CHAPTER 7

Western Apache Pyrogenic Placemaking in the Mountains of Eastern Arizona

Christopher I. Roos

Keith Basso's *Wisdom Sits in Places* (1996) catalyzed archaeological and anthropological interest in how people inscribe landscapes with meaning. Apache identity and appropriate cultural behavior are intimately connected to the physical geography in which they are embedded, and Western Apaches give meaning to natural places through place-names and stories, thus creating a cartography of Apache worldviews and morality. At face value, physical geography is essentially natural, while the cultural components of landscape are cognitive, linguistic, and metaphorical. In this view, placemaking is a cognitive rather than behavioral act. People give symbolic and cultural meaning to otherwise physically and ecologically unaltered places.

Rather than being exclusively linguistic, cognitive, or metaphorical phenomena, however, Apache cultural landscapes were actively shaped through land-use activities. Through the regular use of wildland burning in particular, Western Apaches simultaneously engineered their mountain environments for economic ends and created the landscape context for the social investment that Basso has captured so articulately. Although the ecological significance of anthropogenic burning in fire-adapted forests is controversial, it is my contention that fire played an important role in the making of ancient cultural landscapes in the mountains of eastern Arizona. In their use of fire as a landscape tool, Western Apaches altered the composition, structure, and productivity of their mountain homelands through practices that may have been centuries old and had origins elsewhere—a process that can be described as *pyrogenic placemaking*.

The use of fire as a landscape tool is something that Western Apaches share with other Athapaskan language speakers in mountain environments across North America. Indeed, there are indications in Athapaskan legend and folklore from the Southwestern United States that knowledge of fire and its uses is closely associated with coniferous forests commonly found throughout the Rocky Mountain West. Identifying unambiguous, empirical evidence of anthropogenic burning in paleoecological records, however, is challenging and contentious (Bowman et al. 2011). This is particularly problematic for the Western Apache homeland because the ponderosa pine (*Pinus ponderosa*) forests that dominate high elevations are well adapted to naturally occurring, frequent surface fires (Allen et al. 2002; Fulé et al. 1997), a natural pattern that is similar to that which would be expected for frequent use of fire by human groups in these habitats.

By examining ethnographic records of Western Apache burning practices and using multiple sedimentary proxies of fire regime history, including the fuels that were burned and broad

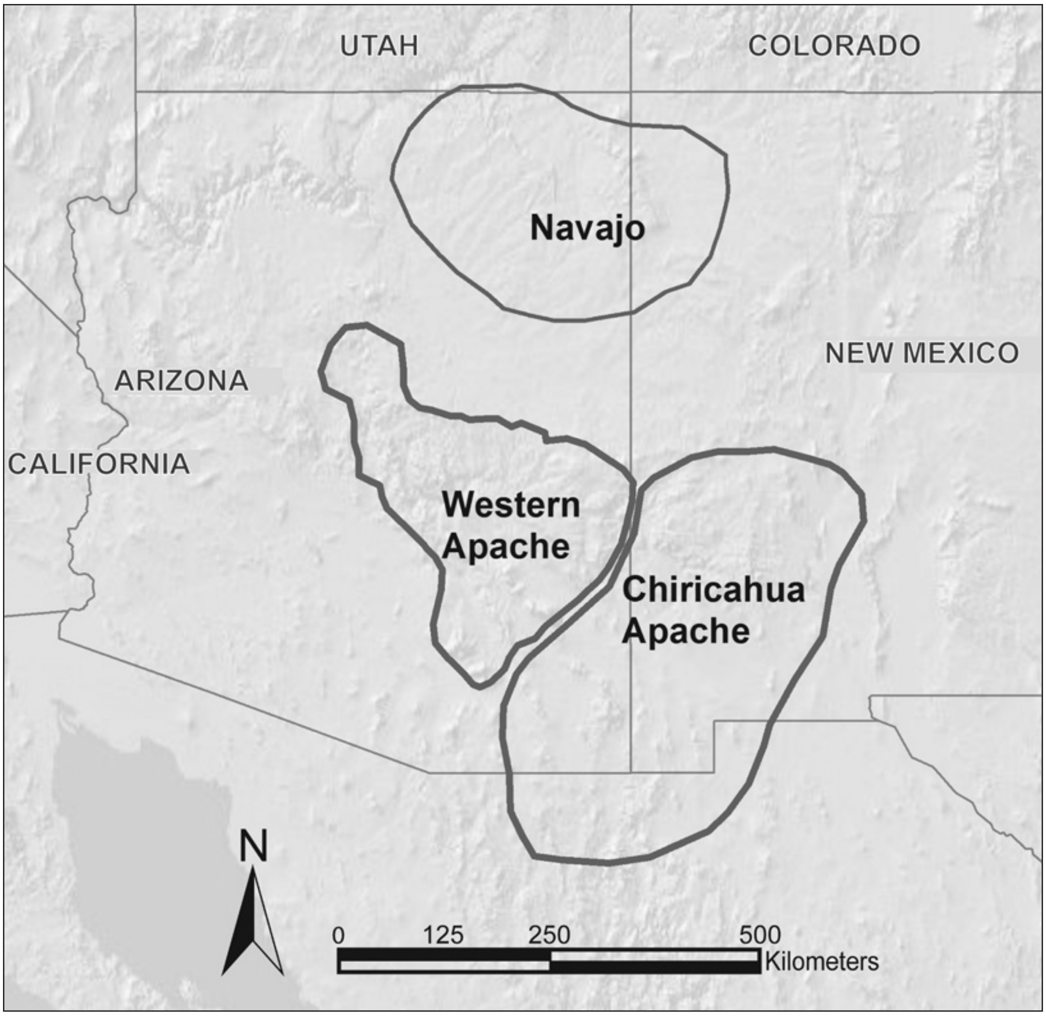

FIGURE 7.1. Traditional territories of the three westernmost groups of Southern Athapaskan language speakers.

ecological impacts, I provide evidence for Western Apache anthropogenic burning within a matrix of frequent, naturally occurring fires. In three stratigraphic records from the Forestdale Valley the emergence of novel fire regimes is coincident with the archaeological and historical evidence for the earliest Apache settlement of the mountains. This pattern of anthropogenic and natural burning persisted until the U.S. Army suppressed traditional land use at the end of the nineteenth century, thereby lending direct historical support that this pattern is distinctly associated with Western Apache land use and, by extension, pyrogenic placemaking.

Athapaskans, Western Apaches, Mountains, and Fires

Today, Western Apaches predominantly live on the Fort Apache and San Carlos Indian reservations in a diminished portion of their traditional homeland within eastern and southeastern Arizona (Figure 7.1; Basso 1983; Goodwin 1942). The importance of mountains and mountain resources is a characteristic that is shared by all Athapaskan language speakers (Perry 1983). The Western Apache homeland is centered in the rugged, mountainous region of eastern Arizona. Indeed, Apachean traditional territory is defined by sacred mountain peaks and ranges including Mount Baldy on the north (in the White Mountains adjacent to the Mogollon Rim), Mount Graham on the south (in the Pinaleño Mountains), the Mazatzal Mountains on the west, and the Blue Range on the east.

Western Apache oral traditions indicate that they have been in their Southwestern homeland since time immemorial. Linguistic, ethnohistoric, and archaeological evidence suggests that Western Apaches arrived in the Southwest within the last 1,000 years—likely within the last 500 years. Linguistic diversity among Northern Athapaskan groups indicates that central Alaska was the probable origin for all Athapaskan language speakers. Northwest Coast and Southern Athapaskan language groups probably separated from the most closely related Northern Athapaskan groups within the last millennium (Basso 1983; Matson and Magne 2007; Perry 1980). The linguistic data are generally corroborated by genetic data (Singh Malhi et al. 2008).

Although both the origin (southwestern Canada) and destination (southwestern United States) are clear, the scant and ambiguous archaeological record of Apaches in the Southwest and along their migration route has led to a variety of largely untested hypotheses about the timing and route that Southern Athapaskans took to the Southwest. Early in the twentieth century, it was not uncommon for Southwestern archaeologists to claim that raids by Athapaskans contributed to the depopulation of Ancestral Pueblo communities in parts of the Southwest between AD 1275 and 1300 (Kidder 1924). Although this view is still advocated by some, most interpretations of the linguistic, historic, and archaeological data suggest that Southern Athapaskans arrived in the Southwest closer to AD 1500 (Towner and Dean 1996) and may have moved into eastern Arizona in the early 1600s (Herr 2013; Herr et al. 2009). For the highlands of eastern Arizona, historical and archaeological records seem to converge on an arrival of Western Apaches in their homeland in the late sixteenth and early seventeenth centuries (Forbes 1960; Whittlesey et al. 1997).

Similar to Northern Athapaskan communities, Western Apaches were extremely mobile, allowing them to take advantage of a diverse range of resources (Basso 1983:468). The principal unit of Western Apache settlements was the *gota*—a residential unit consisting of two to 10 related households (Goodwin 1942). To simplify a complex, dynamic, and contingent process, Western Apaches undertook a seasonal round focusing on a diversity of wild and cultivated resources across desert, chaparral, woodland, and forest biomes (Graves 1982; Griffin et al. 1971). In the spring, perhaps as early as March, Western Apache households moved to the uplands—typically to ecosystems dominated by piñon-juniper woodlands or ponderosa pine forests in the rugged higher elevations of their territory. In the uplands, Apaches cleared small plots and planted corn and beans, usually less than 1 ac. From these farm sites Apache families conducted short foraging and hunting trips across diverse environments with periodic returns to their garden plots. In the early autumn, families returned to harvest their crops and gather other wild resources near farm sites. Hunting assumed extra importance in the late fall and winter, as camps moved to lower elevations where collecting and roasting wild agave (mescal) hearts was economically central.

Among the Western Apaches, fire was used for a variety of purposes related to hunting, gardening, and gathering activities. Favored hunting spots were located in the mountainous and forested regions of their traditional territory, where White Mountain and Cibecue band informants indicated occasional summertime use of fire to encircle rabbits (Buskirk 1986:135). Summer was also the primary time when Western Apaches used fire to drive or encircle large herbivores, such as deer, antelope, elk, and mountain sheep (Buskirk 1986:127, 131).

Fire was used to clear agricultural fields of grasses and shrubs, where its use was also believed to be good for the fertility of the fields (Buskirk 1986:25, 61). Trees were never removed in this way. Weeds were periodically burned to clean out irrigation canals (Buskirk 1986:21). After harvest, husks and stalks were frequently burned in the field (Buskirk 1986:72). Fire was also used to clear small plots for cultivating wild tobacco away from the cornfields (Buskirk 1986:97).

For the manipulation of succession and plant growth responses, fire was also used to encourage resources used as food, as craft materials, and for ritual purposes. The use of fire to manipulate the productivity of wild plant communities may have been particularly important for Western Apache subsistence economies in pre-reservation times. Edible resources were rare and less productive in the spring—after Western Apache *gota* had moved to higher elevations (Graves 1982). As a result, Apache households relied heavily on wild greens and stored cultigens for food. Traditionally, wild greens were an important and valued part of the Western Apache diet, so much so that even in the reservation era, some Apaches broadcast or scattered the seeds of wild annuals to produce preferred edible leaves near settlements (Buskirk 1986:192). Using fire to promote wild annuals, including those that produce edible greens in the spring and a harvest of edible seeds in the late summer and fall, may have been a common strategy in the pre-reservation era.

Distinguishing Apache Burning

Distinguishing human contributions to ancient fire regimes poses a number of challenges, particularly in environments that are adapted to frequent surface fires. For example, the addition of small fires every year or two in a landscape that already experiences a range of fire sizes every few years would be indistinguishable at a large scale (Bliege Bird et al. 2008). However, by carefully selecting fire history study locations, paleoecological proxies that are spatially and temporally relevant can be generated to test the anthropogenic burning hypothesis (Bowman et al. 2011; Roos 2008).

Fire ecology and historic fire regimes for ponderosa pine forests are exceptionally well studied. On the basis of more than 120 regional fire scar study localities, fire historians have reconstructed a well-replicated pattern of low-severity surface fires occurring every three to 10 years in ponderosa pine forests throughout Arizona, New Mexico, northern Mexico, and southern Colorado. In general, such fires maintained an open-canopied, mixed-age stand structure in these parklike forests. Regionally synchronous fire activity in ponderosa pine forests corresponded with dry years that followed one to three wet years (Crimmins and Comrie 2004; Swetnam and Baisan 2003). In semiarid ponderosa pine forests, ignition sources are not a limiting factor in fire activity. Both lightning and human ignitions are abundant in these environments (Allen 2002; Kaib 1998). Additionally, the bimodal pattern of seasonal precipitation creates an annually occurring, arid foresummer between April and July in which both lightning- and human-ignited fires typically burn (Figure 7.2).

The abundance and connectivity of surface fuels, however, appear to be a limiting factor in fire activity in these environments. Multiple wet years preceding fire years are probably important for the production of fine biomass, including herbaceous vegetation and needle litter, necessary to carry widespread fires. Continuous fine fuels are cured to burn during dry years, particularly following dry winters (Crimmins and Comrie 2004). This pattern of antecedent moisture has been observed to be statistically significant both for fire scar reconstructions (Swetnam and Baisan 2003) and for modern fire activity in middle-elevation forests and woodlands (Crimmins and Comrie 2004; Westerling and Swetnam 2003). Long-term variation in the production and curing of fuels has been modeled using tree-ring-based precipitation reconstructions (Roos and Swetnam 2012), which provides climate-based expectations about when natural surface fires should have been more or less frequent over the last 1,400 years (Figure 7.3).

On the basis of ethnographic evidence and climate controls on natural fires in ponderosa pine forests, we can generate the following expectations about what Apache patterns of burning might look like. Although Apache uses of fire for hunting may have had important consequences for ecosystems, the dispersed nature of hunting land use (i.e., away from farm sites and more enduring settlement locations) and the seasonality of most hunting burns (i.e., during

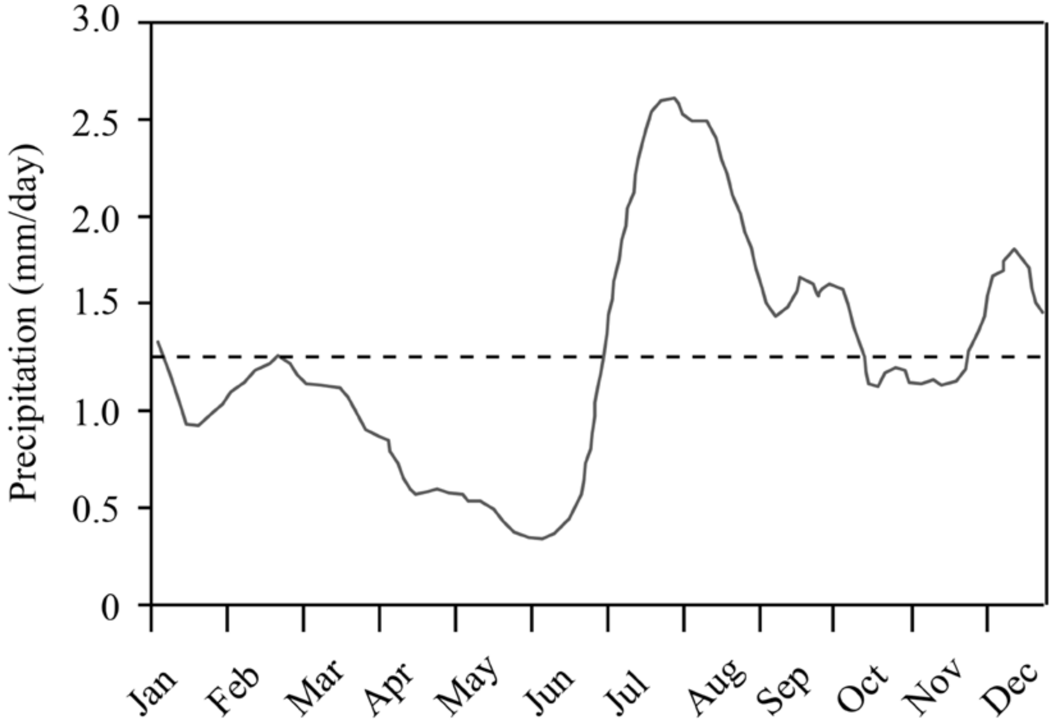

FIGURE 7.2. Daily average precipitation for Show Low, Arizona (from the National Climatic Data Center, National Oceanic and Atmospheric Administration, Show Low data set, 1949–2005).

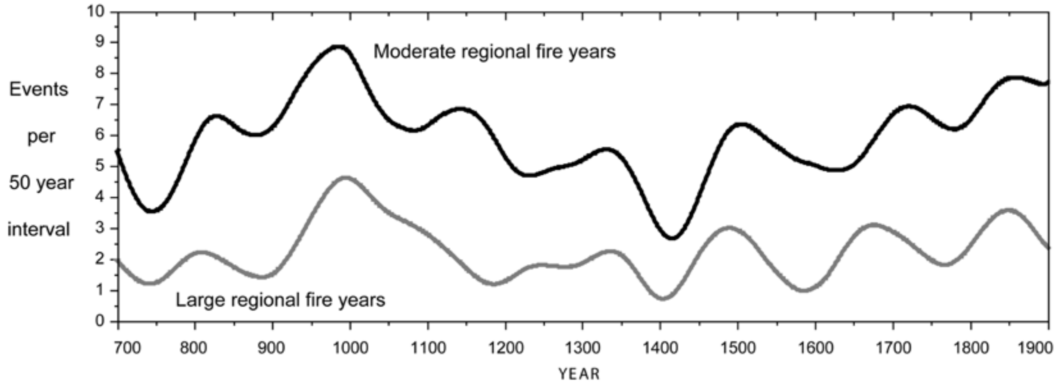

FIGURE 7.3. Locally weighted scatterplot smoothed long-term fire climate–predicted fire frequency for the southern Colorado Plateau (adapted from Roos and Swetnam 2012).

the summer—see discussion above) would make such practices difficult to distinguish from lightning-started summer fires. However, any uses of fire outside of the natural fire season to drive or confuse animals during the fall or to promote forage for large herbivores by burning out of season (during the winter or early spring) should be distinguishable from natural fires on the basis of seasonality.

Agricultural uses of fire to clear and maintain fields was likely done early in the spring (at lower elevations)—essentially before the natural fire season (see Figure 7.2)—or, more likely, after the harvest in the fall (at higher elevations)—during the autumn dry period (Figure 7.2). Burning during the cooler, moist autumn dry period could have been a relatively low-risk strategy for Western Apache communities, since this would have been around the time that they moved to lower elevations for winter hunting, foraging, and raiding. Spring burning may have risked patches of wild greens or at least threatened the possibility of getting both greens and seeds from wild annuals. However, postharvest burning of agricultural and wild seed–collecting areas would have cleared the seedbeds of competition for early spring regrowth in the following year.

This scenario of very frequent, predominantly cool-season (and probably fall) burning is also suggested by the limited tree-ring-based fire histories from Apache territory. In the Sacramento Mountains of southern New Mexico, Mescalero Apache occupation is coincident with an increase in the frequency of fires during the trees' dormant growth period (i.e., after August) (Kaye and Swetnam 1999). In southern Arizona, Chiricahua Apache occupation is coincident with extraordinarily high fire frequencies (i.e., every one to three years), although no clear changes in seasonality are evident (Kaib 1998; Kaib et al. 1996; Seklecki et al. 1996).

In summary, distinguishing Apache burning practices in fire-adapted ponderosa pine forests would be exceedingly difficult if fire frequency were the only variable used. However, Apache subsistence and land-use practices might favor a change in seasonality toward frequent fall burning in areas near farm sites. The changes in seasonality and the increase in annual area burned would have measurable consequences on understory plant communities, biomass/charcoal records of burned area, and soil chemistry. Frequent postharvest burning of wild seed–collecting areas near farm sites might increase the area that is annually burned (and thus the charcoal produced), but by promoting fine, herbaceous annual vegetation, the quantity of biomass on the landscape to burn will decrease, and the finer fuels will be more likely to combust completely or produce smaller amounts of macroscopic charcoal (>250 μ). The lower-temperature, frequent burns would accelerate nutrient cycling, particularly phosphorus (DeBano et al. 1998). Repeated burning of wild seed–collecting patches would be unlikely to alter the canopy but would likely enhance the production of pollen from wild annuals that should be represented in pollen assemblages.

Forestdale Valley Paleofire Records

The Forestdale Valley on the Fort Apache Indian Reservation, south of Show Low, Arizona, has been the focus of archaeological investigation for more than a century (Hough 1903). From 1939 to 1941, Emil W. Haury led crews of students and Apache laborers in the excavation of Bear Ruin (Haury 1985a), Bluff site (Haury and Sayles 1985), and Tla Kii Ruin (Haury 1985b) in an effort to define the prehistoric Mogollon culture. In the past decade, the University of Arizona field school returned to the Forestdale Valley as part of a collaborative endeavor with the Historic Preservation Office of the White Mountain Apache Tribe. This project emphasized damage assessment of recently vandalized sites and a valley-wide surface survey for archaeological phenomena of all time periods. Survey documented a number of pre-reservation Apache sites, although these are not yet well dated.

The surface geology of the Forestdale Valley is largely Permian-aged Coconino sandstone with Kaibab limestone and Cretaceous sedimentary rocks present in the upper reaches of the drainage. The valley floor is unusually broad and filled with at least 4 m of alluvium that has accumulated as a result of an unusual geomorphic situation. Quaternary basalt flows effectively blocked the Forestdale Creek drainage where it intersects with Corduroy Creek, thus artificially raising the base level for the drainage and creating a situation that is favorable for low-energy, fine-grained overbank sedimentation. Some riparian woody species, including willow (*Salix* sp.), walnut (*Juglans* sp.), and cottonwood (*Populus* sp.), can still be found along parts of Forestdale Creek. Until 1910, the creek ran perennially and was easily crossed by horses and

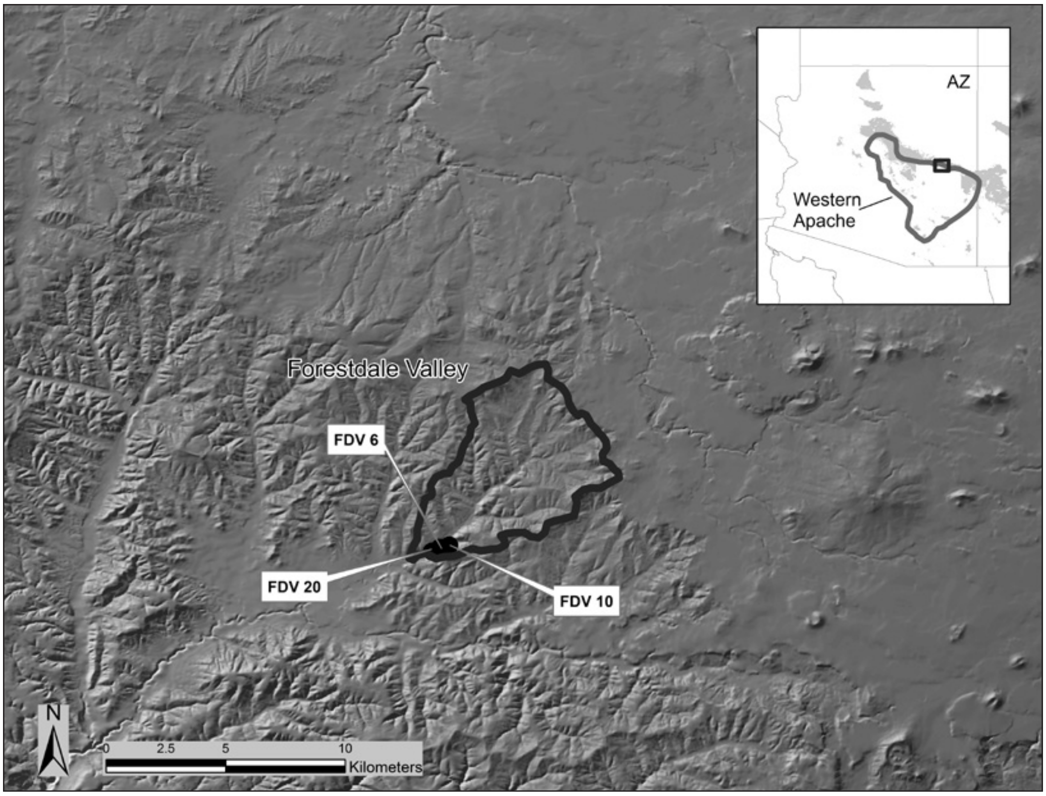

FIGURE 7.4. Forestdale Valley watershed boundary with the sampling locations (FDV 6, FDV 10, and FDV 20) plotted, as discussed in the text. Gray in the inset map represents ponderosa pine forests.

carriages, until flooding and incision of the channel created the deep arroyo that characterizes Forestdale Creek today (Haury 1985b). The sandstone hills surrounding the valley are covered in ponderosa pine forests with rare patches of manzanita (*Arctostophylos* sp.)—a woody shrub—and uncommon silverleaf oak (*Quercus hypoleucoides*) and juniper (*Juniperus* sp.).

Samples of alluvial sediments and soils were collected from four localities in the upper reaches of the watershed for Forestdale Creek in 2005 and 2006. Sampling locations were chosen to match alluvial terraces previously mapped by Antevs and Haury (Haury 1985a) and to avoid collecting samples from archaeological deposits from prehistoric sites located on the terrace surfaces. Two types of samples were collected for subsequent analysis: continuous samples at 2-cm intervals (i.e., high-resolution sampling), from which macroscopic charcoal was quantified, and bulk samples from each depositional stratum or pedogenic horizon for chemical and sedimentological analysis. Palynology was undertaken episodically from organic-rich horizons. Further details on sampling and lab processing can be found in Roos (2008).

Here, I focus on three proxy records that are relevant for identifying natural and anthropogenic contributions to landscape fires in the watershed surrounding each sampling location: macroscopic charcoal, soil phosphorus, and the proportion of terrestrial pollen taxa represented by weedy, grassy, and herbaceous vegetation. I only use the sedimentary records from the three localities—FDV 6, 10, and 20—that date to the last 1,000 years (Figure 7.4).

Charcoal production is dependent upon the amount and type of biomass burned (e.g., woody vs. fine/grassy fuels) and the completeness of combustion related to fire weather conditions. More fires increase the amount of charcoal produced if fuels remain unchanged. However, frequent fires in the same ecological patch reduce coarse fuels and promote fine, herbaceous fuels that tend to produce fewer particulate byproducts (DeBano et al. 1998).

The sandstones and other sedimentary rocks that make up the geology of the Upper Forestdale drainage are generally nutrient-poor, especially in phosphorus. Mehlich II extractable phosphorus concentrations from fresh alluvium collected from Forestdale in 2005 were at or just above 0 mg/kg. Any enrichment in alluvial sediments and soils is likely derived from two sources: biological decay of organic matter and pyrogenic recycling of phosphates from organic fuels. Since phosphorus volatilizes as a gas above 700°C, larger or more frequent low-temperature surface fires increase the amount of phosphorus available for erosion and deposition on accumulating floodplains.

Age control for all three records was provided by accelerator mass spectrometry radiocarbon dating of charred plant tissues collected from high-resolution samples during charcoal counting. Bayesian calibration of these radiocarbon ages and stratigraphic correlations between weakly expressed buried alluvial soils were combined to calculate age-depth curves for each profile.[1] Macroscopic charcoal, phosphorus, and pollen data were standardized to *z*-scores in standard deviation units. Charcoal *z*-scores were calculated relative to the mean (128.23 pieces/cm^3) and standard deviation (36.68 pieces/cm^3) of charcoal concentrations from sediments from nearby watersheds that are thought to have experienced natural or nonanthropogenic fire histories from AD 1650 to 1900 (see Roos 2008), thereby plotting charcoal concentrations as deviations from expected natural fire regimes. Phosphorus *z*-scores were calculated relative to the Forestdale Valley mean (6.76 mg/kg) and standard deviation (2.83 mg/kg) since the source for phosphates for each locality should be similar. However, all three localities are surrounded by different compositions of vegetation, so the locality-specific means and standard deviations were used to standardize the percentage of composite, cheno-am (i.e., chenopods such as goosefoot and amaranths such as lamb's-quarters), and grass pollen from each locality.

Results and Interpretations

Although the precise beginning of Apache land use in the Forestdale Valley is unknown, I expect that the sedimentary fire proxies during the nineteenth century must include Western Apache contributions.[2] Using the direct historical approach, the extension of the nineteenth-century fire regime in the past will also trace the history of Apache land use and burning. To further distinguish Apache land use from the impacts of other groups, it is worth considering the paleofire proxies in the centuries prior to Apache settlement (ca. AD 1300–1600). Although somewhat variable, macroscopic charcoal concentrations are clearly at their highest during the last century of Ancestral Pueblo occupation (ca. 1300–1400) (Figure 7.5). Phosphorus concentrations are also relatively high during the fourteenth century, and the percentages of composites, cheno-ams, and grasses are moderate or low. Although pollen assemblages remain mostly unchanged after depopulation by Pueblo populations, phosphorus and charcoal concentrations decline. In aggregate, these patterns suggest that Ancestral Pueblo land use added fire to the landscape without transforming plant communities. The depopulation of the area by the start of the fifteenth century resulted in the discontinuation of Pueblo burning, presumably as part of agricultural land use (Roos 2008; Roos et al. 2010; Sullivan 1982), effecting a decline in the amount of fire on the landscape but not a cessation.

The nineteenth-century, and presumably Western Apache, pattern of natural and anthropogenic burning is represented by relatively low charcoal concentrations; elevated percentages of composites, cheno-ams, and grasses; and elevated phosphorus concentrations. This pattern in all three proxies emerges in the three records in the late 1500s and generally persists until the end of the nineteenth century, suggesting that the landscape processes responsible for these records persisted over this same interval. The

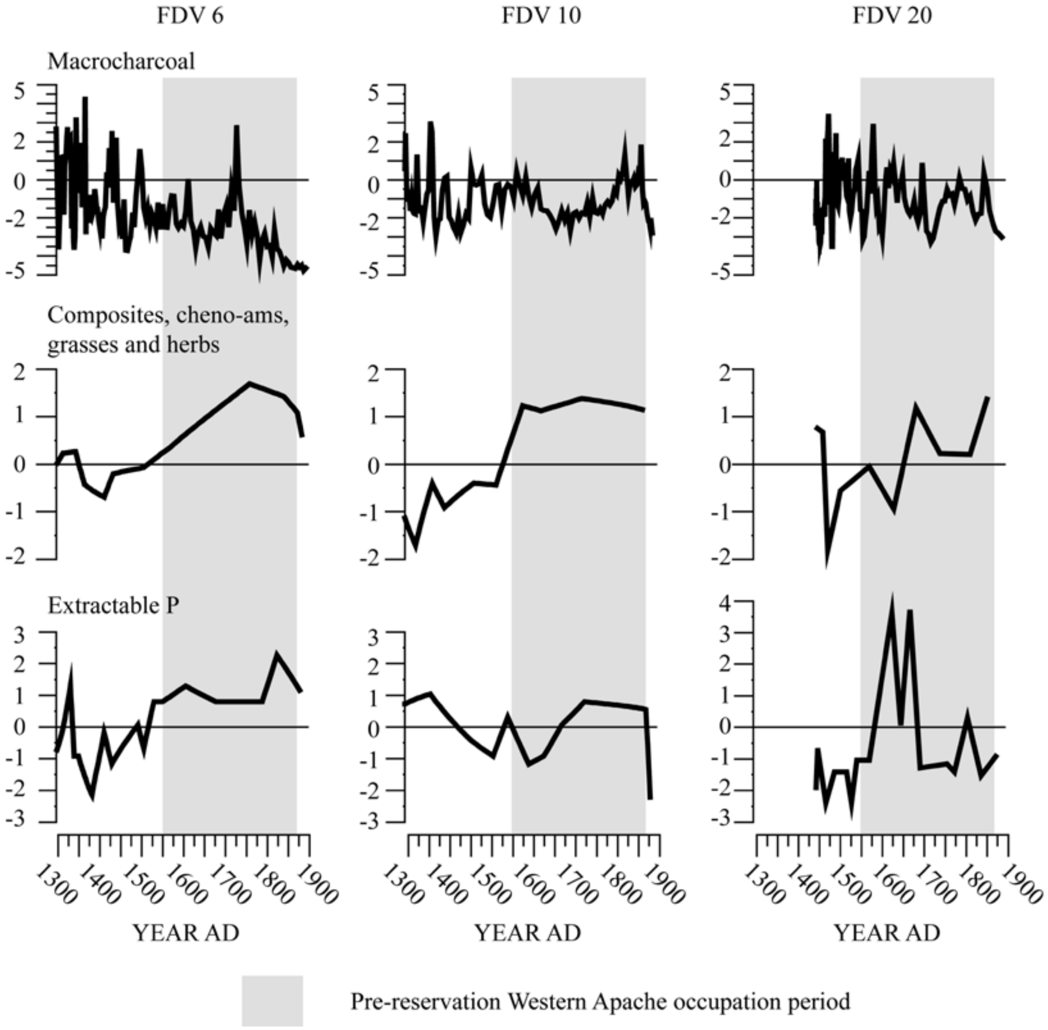

FIGURE 7.5. Sedimentary charcoal, pollen, and phosphorus z-scores for each locality (FDV 6, FDV 10, and FDV 20), as discussed in the text.

decrease in charcoal paired with an increase in phosphorus concentrations and an increase in the representation of composites, cheno-ams, and grasses are consistent with an increase in patch-specific fire frequencies that promoted fine herbaceous, grassy, and weedy vegetation that became the fuels for subsequent fires. In other words, this is consistent with an increase in fire activity associated with Western Apache burning to promote wild plant–harvesting areas for greens and seeds. Composites, especially those plants in the wild sunflower family, and cheno-ams (i.e., goosefoot and lamb's-quarters) were particularly important economic plants for Western Apaches (Buskirk 1986:190–192).

Two components of this pattern are especially noteworthy. First, the commencement of this change in the paleofire proxies occurs consistently in the middle to late 1500s across the three localities. Although this slightly predates the earliest Apache archaeological sites, which date to the early 1600s (Herr 2013; Herr et al. 2009; Whittlesey et al. 1997), it is consistent with early Spanish chroniclers who indicate that this area was unpopulated at the time of the 1541 Coronado expedition but had Apache-like residents by the 1583 Espejo and the 1598 Oñate expeditions (Forbes 1960). The precision of this age estimate for Apache anthropogenic burning should be interpreted with caution, however. The age-depth chronologies are dependent upon radiocarbon dating of detrital charcoal, which provides terminus post quem ages for the associated sediments (see note 1). The 95 percent posterior probability distributions of the calibrated ages span multiple decades, so the true dates for the onset of the Apache burning period may be as much as several decades after the onset indicated in the age-depth model used.

The second point of note is that the particular ecological changes that we can infer from these paleofire proxies are consistent with a particular suite of Apache behaviors that are documented in the ethnographic literature, such as the use of fire to enhance the productivity of wild plant food-collecting areas. Other scholars have suggested that elevated fire frequencies in tree-ring records of southeastern Arizona are best interpreted as periods of elevated warfare and raiding between Chiricahua Apaches and outsiders (Kaib 1998). However, the Forestdale Valley was never clearly a locus for conflict between Western Apaches and other communities, with the exception of a brief encounter with Mormon settlers during an attempted landgrab in the 1880s (Jelinek 2005; Smith 2005). In the case of the Forestdale Valley records, it is unlikely that the elevated fire frequencies between circa AD 1550 and 1880 were due to an increase in conflict.

Tree-ring fire records from the Sacramento Mountains indicate that fires started by Mescalero Apaches were both more frequent and irregular in their seasonality (Kaye and Swetnam 1999). Are there any sedimentary indicators that there was a change in the seasonality of fires during the pre-reservation Apache occupation of the Forestdale Valley? Perhaps. Two additional independent paleoecological proxies suggest that the increase in fire activity occurred during the fall or very early spring: stable carbon isotopes of soil organic matter and the sedimentology of the alluvial deposits.

More frequent fires during the spring or summer might be expected to increase the growth of warm-season grasses and weeds, many of which use the C4 photosynthetic pathway. These C4 plants should make the ratios of ^{12}C to ^{13}C less biased toward the lighter isotopes. Stable carbon isotope ratios of soil organic matter vary little across the strata from these localities, however, suggesting that C3 plants remain the main contributor to soil organic carbon pools. Fall burning would promote the early growth of herbaceous vegetation during the following growing season, thus promoting cool-season grasses, which are predominantly C3. The persistence of C3-like stable carbon isotope ratios coupled with the palynological evidence for the increased productivity of herbaceous vegetation, therefore, could suggest that Apache fire regimes included a shift in the seasonality of landscape fires toward fall burning.

An inference of increased fall burning may be supported by a change in sedimentology as well. Prior to AD 1600, alluvial strata are characterized by upward-fining sets that grade from poorly sorted sands to laminated silts and clays. After AD 1600, strata at all three localities are characterized by poorly sorted sands. Sand-sized mineral particles require the least energy to mobilize (Waters 1992:121); therefore this change in the grain size of alluvial sediments suggests that erosive energy may have been reduced on the surrounding hillslopes. Increasing vegetation cover before the summer monsoon season—as would be the case with thick spring growth after burning during the previous fall—could reduce rain splash and, by extension, reduce potential erosive energy on surrounding hillslopes.

The natural fire season occurs immediately before the monsoon and would typically be expected to enhance sediment yield across grain size classes. Fires that precede the growth season may increase annual vegetation cover in the understory, thereby increasing foliage cover to intercept rainfall and reduce rain splash energy and erosive power. By extension, the shift to sandy sheetwash accumulation after AD 1550 could be explained as a result of changes in fire seasonality that reduced hillslope erosion rates by enhancing understory plant cover. Although the sedimentological evidence is consistent with this scenario, this too should be noted with caution, as it only accounts for a fraction of the factors that could affect sediment availability and deposition.

Pyrogenic Placemaking and Apachean Transported Landscapes

The balance of evidence from the Forestdale Valley indicates that Western Apaches enhanced fire activity on the surrounding landscapes for as many as three centuries before the U.S. Army actively curtailed traditional land use in the decades following reservation establishment in the 1870s. The stratigraphic evidence is consistent with Western Apache burning after the monsoon season, during the fall. This burning enhanced the productivity of wild plant–collecting areas, particularly the productivity of wild greens in the following spring, ultimately enhancing wild seed production during the following fall. This paleoecological evidence is consistent with tree-ring evidence for fall burning by other Apache populations in ponderosa pine forests in the American Southwest and also corroborates the archaeological and historical evidence that Western Apaches' land-use patterns were established in the mountains of eastern Arizona after AD 1540 but before AD 1626.

An important question that remains is whether Western Apaches learned how to use fire in this way to promote important wild plants after they arrived in the Southwest or if they brought this knowledge and skill with them. This distinction would have important implications for our expectations about the timing and route of Apachean migration into the Southwest. The folklore of Western Apaches (Goodwin 1994), Chiricahua Apaches (Opler 1994), and Navajos (Newcomb 1990) offers interesting insights into the origin of these fire practices. For all three traditions, fire originates in the pine-covered mountains, and the Coyote mythical character is responsible for winning fire from its protectors through trickery. In the course of the theft of fire, Coyote and the mythical ancestors of these Athapaskan communities set fire to understory plants as they fled. Among the Western Apache in particular, the owner and protector of the first fire is Abert squirrel (*Sciurus aberti*), a species that is endemic to ponderosa pine forests (Goodwin 1994:147–148).

The linking of fire with conifer-covered mountains and species that are endemic to ponderosa pine forests suggests a long association of fire knowledge and fire use in pine forests among the westernmost groups of Southern Athapaskans. Ponderosa pine forests—and Abert squirrel populations—are widely distributed in western North America (Figure 7.6). Both may have been a part of migration routes taken by Southern Athapaskans on their journey from southwestern Canada to the U.S. Southwest. Tree-ring records indicate that ponderosa pine forests at least as far north as the Black Hills were adapted to frequent surface fire regimes (Brown and Sieg 1996).

Most scholars have tended to think of Apacheans as focused on Plains bison hunting during their migration to the Southwest (e.g., Wilcox 1981). Regular use of ponderosa pine–covered mountain slopes may have been equally likely as, albeit not mutually exclusive with, hunting on the Plains, given the pan-Athapaskan emphasis on seasonal mobility and use of mountain environments (Perry 1980, 1983, 1991). In fact, the use of ponderosa pine forests—and the use of fire as a tool in these environments, in particular—may have facilitated this migration by allowing Apache communities to establish something akin to "transported landscapes" (sensu Kirch 1995), in which familiar, productive wild plant communities were promoted via burning (rather than transporting agricultural plants) as Apaches moved into new areas.

These pyrogenic transported landscapes may have kept Apache communities tethered to ponderosa pine forests, where these particular fire uses would have been successfully transferred. Altering the structure, composition, and productivity of familiar natural landscapes would have eased any landscape learning challenges faced by the early migrants. In so doing, this pyrogenic placemaking also made for an appropriate physical canvas against which Apache

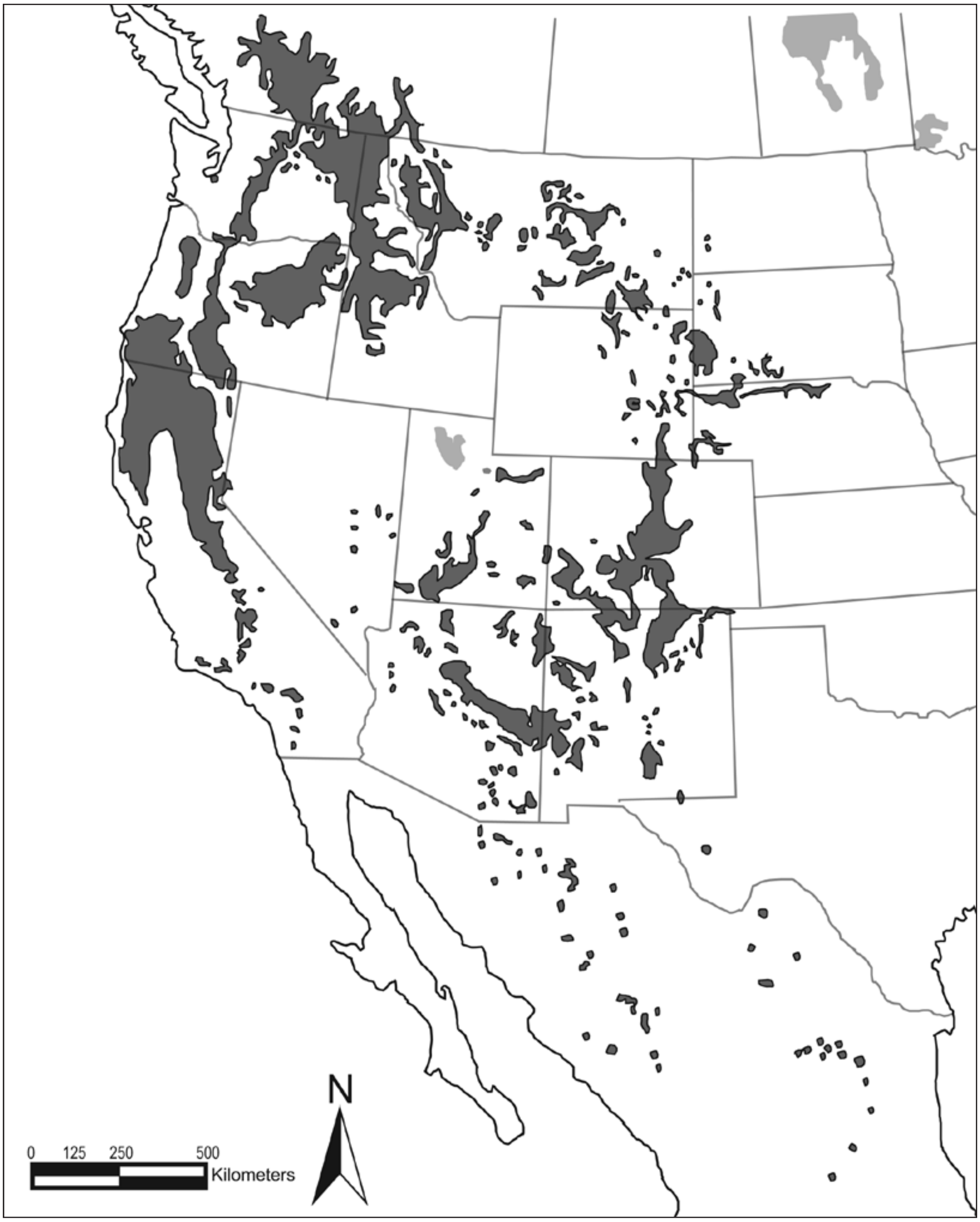

FIGURE 7.6. Distribution of ponderosa pine forests in western North America.

groups could fashion metaphor, meaning, and morality. Rather than being passively disconnected from the physical reality of their landscapes, Western Apaches were active agents in shaping their world. The cognitive, linguistic, and symbolic placemaking described by Basso is wed to the historically contingent and actively shaped physical landscape in which Apaches have also exerted agency through their land use and pyrogenic placemaking.

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Notes

1. Radiocarbon dating of detrital charcoal is among the most common methods used to provide age estimates for alluvial deposits (Brown 1997:50). The relationship among the radiocarbon "death" of a particular plant tissue, its charcoalification, and ultimately its deposition can create a discrepancy between the radiocarbon age of the charcoal (the dated event) and the date of deposition (the date of interest; sensu Dean 1978). Without bioturbation, however, the charcoal dates will reliably provide terminus post quem dates, which constrain the age of deposition to dates younger than the radiocarbon age. The ages of sedimentary deposits between radiocarbon-dated intervals can be estimated using age-depth models. I refer the interested reader to a longer discussion of these issues and the dating of Forestdale Valley localities in Roos 2008:118–123, 164–182.
2. Euro-American settlement of the Forestdale Valley area did not happen until AD 1870 (see Jelinek 2005; Smith 2005), so I do not expect these records to be confounded by fire use by Euro-American or Mexican ranchers or herders.

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