Anthropological and Archaeological Perspectives on Native Fire Management of the Willamette Valley

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> This part of Willamette Valley is a prolonged level, of miles in extent circumscribed by the woods, which have the appearance of being attended to and kept free from undergrowth. This is difficult to account for, except for the agency of fire destroying the seeds. . . . That this is the case appears more probable from the fact that since the whites have had possession of the country, the undergrowth is coming up rapidly in places. (Charles Wilkes 1845:358)

In contrast to popular myth, the hardy Mountain Men of the American West did not venture into an uncharted and untamed wilderness. They frequently followed well worn trails, connecting generations-old villages and camps of a considerable population of Natives that they encountered in every valley they entered. Likewise, when Euroamerican trappers and settlers entered the Willamette Valley in the early 1800s, it was not a pristine wilderness they entered; but an anthropogenic landscape, maintained–and to a real extent created–by the valley's Natives with the use of fire.

It is not my objective to outline the case for aboriginal burning and landscape management in the Willamette Valley. This case has been very capably and convincingly made by several generations of biogeographers and ethnohistorians (Boyd 1986, 1999; Douglas 1926; Habeck 1961; Franklin and Dyrness 1988:126; Johannessen et al. 1971; Towle 1974, 1979). My goal is to bring anthropological and archaeological perspectives to the discussion; to explore the potential antiquity of historically documented burning strategies in the valley.

The Social Correlates to Resource Management with Fire

Many anthropologists, among them Omer Stewart (1956), Henry Lewis (1973 , 1976), Richard Gould (1971), and others, have documented deliberate burning of vegetation by hundreds of Native groups worldwide, for the purpose of managing plant and animals resources. The practice of burning in connection with subsistence activities has been recently explored by Lawrence Keeley (1995), who examined 96 ethnographic groups worldwide–characterized by anthropologists as hunter-gatherers–to assess the strength of correlations between plant exploitation practices, and ecological, demographic, and social variables. He found particularly strong correlations between fire-setting and the use of nuts and seeds as staple foods. Further, he found that the most intensive uses of plants–involving the sowing of seed–usually occurs only if the foraging group is also using fire for vegetation management. Based on his findings, he suggests (cf. Lewis 1972) that burning may be more strongly associated with the development of agriculture than variables such as population pressure, increasing social complexity, or other conditions seen as classic drivers of agricultural development. He does not suggest that burning causes agriculture, but that it is one of a set of tools–including sowing, planting, cultivating, weeding and other practices–used by hunter-gatherer groups worldwide who actively manipulate plants in their environment for the purpose of enhancing their productivity and reliability.

In an important piece written nearly 25 years ago, Paul Mellers (1976) also drew on worldwide literature to postulate that systematic burning could potentially increase the overall productivity of ungulate populations by a factor of ten, and speculated that similar improvements may have been achieved in the yields of certain vegetable food resources. He notes that while burning may reduce biomass in a given area, it promotes a substantial increase in the overall annual production of new plant growth. The effect for humans is that it increases the available biomass easily converted to useable food (forbs, grasses, annuals, as opposed to trees and shrubs).

Mellers notes three significant advantages to the use of fire in the management of plants and animals by hunter-gatherers. First, burning is likely to lead to a substantial increase in the total quantity of food that could be harvested on a *predictable* and *sustained* basis from a given area of land. Second, burning is a powerful tool in influencing the *distribution* of food resources. Finally, and to the extent that burning influences the localization of important resources, it may lead to substantial efficiencies in harvesting. "The essential point," he says, "is that the effect of fires in producing local concentrations of food resources would have permitted the formation of residential

units that were both larger in a social sense and more permanent in a temporal sense than those located in areas of unburned vegetation" (Mellers 1976:36). Burning may be one response of many to stresses such as population growth or a diminishing resource base (as with forest expansion during cool/wet intervals of the Holocene, or due to circumscription due to population pressures), along with increased competition between groups for control of resources, and increasing emphasis on rights of ownership.

Identifying direct evidence for anthropogenic burning in the archaeological or paleoenvironmental records is challenging, and I will address this later. However, the global anthropological studies of researchers such as Keeley and Mellers suggest a number of predictable social correlates to the practice of fire management among hunter-gatherer groups that we can look for in the ethnographic and archaeological records of the Willamette Valley and surrounding areas, as an aid to modeling the possible historic pathways and ecological impacts of this practice. These include: 1) the use of nuts and seeds as staple foods; 2) the presence of corollary plant management practices such as sowing, planting, cultivating, and weeding; 3) factors affecting the distribution or harvest efficiency of important resources; 4) an increasing concern with resource ownership; and 5) the formation of larger social units and more permanent residential patterns. Of course, the extent to which we can identify these attributes does not constitute a demonstration of anthropogenic burning. It does help us, however, in assessing the degree to which native Kalapuya social institutions were consistent with other plant managing groups worldwide who made regular use of fire, which in turn allows us to assess these aspects of social history in the archaeological record.

In spite of the many observations of fire-management by early chroniclers in the Willamette Valley, and their general understanding of its multiple purposes, several factors account for a failure to fully appreciate Kalapuya land management and land tenure strategies, and the inadequate consideration they have been given in modern paleoenvironmental studies in the valley. Between the years of 1770 and 1840, it is estimated that more than 90% of native Kalapuyans died from introduced diseases (Boyd 1985, 1990; Zenk 1976). Further, these declines post-date possible earlier continent-wide post-Columbian epidemics suggested by some archaeological data (Campbell 1990; Guilmet et al. 1991; cf. Dobyns 1983, Ramenofsky 1987). The result of these catastrophic declines was a breakdown in social structures, communities, and traditional modes of behavior. A careful consideration of the archaeological, ethnographic, and historic records strongly suggests that earlier populations in the Willamette Valley, and elsewhere in the Pacific Northwest, were denser, and their social institutions more sophisticated, than has commonly been acknowledged (Bowden 1997; Boyd 1990; Campbell 1990; Zenk 1976, 1994).

The most reliable information on the Kalapuya of the Willamette Valley derives from a set of fieldnotes made by linguist Albert Gatschet in 1877[1]. By making use of the ethnographic notes, and the valley's archaeological record, some of the social attributes associated with burning are considered.

1) The use of nuts and seeds as staple foods, which Keeley (1995) has shown is strongly associated with fire management of these resources.

Zenk (1990:547) notes that camas may have been the single most important staple in the valley, followed closely by tarweed, hazelnuts, and berries. These foods are commonly mentioned as centrally important foods in the Gatschet linguistic texts. One of many examples:

> They dried meat, and in the wintertime they also ate hazelnuts, and acorns, and tarweed seeds, and dried berries. . . . Sometimes they (also) mashed their cooked camas (in the mortar) where they mashed the tarweed seeds (Jacobs et al. 1945:19-20).

These foods also consistently appear in myth texts, in the context of daily routines:

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[1]In his thoughtful assessment of this record, Henry Zenk (1994) observes that Gatschet's notes provide the only formal record of informants (primarily Peter Kenoyer and David Yatchkawa, both Tualatin Kalapuya) who had experienced life under pre-reservation (though not pre-epidemic) conditions. Gatschet was a linguist, and his record is primarily one of the Tualatin language; it is not a systematic ethnographic description. Only limited data regarding Tualatin household, village, and social structure are provided. But his informants do provide commentaries on important foods, village names and locations, and other information (Zenk 1994:148)

> Panther and Flint lived together. Panther used to hunt. Flint stayed all the time at the house, Flint's work was at the house. He gathered tarweeds, and he dug camas, and he gathered hazelnuts, and he gathered acorns, and he speared (fish). That was his work, and he gathered firewood too. . . . (Jacobs et al. 1945:251-252).

The archaeological record, with respect to documenting the use of botanic resources, is admittedly biased; pior to about twenty years ago, when a number of excavations were conducted at apparent residential sites, systematic studies of food remains were typically not conducted. Botanical analyses have become a regular component of more recent archaeological research in the valley, but—due more to serendipity than design—most recent research has been conducted at resource extraction sites, such as camas processing camps, than at residential centers. As a result, the range of plant food resources identified archaeologically is far more limited than the range of resources actually used. Charred camas, hazelnuts, and acorns are ubiquitous at camas processing sites. Tarweed and other annual seeds are not well represented at these sites.

A second feature to consider is **2) The presence of corollary plant management practices such as sowing, planting, cultivating, and weeding that, according to Keeley (1995), commonly accompany the use of fire management**.

This is an aspect of behavior on which the archaeological record is mute, but on which the ethnographic record offers compelling testimony.

All cultural groups in the Pacific Northwest have traditionally been considered by anthropologists as hunter-gatherers; i.e., non-agricultural. However, anthropologists have increasingly recognized variability in hunter-gatherer systems, as well as the inadequacy of this dichotomous categorization of human occupations. This inadequacy has been particularly noted in the Pacific Northwest of North America, where a huge body of literature has developed on "complex hunter-gatherers;" cultural groups who exhibit social features commonly associated with agriculturalists such as permanent settlements, social stratification, long term food storage, and others (Aikens et al. 1986; Ames 1985; Koyama and Thomas 1981). There is now a growing body of evidence indicating that fire management of the landscape, and practices such as planting, weeding, fertilizing, and cultivating of food plants were well known, and fundamental to the Native economies of the region (Deur 1998, 1999; Deur and Turner 1999; Hannon 1991, Thoms 1989). Doug Deur (1998, 1999) and Nancy Turner (Deur and Turner 1999) have recently reviewed native gardening practices among Pacific Coast groups, and have documented Native terms for weeding, cultivating, marking of boundaries, and other practices. They point out that the fact many of these terms are encoded in various Native languages, in etymologically unrelated terms, "suggests that they are practices of long standing," i.e., dating well before initial Euroamerican contact (Deur and Turner 1999:9).

Anthropologists have long recognized that tobacco was cultivated by many Pacific Northwest Native groups. David Douglas (1959) reported finding a tobacco garden near a Kalapuya village in 1825: "An open place in the wood is chosen where there is dead wood, which they burn, and sow the seed in the ashes . . . On my way home I met the owner who . . . told me that wood ashes made it grow very large . . . . Thus we see that even the savages on the Columbia knew the good effects produced on vegetation by the use of carbon."

Alston Thoms (1989:202) reviewed ethnographic accounts from throughout the Pacific Northwest to document that camas fields were cleared and managed by fire, were cultivated and weeded, and that camas was systematically planted and transplanted.

Nan Hannon (1991), Helen McCarthy (1993), and Kat Anderson (1991, 1993) have all examined fire management of oaks for acorn production in southwest Oregon and northern California. Hannon (1991:139) concluded that the western Oregon native was "as much a horticulturalist as a gatherer, with fire as the major horticultural tool."

Tarweed seeds are frequently mentioned in ethnographic and historic sources as a primary food staple in the Willamette Valley (Boyd 1986; Jacobs et al. 1945; Zenk 1976, 1990). Zenk (1976:23) translates the Chinook jargon name for tarweed as meaning "wild wheat," a particularly intriguing name given the frequent mention of the wheat field-like appearance of burned over prairies by early travelers in California's Central Valley, in southwest

Oregon, and in the Willamette Valley (Bean and Lawton 1976:32; Clyman 1960:121; Riddle 1953:51; Church 1951:11-12).

Tarweeds are considered a ruderal species, tolerant of disturbance and able to survive in poor soil under drought conditions. These characteristics preconditioned the proliferation of tarweed under a fire-management regime. Bruce Baldwin, (Jepson Herbarium, UC Berkeley, personal communication, 1998) has noted that soils which develop a thick grass/forb cover are not good tarweed habitiat, "unless disturbance (e.g., fire) is frequent." Based on observations of tarweed at the Marys River Natural Park in the central Willamette Valley, Allen Makinson (Natural Resources Conservation Service, personal communication, 1998) suggested that tarweed plots would had to have been burned on a yearly basis to insure continued high production levels. He noted that the first growing season, after the park was sprayed with herbicide, tarweed was abundant on the bare soil and grew to 36 to 72 inches, with seeds maturing in late August. The following season, in competition with grasses, the tarweeds were less abundant and stunted (12 to 18 inches), and seeds did not mature until late October.

Thus, modern plant researchers agree that tarweed abundance is dependent on a disturbance regime, such as regular burning; its central position in the Native economy implies a history of fire management.

A third element in a consideration of fire management is an examination of **3) Factors affecting the distribution or harvest efficiency of important resources**.

This is most clearly documented with respect to game management. David Douglas (1959:214) learned from the Kalapuya in 1826, that burning was sometimes done:

> for the purpose of urging the deer to frequent certain parts, to feed, which they leave unburned, and of course they are easily killed. Others say that it is done in order that they might the better find wild honey and grasshoppers, which both serves as articles of winter food.

Burning was also, apparently, a part of the process of harvesting tarweed seeds. Charles Wilkes (1845) observed, in 1841, that:

> The Indians are in the habit of burning the country yearly, in September, for the purpose of drying and procuring the seeds of the sunflower, which they are thus enabled to gather with more ease, and which form a large portion of their food.

Jesse Applegate's (1914:69) observations clarify this harvest technique:

> It was the custom of these Indians, late in the autumn, after the wild wheat, Lamoro sappolil, was fairly ripe, to burn off the whole country. The grass would burn away and leave the sappolil standing, with the pods well dried and bursting. Then the squaws, both young and old, would go with their baskets and bats and gather in the grain.

The implication of such testimony is that burning positively influenced both the distribution of plant and animal resources, and their harvest efficiency, in the Willamette Valley.

A fourth possible function to which burning may be related is **4) An increasing concern with resource ownership.**

Nancy Turner (1975:81) notes that among the Coast Salish "camas beds were divided into individually owned plots, passed from generation to generation. Each season, these were cleared of stones, weeds, and brush, often by controlled burning." George Gibbs (1877), Marian Smith (1950), Wayne Suttles (1951), and June Collins (1974) have all reported on different groups of western Washington Salish whose intensively managed plots of camas and other root foods were individually owned and inherited, and frequently demarcated by boundary stakes, rock lines, shallow ditches, or low berms.

Even in the anemic Willamette Valley ethnographic record, we can find evidence for resource ownership. In his assessment of Gatschet's Kalapuya linguistic notes, Zenk (1976:46) reports that each village held exclusive

rights of access to community resources (Zenk 1976:46). In particular, Zenk (1976:17, 58) cites evidence that fields of seed-producing tarweed were owned by each village group, and that plots within these allotments were, in turn, individually owned.

Hunting districts, on the other hand, were not owned by village groups or individuals, but held in common by the larger multi-village dialect communities that occupied the major subbasins in the Willamette Valley. Boundaries between these larger group territories were recognized and enforced. A translation by Jacobs et al. (1945:187-188) of Gatschet's text addresses this point:

> The Tualatins hunted half way in the mountains . . . Perhaps if they [the Tualatin] crossed to the Yamhill country a man who hunted (there) might get killed. (Beyond) half the mountain at *pa naxDin* [the northernmost Tualatin village] if they (the people of that village) should cross over that mountain to Clatskanie country, perhaps a *Ba naxDin* (villager) would be killed. If a Clatskanie should cross over, possibly the Clatskanie would be killed (by a Tualatin).

A note to this translation expresses Jacobs' doubt that a Tualatin crossing into the country of the closely related Yamhill might be killed (a caveat not specifically applied to the Clatskanie), but as Zenk (1976:47) points out, the record is clear about definite boundaries being drawn and recognized. Gibbs (1877:186) also noted that the Indians of western Washington and northwestern Oregon were "somewhat tenacious of territorial right, and well understand their respective limits." Further consideration of this issue by Zenk (1976:46) clarifies these boundary parameters. He cites the Gatschet texts to show that the Tualatin sometimes went to the Columbia River to hunt seals, but never went to fish there, and that they could collect lampreys at Willamette Falls—where they traded for salmon—but could not fish with dip nets. The implication of these accounts is that access to the territory of friendly neighbors may be open, particularly if you brought goods to trade, but access to another's proprietary resources was not.

Boundary maintenance, and private ownership of resources, are features associated with intensive resource management practices, including burning.

The fifth, and final point I will consider is **5) the formation of larger social units and more permanent residential patterns**.

Based on his reading of the Gatschet texts, Zenk (1994) concluded that the Tualatin resided in 15-20 villages or hamlets prior to ca. 1830 (Zenk 1994). Although historic detail diminishes as one progresses southward through the Willamette Valley, it is believed that each major sub-basin was more-or-less similarly configured (Zenk 1976:17-18), with localized village clusters identified by names still preserved in the basins they occupied: "Tualatin," "Yamhill," "Santiam," "Luckiamute," "Yoncalla," and others. The linguistic texts also provide evidence that these ethnic groups were dialect communities. Linguists report that the Kalapuyan language family includes three mutually unintelligible languages and an undetermined number (but at least 13; Zenk 1990:547) distinct dialects. This linguistic diversity provides a compelling argument for considerable time depth to a pattern of residential stability in the valley, a rather striking contrast to the historic perceptions of post-epidemic wandering foragers.

Cheatham (1988:175) examined archaeological site inventory data from the upper Willamette Valley, focusing especially on the Fern Ridge Reservoir area. He found that sites occurred in notable clusters, each with many small and medium sized sites scattered mostly on the floodplain, associated with a few larger sites often located on higher elevation terraces. Based on his excavations at selected sites associated with such clusters, he concluded that each "is believed to represent a complex including a winter village and associated summer base camps and activity stations" for a local, resident community group.

This hypothesis has received support from a number of subsequent studies (Ellis 1996; Roulette et al. 1996). Bowden (1995) noted that many midden sites—sites built up from the cumulative debris of continuous occupations—occur in clusters, and that while many midden sites have produced older radiocarbon ages from below the built-up midden, dates from midden deposits themselves begin between about 3,000 and 4,000 years ago. This archaeological pattern, coupled with the valley's documented linguistic diversity which indicates a long history of stable local communities, suggests that the pattern of relatively permanent, established settlements was initiated at least three millennia ago (Bowden 1995:1; Cheatham 1988:201; Roulette 1993). It is in this time frame that we are

most likely to being seeing evidence for localized intensification of resource management.

In summary, the social history and economy of the Native Willamette Valley, particularly over the last 3-4,000 years, exhibits congruence with other cultural groups worldwide who used fire to intensively manage critical plant and animal resources. The short list of features focused on here include: 1) the use of nuts and seeds as staple foods; 2) the presence of corollary plant management practices such as sowing, planting, cultivating, and weeding; 3) factors affecting the distribution or harvest efficiency of important resources; 4) an increasing concern with resource ownership; and 5) the formation of larger social units and more permanent residential patterns. As acknowledged previously, this congruence does not by itself provide direct evidence regarding the antiquity of the use of fire for resource management. It does, however, allow us to see that if the Willamette Valley Natives were not significantly modifying the biotic landscape, particularly during the last 3-4 millennia, we are in the much more challenging position of having to explain why the Willamette Valley's cultural history runs counter to the rest of the world.

Perception and Explanation

While I would dearly love to forcefully relate the evidentiary case for the great antiquity of anthropogenic burning in the Willamette Valley, I am at present limited to offering a case that is largely circumstantial. It is a case, though, that must be made. It is the consideration of reasonable possibilities that puts us in a position to formulate appropriate questions, to appreciate the contextual parameters of our data, to know how to think about what observed patterns mean. These statements may appear to be so fundamental and obvious that I run the risk of appearing silly to even state them. But i n many areas of the Pacific Northwest, and in the Willamette Valley in particular, the human history in the context of landscape history has not been effectively articulated, leaving human forces under-appreciated, and inadequately considered, even by anthropologists. Let me offer some examples:

1. Based in part on a post-epidemic historic record, and in the absence of now better documented ethnographic texts, early 20th century ethnologists characterized the Natives of the Willamette Valley as mobile hunter-gatherers, due their perceived lack of social hierarchy, absence of agriculture, food surpluses, and other features. In his *Kalapuya Texts*, published in 1945 and still one of the most important records on the Kalapuya that we have, linguist Melville Jacobs (1945) took a lead from these inadequately informed earlier ethnologists and reinformed this characterization in his introductory contextualization of the Kalapuya. Evaluating a richer ethnographic and archaeological record, Bowden (1997) has more recently argued that this characterization "has largely gone unchallenged despite historical, archaeological and Jacobs' own ethnographical information that suggests otherwise." The point, of course, is that our perceptions of possibilities impact our interpretations.

2. Tarweed is a relatively large subtribe (Madiinae) in the sunflower (Heliantheae) family. Clausen and Hiesey (1958:22-224) report that not only do different genera within the tarweed family tend to exhibit differential seasonality, but that there can also be considerable within-species diversity. They note spring- and fall-flowering races in several species of tarweeds, variations which Babcock and Hall (1924:51-54) have shown to be gene-controlled.

I began to ask whether some of this genetic variability might relate to intensive fire-management of tarweeds throughout the Far West. It struck me that scheduled burning over a period of several millennia could impose a potentially rather intense genetic filter that might encourage selection for traits such as maturation time. I tracked down several leading researchers in tarweed genetic studies to pose this question. A typical response: "Although it is certain that maize evolved from teosinte over a relatively short time period, this evolution involved very significant food" (Les Gotlieb, UC Davis, personal communication, 1999). I don't know whether people influenced the modern genetic profile of tarweeds, but I do know that unless we appropriately acknowledge the historic relationships between people and the plants they manipulated, we will not recognize the possibilities. We will not comprehend the appropriate questions.

3. A pollen core taken in the Coast Range west of the Willamette Valley produced a charcoal record, reported by Long (1996) and Long et al. (1998), which showed a dramatic increase in charcoal inputs during the last ca. 3500 years. I was intrigued by the potential cultural interpretations relating to this pattern, and further intrigued when a very similar charcoal record was reported by Chris Pearl (1999) for the Willamette Valley floor.

An objective of the Long et al. study was to identify "fire events," defined as peaks in the charcoal accumulation record that exceeded the background values. By this method, a measured decrease in fire frequency accompanies the dramatic increase in background charcoal levels, a pattern interpreted as indicating that less frequent fires consumed more biomass (i.e., they were larger, more catastrophic fires). This, in fact, may have been the case. But can we similarly explain the parallel pattern on the Willamette Valley floor? I have not resolved in my own mind that the dramatic increase in background charcoal documented throughout the last 3000+ years is adequately explained by a significantly decreasing fire frequency. Can climatic factors adequately explain these patterns? Reaching beyond the boundaries of environmental phenomena, we might pose the question: "If people were regularly burning, what should we expect the charcoal record to look like?" Isn't it likely that frequent small-scale controlled fires would result in a marked increase in charcoal input, and a likely decrease in the incidence of catastrophic fires? We are not likely to know, unless we acknowledge and address the question in our both our research designs, and our interpretations. I would feed better about consideration and dismissal of a human factor, than I do about an absence of such a consideration (e.g., Long et al. 1998).

Final Thoughts

I am struck by what appears to me as an intellectual bias; derived not from intent but from the inevitable inertia developed within a particular field of study. For example, fire and vegetation histories are freely considered in terms of possible correlations to lightning strike history, solar flare activity, and other physical phenomena, while the exceptionally well-documented human influences on fire history are often regarded as too speculative for serious consideration. Our perceptions are limited by our understanding; there is much to be gained by developing a rich critical understanding and appreciation of the tools, models, and theories of other disciplines.

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