# There Grows a Green Tree: Papers in Honor of David A. Fredrickson

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# *Prehistoric Burning in Northwestern California*

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> Contemporary human groups interact with their environment in many ways and at different levels, depending on their technology and organizational skills. The regional environment provides a resource base that may also be relevant to the development of individual economic traits, primary technology, subsistence patterns, and even social structure. Similarly, on a more local scale, the habitat provides settlement sites and the focus for human activities. Conversely, man leaves his imprint upon the local setting and even the regional environment. Food-gatherers modify vegetation by fire and accidental dispersal of plants... [Butzer 1971:vii]

In a landmark treatise on the ecology of Indian burning practices in California, Henry Lewis suggested an investigative approach involving "the collection and examination of the few and desultory ethnographic and historic statements about Indian burnings to fit these into the findings and recommendations of contemporary ecological research" (1973:12). The broader ecological features of Indian burning can supplement archaeological data by offering a glimpse of the prehistoric landscape and some insight into the patterns of prehistoric land use in the Southfork Mountain-Pilot Ridge area of northwestern California. Toward that goal, ethnographic data are used here to determine the frequency and seasonality of Indian burning. Palynological data are then examined in an effort to determine the effects of periodic burning. These data further suggest a time for the introduction of this activity.

## The Ethnographic Data

The Southfork Mountain-Pilot Ridge area was claimed by the Athabascan speaking Nongatl (Kroeber 1925; Baumhoff 1958), although some confusion exists as to their actual name(s) and territorial boundaries. The first published mention of these people was that of Powers (1877:122-124) who referred to them as the *Saiaz* but noted "the Wailaki call the saiaz (sic) *Noankakhl*" (Powers 1877:124). P.E. Goddard (1913:703) introduced the spelling *Nongatl* which Kroeber (1925) retained. Other names applied to them are *Nung-Kah,hl* and *Ketel* (Merriam (1923:276). Baumhoff (1958:181-184) in a summary of the published and unpublished ethnographic work of C. Hart Merriam and P. E. Goddard, identified eight Nongatl sub-groups and placed the *Naaitcikiya* sub-group within the Southfork Mountain-Pilot Ridge area. Elsasser (1978), in contrast, recognized the presence of only six of the sub-groups (those mentioned by Goddard [1913]) and excluded the two mentioned by Essene (1942:90-92). Further confusion exists as to whether the neighboring *Lassik* should be combined with the *Nongatl* (Merriam in Baumhoff 1958, Coy 1929), given the high degree of cultural similarity exhibited by the two groups (see Keter, this volume).

The most extensive source of information regarding the use of fire among the Nongatl is derived from Driver's (1939) Culture Element Distribution (CED). Driver (1939) noted that fire was used to drive large and small game, obtain better seed crops and to facilitate the collection of grasshoppers. Although no information is presented on the season of burning, it probably occurred after the late summer harvest of grass seeds. Such a conclusion is consistent with data from other areas where specific information on seed gathering and burning is found. For example, Driver's Mattole informant, whose ethnographic territory was located directly west of the Nongatl, indicated that September was generally the time when grasslands were annually burned (Driver 1939:347). Driver also noted that "the same fire may have served two or more purposes," suggesting that one fire could have been used to drive game, maintain the grassland habitats, and harvest grasshoppers.

Data on the Lassik reveal the extensive use of fire to remove underbrush, kill rattlesnakes, and drive deer. Essene's Lassik informant stated that burning was done "in late summer and early fall" (Essene 1942:54). Essene further notes that his informants


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told him "much of Trinity County, now choked with thick brush, was almost open prairie before the white man came" (Essene 1942:55).

Although these data clearly document the ethnographic practice of periodic burning, information regarding the origin and development of this activity must be derived from the archaeological and palynological record. Archaeological research by Weigel (1976), Weigel and Fredrickson (1982) and Hildebrandt and Hayes (1983), as well as palynological studies by West (1983,1984) offer ample evidence for prehistoric use of areas that appear to have been burned on a regular basis.

## The Palynological Data

A pollen profile spanning the last 5000 years was obtained from a series of cores extracted from a pond next to archaeological site CA-HUM-588 (West: 1983, 1984). Beginning around 2700 to 2800 BP, West (1983:3.21) identified an increase in Douglas fir simultaneous with a decrease in pine and oak. Tracking with Douglas fir, tan oak (*Lithocarpus*) and chinquapin (*Chrysolepis*) also became established during the latter temporal interval. West attributed these long-term changes to a climatic shift from a warmer/dryer regimen to a cooler/moister one.

In addition to pollen, charcoal and peat were observed in the cores. Charcoal was found in two distinct lenses and present in 30 of the 37 analyzed samples. Chronological control was provided by two radiocarbon dates obtained from the peat. The first (from 20 to 22 cm from the top of the core) produced a date of 2640 ±70 BP and the second, from 128 to 133 cm yielded a date of 4600±100 BP. West concluded that the charcoal lenses were the result of major fires and at least one was of sufficient magnitude to eliminate pine (*Pinus*), fir (*Abies*), and Douglas fir (*Pseudotsuga*) pollen from the core. The majority of charcoal, however, was found in moderate densities and appeared to represent smaller scale events (West 1983).

In order to evaluate these patterns of burning from the perspective of aboriginal behavior, pine, fir, oak, tan oak, and Douglas fir were combined into a single overstory component and compared to the frequency of Gramineae pollen grains. Because grasses quickly re-occupy areas that have been severely burned, it was expected that significant increases in Gramineae would coincide with major reductions in the overstory species, whereas more moderate fires would produce intermediate results (eg., increased grasses without significant decreases in overstory pollen grains).

The absolute and relative frequencies of Gramineae versus pine, fir, oak, tan oak, and Douglas fir are presented for each of the 37 samples in Table 1. Trends in this relationship are evaluated through comparing sample-specific values for Gramineae to the mean and standard deviation of the overall population. For example, the only values well beyond one standard deviation were from samples 21 and 30, both of which showed significant reductions in the frequency of overstory species. This was particularly the case for sample 30 where the fire was "great enough in size to virtually eliminate pine, fir, and Douglas fir from contributing to the local pollen rain" (West 1983:3.21).

Other fluctuations in relative percentages of grass pollens appear to indicate that open areas on the ridge may have undergone a series of expansions following fires that did not produce drastic reductions in the overstory. If the frequent, periodic burning attributed to the Native Americans stabilized grassy openings, the percentage of Gramineae should increase relative to arboreal pollen but with a lower rate of fluctuation. Evidence for this process should be reflected by a relatively high arithmetic mean value for the percentage of grass pollens with a corresponding low standard deviation. In fact, the pollen data do suggest a general stability in the six samples post-dating 2640±70 BP. When comparing overstory to Gramineae (Table 1, Column 6), samples 1 through 6 have a mean of 17.3 with a standard deviation of 4.5 while the entire column has a mean of 15.7 and a standard deviation of 10.3. To further investigate this relationship, the total pollen count for each sample was contrasted with the Gramineae and the Gramineae expressed as a percent of the total (Table 1, Column 8).

The first six readings have a mean of 9.3 percent with a standard deviation of only 2.3 percent, while the rest have mean of 7.6 percent and a standard deviation of 4.7 percent. By expressing the standard deviation as a percent of the mean, it is demonstrated that the first six samples fluctuate an average of only 24 percent from their mean value, in contrast to the remaining samples which fluctuate an average of 62 percent from their mean value. While these figures are not statistically significant they are suggestive of greater stability in the recent past for two reasons: (1) the higher mean value of the upper samples suggests large openings developed late in time, (2) the lower degree of fluctuation suggests the sizes of the openings were maintained. Both of these phenomena suggest that frequent periodic burning practices were introduced a few hundred years after the 2640±70 BP radiocarbon date.

*Table 1: Pollen Counts, Totals and Percentages.*

| Sample[a] | Depth[b] (cm.) | Overstory[c] | Gramineae[d] | Total[e] | % Graminea[f] | Total Sample[g] | % Graminea[h] |
|---|---|---|---|---|---|---|---|
| 1 | 0-1 | 217 | 29 | 246 | 11.7 | 413 | 7.0 |
| 2 | 2-3 | 178 | 50 | 228 | 21.9 | 474 | 10.5 |
| 3 | 5-6 | 160 | 21 | 181 | 11.6 | 367 | 5.7 |
| 4 | 7.5-8.5 | 184 | 47 | 231 | 20.3 | 410 | 11.4 |
| 5 | 10-11 | 260 | 65 | 325 | 20.0 | 581 | 11.1 |
| 6 | 13-14 | 173 | 39 | 212 | 18.3 | 384 | 10.1 |
| 7 | 15.5-16.5 | 224 | 25 | 249 | 10.0 | 522 | 4.7 |
| 8 | 17-18 | 192 | 21 | 213 | 9.8 | 412 | 5.0 |
| 9 | 20-21 | 212 | 13 | 225 | 5.7 | 439 | 2.9 |
| 10 | 22-23 | 161 | 25 | 186 | 13.4 | 423 | 5.9 |
| 11 | 23.5-24.5 | 205 | 20 | 225 | 8.8 | 491 | 4.0 |
| 12 | 25-26 | 191 | 14 | 205 | 6.8 | 503 | 2.7 |
| 13 | 26.2-27.2 | 151 | 44 | 195 | 22.5 | 365 | 12.5 |
| 14 | 27.5-28.5 | 167 | 20 | 187 | 10.6 | 342 | 5.8 |
| 15 | 30-31 | 133 | 46 | 179 | 25.6 | 432 | 10.6 |
| 16 | 31.5-32.5 | 198 | 36 | 234 | 15.3 | 385 | 9.3 |
| 17 | 33-34 | 199 | 37 | 236 | 15.6 | 394 | 9.3 |
| 18 | 96-97 | 227 | 21 | 248 | 8.6 | 461 | 4.5 |
| 19 | 99-100 | 228 | 30 | 258 | 11.6 | 480 | 6.2 |
| 20 | 102-103 | 201 | 10 | 211 | 4.7 | 372 | 2.6 |
| 21 | 103.5-104.5 | 143 | 66 | 209 | 31.5 | 359 | 18.3 |
| 22 | 105-106 | 188 | 28 | 216 | 12.9 | 361 | 7.7 |
| 23 | 107-108 | 185 | 23 | 208 | 11.0 | 395 | 5.8 |
| 24 | 110-111 | 161 | 28 | 189 | 14.8 | 369 | 7.5 |
| 25 | 113-114 | 215 | 37 | 252 | 14.6 | 407 | 9.1 |
| 26 | 117-118 | 241 | 37 | 278 | 13.3 | 418 | 8.8 |
| 27 | 120-121 | 163 | 50 | 213 | 23.4 | 421 | 11.8 |
| 28 | 123-124 | 176 | 21 | 197 | 10.6 | 336 | 6.2 |
| 29 | 124.5-125.5 | 181 | 35 | 216 | 16.2 | 374 | 9.3 |
| 30 | 126-127 | 65 | 127 | 192 | 66.1 | 494 | 25.7 |
| 31 | 127-128 | 213 | 23 | 236 | 9.7 | 391 | 5.8 |
| 32 | 128-129 | 167 | 38 | 205 | 18.5 | 393 | 9.6 |
| 33 | 130-131 | 227 | 18 | 245 | 7.3 | 417 | 4.3 |
| 34 | 132-133 | 171 | 19 | 190 | 10.0 | 383 | 4.9 |
| 35 | 134-135 | 166 | 29 | 195 | 14.8 | 353 | 8.2 |
| 36 | 137-138 | 141 | 31 | 172 | 18.0 | 452 | 6.8 |
| 37 | 139-140 | 150 | 21 | 171 | 17.1 | 338 | 6.2 |
| | | | | | Mean = 15.7<br>SD[i] = 10.3 | | Mean = 8.0<br>SD[i] = 4.3 |

[a] — Sample = one of 37 areas of the core sampled
[b] — Depth = the depth in centimeters of the sample as measured from the top of the core.
[c] — Overstory = the total pollen contributed by *Pinus*, *Abies*, *Quercus*, *Pseudotsuga*, and *Lithocarpus*.
[d] — Graminea = the count for graminea in each sample.
[e] — Total = overstory pollen added to graminea.
[f] — % Graminea = the percentage of the total attributed to graminea.
[g] — Total Sample = all the pollen counted in the sample, not just overstory and graminea.
[h] — % Graminea = the percentage of Graminea in the total pollen count.
[i] — SD = Standard Deviation

## SUMMARY AND CONCLUSIONS

An examination of the ethnographic data suggests that frequent periodic burning in the late summer or early fall was practiced throughout the study area. While it is intriguing to speculate that aboriginal burning may be evidenced early in the pollen record, coinciding with a large-scale reduction of arboreal pollen, probable evidence of annual or semi-annual burning does not appear in the pollen record until much later (probably around 2000 BP).

Hildebrandt and Hayes (this volume) hypothesize that the cooler/wetter conditions of the late Holocene (post 2800 BP) decreased the abundance and diversity of the upland resource base. The presumed results of this change were the establishment of semi-sedentary residential bases in the river valleys (reliant on the storage of acorns and salmon) corresponding to a more specialized use of upland habitats. If my conclusions are correct, burning may have been practiced to increase productivity of upland areas focusing on the harvest and maintenance of a specific set of resources. This activity may be viewed as further evidence for late Holocene resource intensification in that it represents a concerted effort to control the productivity of a marginal environmental zone.

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