

Pollen as a proxy for pre-historic burning

Anna Klimaszewski-Patterson

Department of Geography

College of Natural Sciences & Mathematics



PROBLEM STATEMENT

Finding evidence for pre-historic burning that is unambiguously ascribed to human activity and not climate is a challenge in the geologic record.

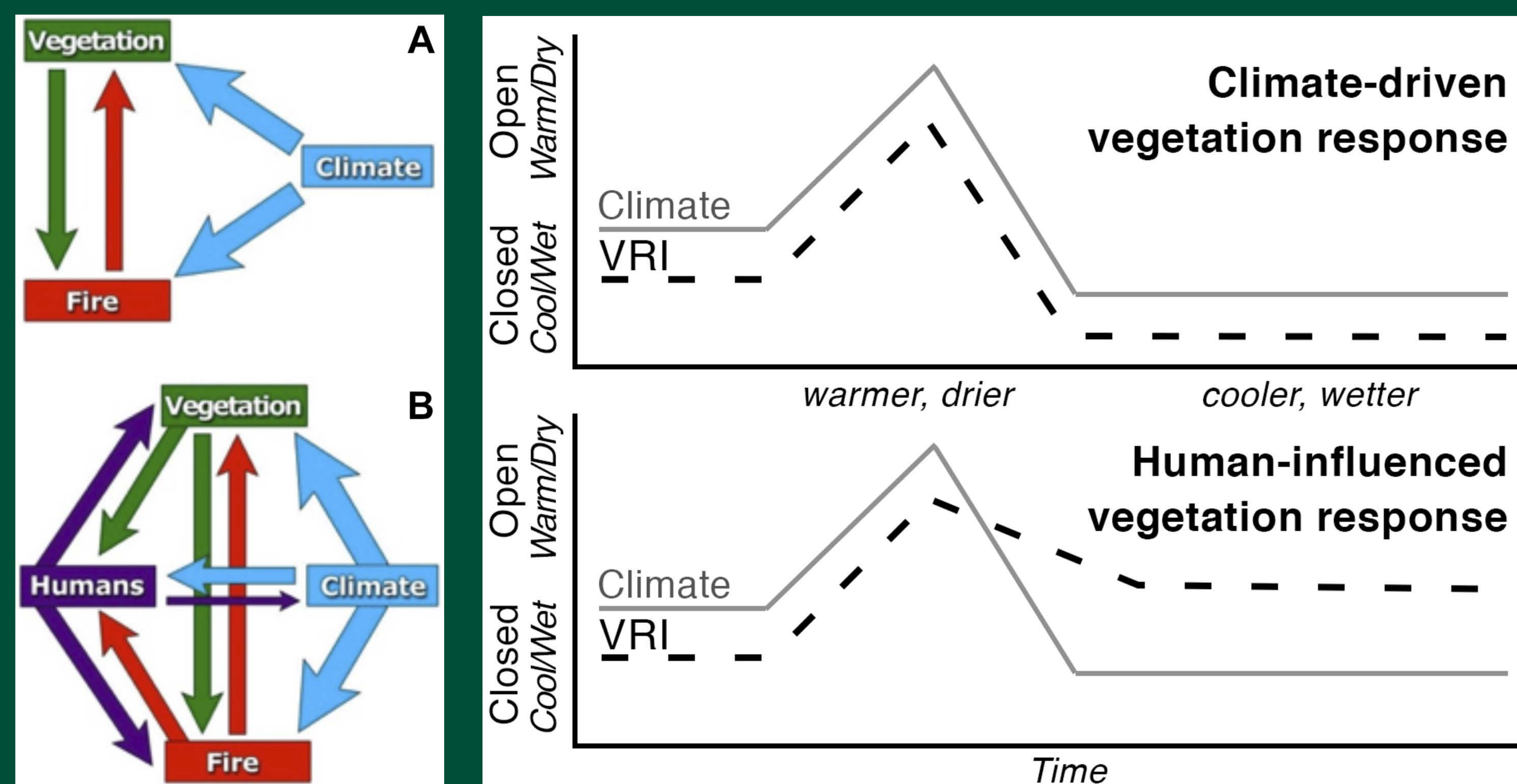


Figure 1: Model of climate-only and human-influenced fire regimes (left) against conceptual models of VRI response under those regimes (right)

BACKGROUND

I use a combination of pollen, sedimentary charcoal, and paleolandscape modeling to identify signals of anthropogenic fire use. Paleoecological studies based on pollen and sedimentary charcoal provide a biosphere record stored in a geologic context of sedimentary records.

Based on vegetative life history traits, I create a Vegetation Response Index (VRI) to explore how forest composition changes relative to expectations based on climate (Fig. 1 right). Climatically, I expect a more negative VRI (-VRI) when it's warm/dry (e.g. more fire- & drought-tolerant oaks), and a more positive VRI when it's cool/wet (e.g. more fire-sensitive fir; Fig. 1A). During cool/wet periods, a more -VRI is counter to climate-vegetation dynamics and likely indicates human influence on forests (Fig. 1B).

SUMMARY OF WORK

Using climate-fire-vegetation dynamics and a vegetation response index (VRI), I can make inferences as to the primary driver of vegetation change (Fig. 1). Metanalyses of pollen (Fig. 2) at five paleoecological sites with sub-centennial pollen reconstructions all show support for pre-historic burning by Native Californians in the last 1500 years, especially during cooler, wetter periods that are less conducive to oak habitat (important food source).

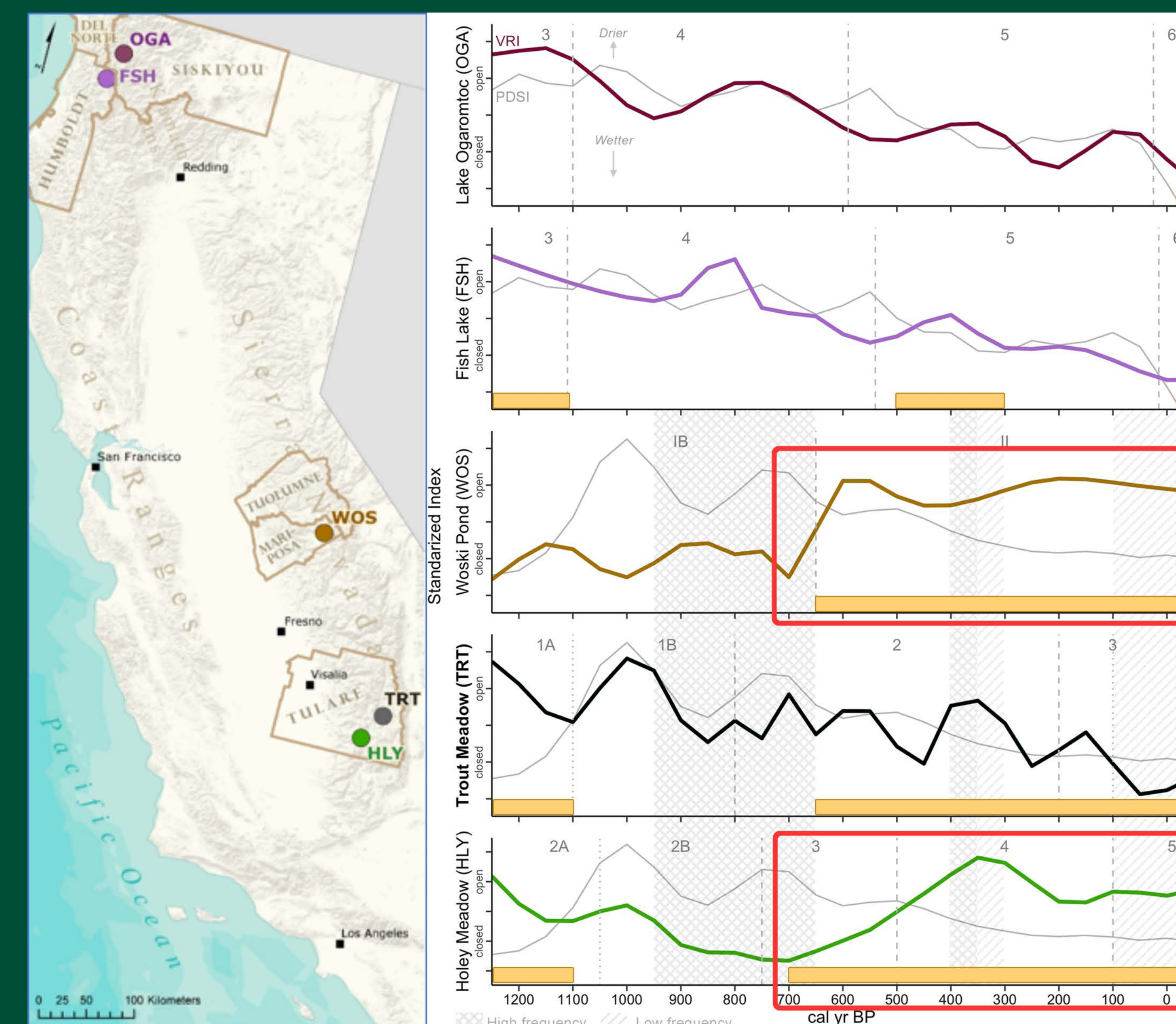


Figure 2. Metanalysis of sub-centennial pollen reconstructions in mountainous California, with calculated VRI, for the last 1300 years. All sites, most notably WOS and HLY (red boxes), show evidence for burning by Native Californians, especially during the Little Ice Age (1250-1850 C.E.). Bars = periods of inferred human activity. Cross-hatch = regional high fire frequency, hatch periods of low fire.

IMPACT ON COMMUNITY

This work is important because it:

- provides empirical evidence of traditional Native Californian practices on lands in California
- characterizes the ecological history of the Sierra Nevada
- may provide policy makers support for traditional burning practices to reduce the severity of future Sierran wildfires