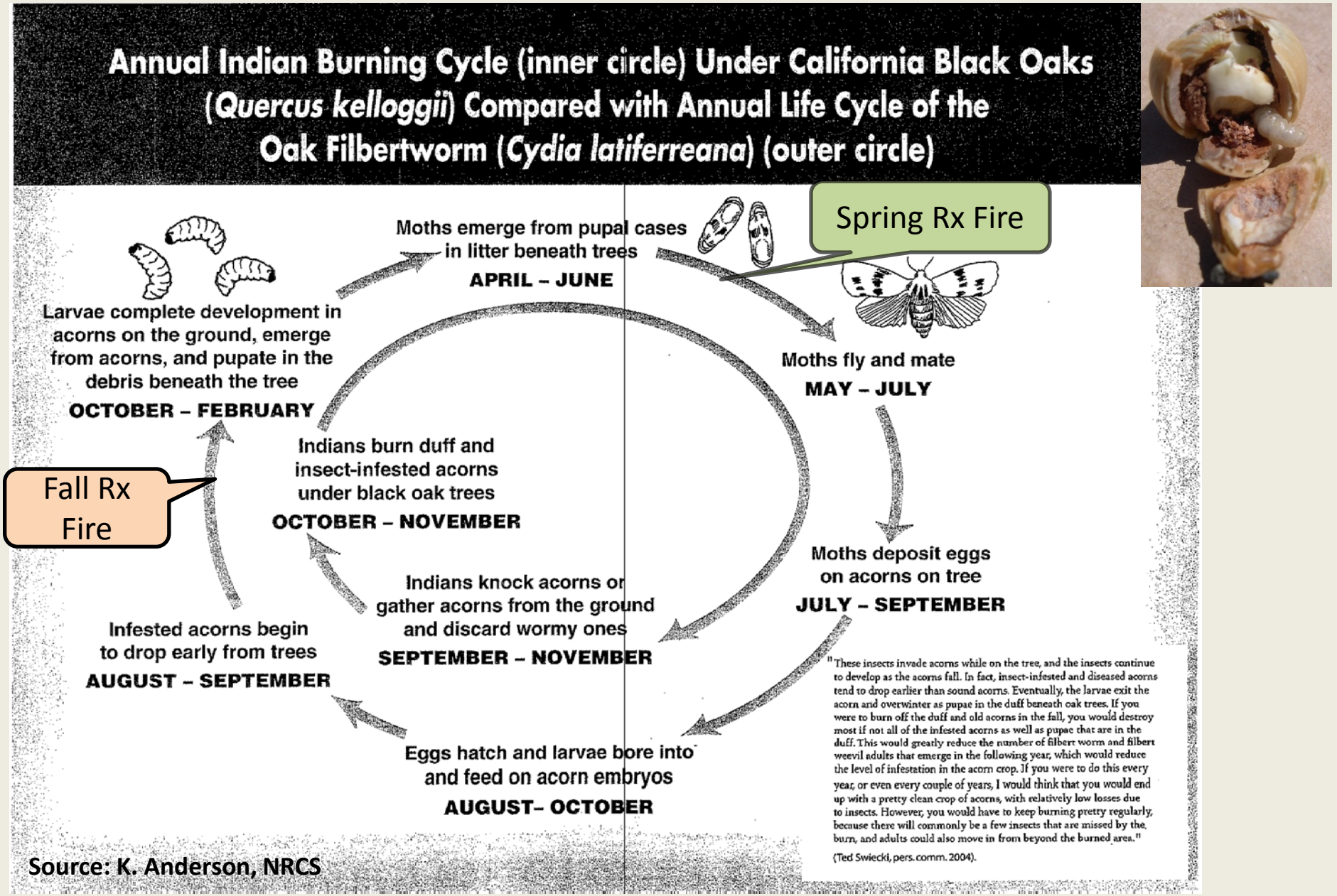
Increased quantity and quality of acorns for harvest by:

- reducing pest loads
- reducing dead branches
- reducing competition for light
- facilitating access

Similar increases in acorn production reported by Carl Skinner following frequent prescribed burning in winter near Lake Shasta

Slide and photo source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Oak Tree & Acorn Pest Life History

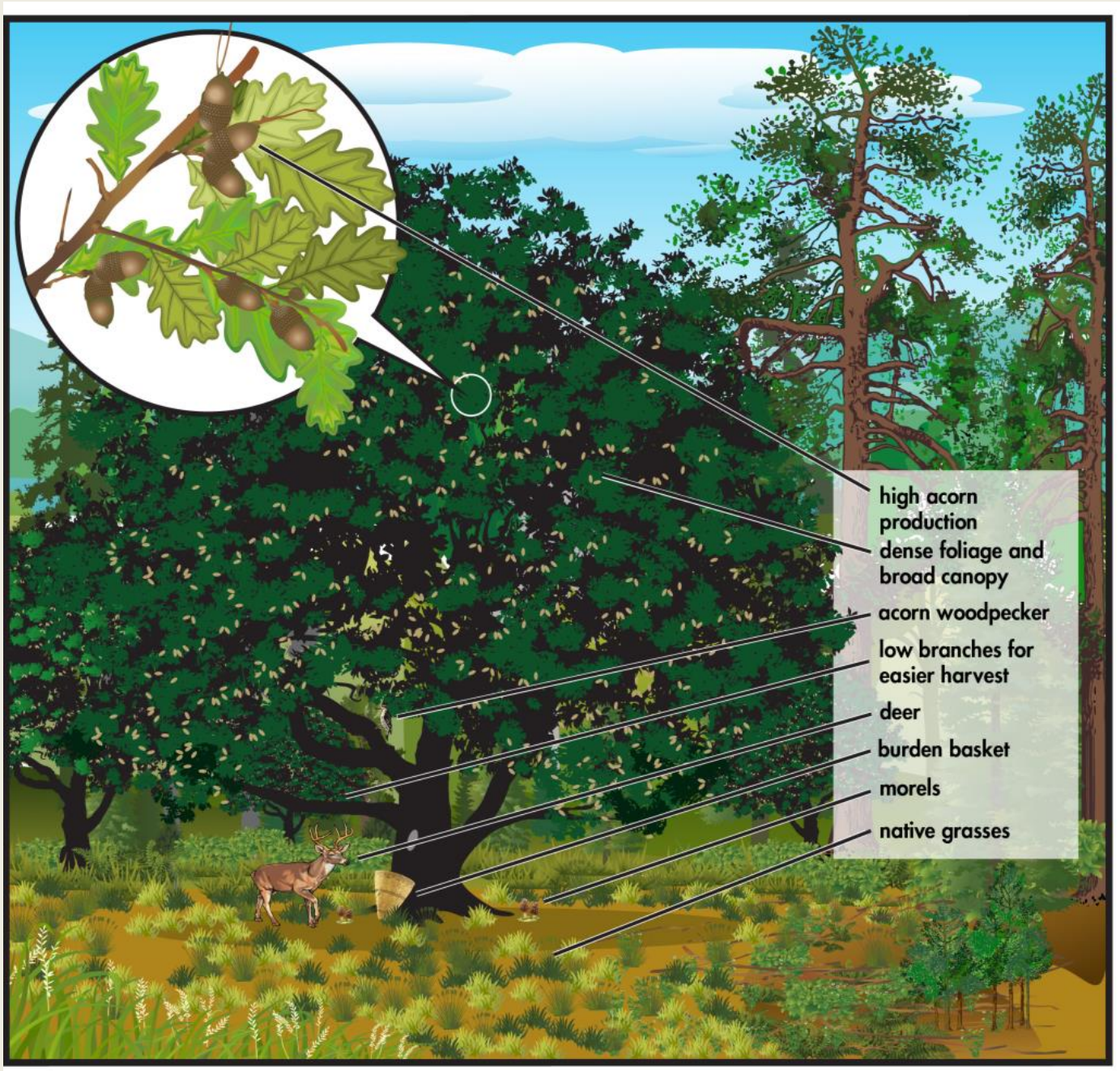


Source: K. Anderson, NRCS

Collaborative Learning: TEK and SEK

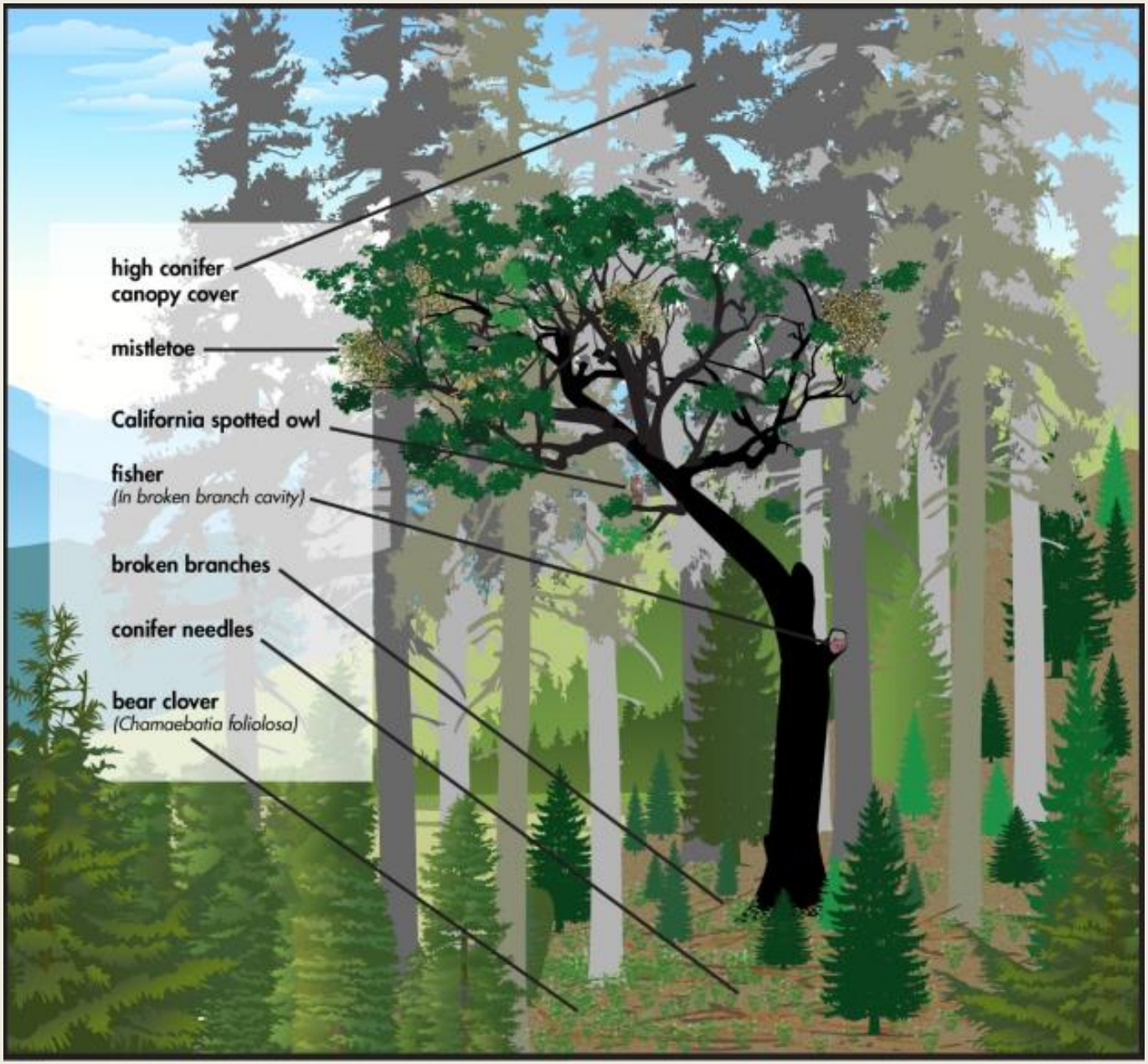
- Addressing the challenges of climate change-
  - Learning from and teaching each other
- Integrating tribal/native community TEK with western science and management approaches
- Shared perspectives, common understanding, creative solutions for mitigation and adaptation strategies
- Intergenerational and multidisciplinary methods

Desired conditions for acorn gathering



Slide and figure source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Desired conditions for old-forest wildlife



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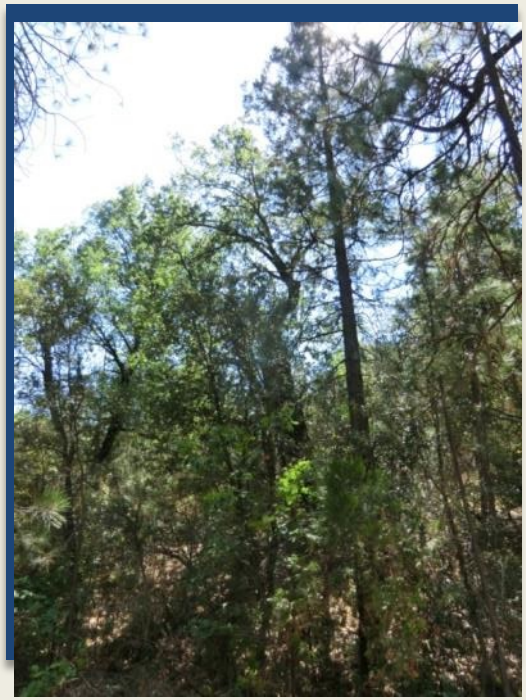
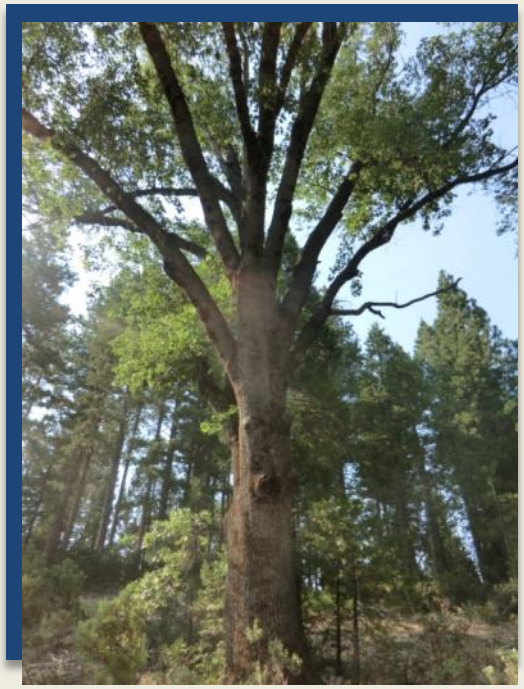
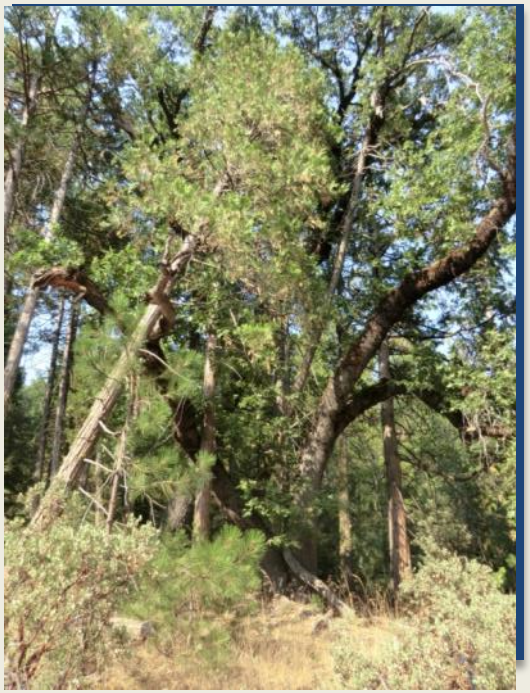
Landscape Restoration Strategy

Retain high-value features in less accessible areas	Restore conditions in general forest	Re-tend former orchards/more accessible trees
		

Intensify management according to consultation with tribes, landscape to stand prioritization and accessibility for management of treatments

Slide and figure source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Re-tending Strategy

Apply more intensive management based upon aboriginal tending practices in accessible “orchard” areas (near roads, flatter slopes) to enhance production and mitigate losses from fires

- Thin conifers to create gaps (larger in orchards than in general forest)
- Reduce fuels around older trees to ensure survival
- Restore fire as a more frequent process

Slide source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

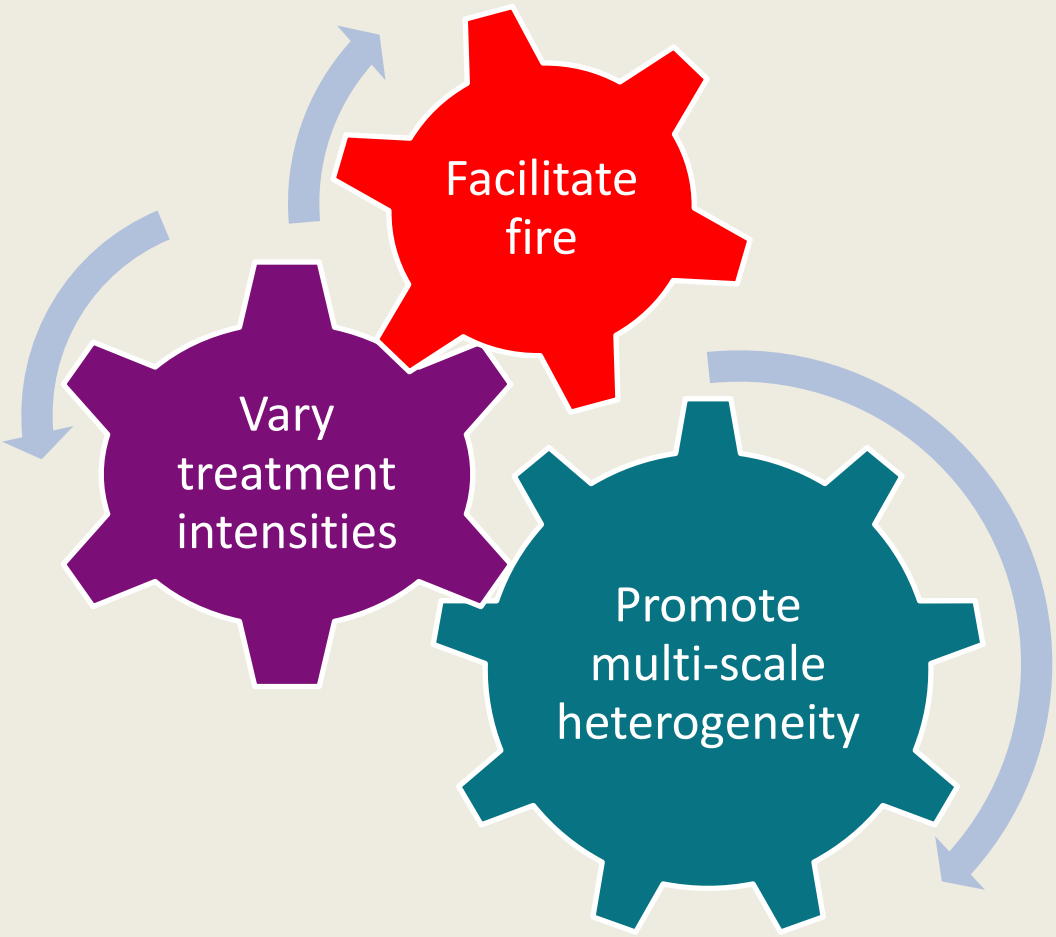
Black Oak Restoration Fosters Socioecological Resilience

- Diversity of structure and fire effects through formation of gaps and burning
- Resilience to wildfire
- Acorn production
- Formation of habitat trees
- Reduced water stress
- Supports tribal traditions, social interactions, and healthy diet

Slide and photo source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Problem demands a long-term adaptive management strategy

- Design treatments to shift structure back to conditions where fire can be restored
- Promote heterogeneity at multiple spatial scales:
  - Create gaps around oaks
  - Retain clumps of high value decadent structures and high canopy cover to support near-term habitat needs



Slide source : Jonathan Long, USFS-PSW. Tribal Research Partnership for Cal. Black Oak

Partnerships with Tribes

- Restoration of landscapes and culture practices
  - Ecocultural restoration for ecosystem and human health
- Through partnerships, integrate landscape restoration strategies with tribal traditional ecological knowledge and stewardship practices
  - Identify current and former "orchards"/productive groves for more intensive tending:
    - Active Restoration
  - Consider how to evaluate whether tribal resources are available in the desired quantity and quality
    - Identify and understand common metrics and indicators

Resources of Tribal Uses and Management of Oaks

- Diver 1952 The Acorn in North American Indian Diet, Proc. Of Indiana Acad. Of Sci.
- McCarthy 1993 Managing Oaks and the Acorn Crop *in* Blackburn and Anderson (eds.) Before the Wilderness
- Hosten et al. 2006 Oak Woodlands and Savannas –Chapter 4 in Restoring the Pacific Northwest
- Tushingham and Bettinger 2013 Why Foragers choose acorns before salmon… J. of Anth. Arch. 32
- Anderson 2007 Indigenous Uses, Management and Restoration of Oaks of the Far Western United States. NRCS Tech. Note No. 2
- Long, Jonathan W.; Anderson, M. Kat; Quinn-Davidson, Lenya; Goode, Ron .W.; Lake, Frank K.; Skinner, Carl N. 201x. Restoring California Black Oak Ecosystems to Promote Tribal Values and Wildlife. Gen. Tech. Rep. PSW-GTR-xxx Albany, CA: USDA Forest Service, Pacific Southwest Research Station. xxx p.

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