FUEL FOR THE FIRE: CHARCOAL MAKING IN SONOMA COUNTY: AN OVERVIEW OF THE ARCHAEOLOGY AND HISTORY OF A LOCAL INDUSTRY

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ABSTRACT

Recent cultural resource inventory studies at Annadel and Sugarloaf Ridge State Parks, Sonoma County, California, situated approximately 50 miles north of San Francisco, resulted in the identification of a variety of historic-era archaeological sites. A number of these sites and features are associated with the manufacture of charcoal during the late 19th and early 20th centuries. Preliminary results of ongoing research into the archaeological and historical records of this local industry are presented, based on archaeological field reconnaissance, initial archival research, and oral interviews. Topics include an historical overview of the charcoal making process and summary descriptions of the over 24 archaeological features and remains related to charcoal production recorded within the two state parks.

INTRODUCTION

Endowed with a rich diversity of natural resources and a comfortable climate, California has always attracted a steady stream of immigrants. As the state's population increased, so did the collective demand for energy. From the fuel wood, charcoal, and coal used for heating by the early migrants and settlers to the hydroelectric and nuclear power plants that run today's heaters and air conditioners, California has been shaped by the interplay of technology, population growth, human values, and the environment, all forces that have shaped its culture and economy (Williams 1997).

The two most commonly used sources of energy in 19th- and early 20th-century California were wood and coal. Although California's naturally occurring coal was scarce and of such poor quality that much of that fuel had to be imported, fuel wood was abundantly available and, while it was used to power steam engines for manufacturing and transportation, nearly 90% of it was used in residential households for domestic heating and cooking (Williams 1997:36). Harvesting and preparing fuel wood required large inputs of human energy, as did the conversion of wood into charcoal, another energy source that came into use by the 1850s and that was in demand for blacksmithing, tinsmithing and smelting, as well as for domestic heating and cooking (Bancroft 1890:77). Its light weight, superior heating capacity compared to fuel wood and ability to burn without producing sooty smoke made charcoal an excellent fuel (Brady 1971:182; May 1956:2).

By 1900, not only did San Francisco have 400,000 residents, making it the eighth-largest city in the United States at that time, but one quarter of all Americans who lived west of the Rockies lived in the San Francisco Bay Area. In commenting on the use of charcoal as a fuel, California historian Hubert Bancroft observed that, "San Francisco used in 1881 120,000 sacks of 60 lbs. each, or 3,600 tons, worth about $65,000. This came chiefly from Sonoma" (Bancroft 1890:77). This demand for charcoal continued, so that by 1900 Sonoma County had become a major supplier of charcoal to San Francisco homes and restaurants (May 1956:1; Street-Hively 1977:102).

HISTORICAL OVERVIEW OF CHARCOAL MAKING IN CALIFORNIA

Historical overviews of charcoal making in Europe and the United States may be found in Rolando (1992) and Reno (1994; 1996). With regard to post-1850 California, as early as 1868 Sonoma County was mentioned as a principal supplier of charcoal (Cronise 1868:164 in May 1956). As well, the California State Agricultural Society reports for 1905 and 1907 indicated that 100,000 sacks of charcoal [containing 50 – 70 lbs. per sack] were made and shipped to San Francisco from this area (May 1956). Although much of the charcoal produced in Sonoma County between 1870 and 1910 came from areas around Sebastopol (west of Santa Rosa), charcoal was made in other areas of Sonoma County as well (May 1956:2). These "other areas of the county" included portions of what are now Annadel and Sugarloaf Ridge State Parks (SP) (Catelani 1987). Both situated east of Santa Rosa, the county seat, Annadel SP is located at the terminus of the Sonoma Mountains, while Sugarloaf Ridge SP is situated in the Mayacamas Mountains, which form the divide between the Valley of the Moon and the Napa Valley.

Between about 1860 and 1910, charcoal had been made in smaller quantities in various parts of the state including San Mateo County (May 1956:2), San Luis Obispo County (Barter et al. 1994), and Santa Barbara County (Johnson 1999). During the 1870s and 1880s, charcoal was also made in various locations of the state for use by smithies and smelters including the Sierra Nevada foothills, the eastern side of the Sierra near Darwin (Ruby 1999), and the Death Valley area (Wallace and Wallace 1981). The largest charcoal operation was that of the Sisson and Wallace Company in Truckee, California, where 350 Chinese charcoal workers produced up to 58,000 bushels of charcoal a week to supply smelters in Virginia City, Nevada and Central Pacific Railroad's smelting works in Utah, where 90% of that charcoal was shipped (Elston and Hardesty 1981:96-97).

Most of those working in the late 19th- and early 20th-century Sonoma County charcoal industry were Italian immigrants (Bancroft 1890:77; Lee 1963:320; Lee 1979:181; Street-Hively 1977:102), who employed traditional methods that had been used in Europe for centuries. With these skilled immigrants supplying the labor, charcoal was relatively cheap to produce given the locally available fuel wood. The Sonoma County charcoal industry thrived during this time due to several factors including the fact that charcoal is relatively lightweight, allowing large quantities of it to be transported with moderate effort. As well, the existence of several railroad lines within a reasonable distance of the woodlands, the labor and time needed to cut the timber, char the wood and deliver the charcoal by railroad and boat to San Francisco was also made economically feasible by the available, skilled but relatively inexpensive immigrant labor.

The following account of the process of charcoal making in what Zeier (1987) has termed "temporary surface ovens" is a composite one, interpolated from a number of oral histories that describe the local charcoal industry as it existed in Sonoma County and nearby areas circa 1900-1912 (Lee 1963:320-321; Lee 1965a: 226-228; Lee 1979:178-190; Sand 1988:60; and Street-Hively 1977:102). Although charcoal making kilns of stone have been identified at locations within the Mark West Springs area northeast of Santa Rosa (Lee 1965b: 361; Berg and King 1974; Flynn 1981), because the charcoal making remains and sites at both state parks that are the subject of this paper all appear to be related to the use of temporary surface ovens, the discussion below addresses only that technology.

Working together, groups of Italian immigrants would often contract with landowners to clear their land of trees in return for the opportunity to make the wood into charcoal before moving on to the next ranch. As practiced at this time, charcoal making was a labor-intensive process, involving a great deal of work as well as the use of hand tools and horse-drawn implements. Because of the wet Sonoma County winters, charcoal making usually took place between April and November. Only live trees (e.g. black oak, madrone, Douglas fir) were cut for making charcoal. Leaves, small branches, and sometimes the bark were removed in order to maximize the amount of solid wood in the completed pile. The wood was cut into four-foot

lengths and, to keep the pile as uniform as possible, very large pieces were split so that all the wood was about the same diameter. Once a sufficient amount had been cut, it was hauled in horse-drawn wagons to a nearby flat that had been leveled from the naturally-sloping terrain—often at the "Y" created by the confluence of 2 small creeks or on gently sloping alluvial terraces. Deliberately located near water to control the burning process, these flats were 30 to 40 feet in diameter. The soil that had been removed in leveling off the flat was kept nearby and later thrown on top of the pile after the wood had been stacked. If the flat was an existing surface oven that was being reused, the floor would be raked prior to stacking the wood upon it.

Once the clearing had been prepared, the four-foot long logs and limbs were placed upright in circular fashion around a center pole that would later be removed to create a central chimney about 12 inches in diameter. When the first layer of wood was four or five feet from the center, a second layer was begun. This process continued until the first layer was about 30 to 40 feet in diameter. Subsequently, the second and third tiers were stacked so that each layer had a smaller diameter. The completed pile resembled a beehive or inverted cone and the finished diameter varied depending upon the amount of wood available when the stack was constructed (Lee 1965a: 226).

Folk beliefs apparently played a role in the woodcutting as illustrated in the following quotation from an oral history account of Sonoma County charcoal making in the Occidental area (west of Annadel and Sugarloaf Ridge State Parks):

> See_to burn charcoal, to cut the wood—now this might sound kind of funny to you, but they used to cut the wood in the dark of the moon. They used to cut wood for two weeks and for two weeks they'd bring it down, split it and put it into their charcoal [flat]. They always claimed that cutting the wood in the dark had something to do with the making of the charcoal. The moon affects the tide, it affects humanity, it affects everything, doesn't it? Now, my wife plants a garden and she sure doesn't plant onions in the light of the moon because if she does they'll all go to seed. But if she plants them in the dark of the moon they don't. They had a phrase, don't worry about the moon, plant the potatoes in the ground. You don't plant them in the moon. Well, if you don't plant potatoes in the dark of the moon you get a lot of head growth, you get a lot of plant but you won't get any potato. _. So, nevertheless, I can prove to you anytime you want—we can go up and I'll fall a tree in the light of the moon, and we'll leave it lay and I'll show you that it'll get full of worms. Then we'll go fall one in the dark of the moon and we'll let it lay and I'll show you that it won't get any worms, especially pepperwood. People say you're nuts but I don't care. It doesn't make any difference to me. (Lee 1979:188)

When the wood had been stacked, it was time to light the pile (also referred to as a surface oven or charcoal oven). Various methods of lighting the pile/oven were used. In some places paper and kindling was lit and then dropped down the 12" chimney that extended the full height of the pile. If needed, some kerosene was then poured down the chimney to encourage the burning. An alternative method was to drop hot coals down the chimney, then fill it with wood chips. As the chips were reduced to hot coals, more were added, keeping it filled. When the hot coals thus created had reached the top, leaves were placed on top and covered with soil. Because the intent was to char the wood, not burn it, to induce the lighted pile to smolder without flaming, the entire oven was then covered with green Douglas fir or redwood boughs, followed by a covering of 6 to 8 inches of soil shoveled by hand and firmly packed to keep the wood from burning too fast. Small vent holes (6-8" diameter) located every 2 or 3 feet near the base of the pile were opened and closed as needed to supply a natural draft and draw the burning from the middle of the pile to the sides.

The charring process reduced wood fiber to charcoal by driving off the volatile gases and moisture in an oxygen-poor environment to

produce an almost pure form of carbon [about 95% carbon] (Brady 1971:182). The entire art and science of charcoal making centered on the manipulation of the oven vents and the charcoal maker's ability to understand conditions inside the oven from external signs. Once the oven had been lit, the charcoal makers never left the site until the process was complete and tended the oven(s) day and night. Depending upon the type and size of the wood as well as the skill of the colliers, it took 3 to 5 weeks to thoroughly char the wood using the temporary surface oven technique. Hardwood required more time to char than softwood and, by varying the combustion rate, hard or soft charcoal could be produced, according to the rule of thumb that in general the slower the process, the better and higher quality the charcoal (Ure 1839:276). Maintenance of the surface oven was a constant problem due to cracking of the soil cover caused by the substantial reduction in volume that took place over the duration of the burn. If these cracks were left untended, they could become substantial openings that would allow increased airflow into the pile, turning it from a smoldering oven into a flaming inferno. In addition to that ever-present danger, there would also be problems if the process proceeded too slowly. When that happened, a worker would take a sharpened fir pole and work it through the soil covering into the wood beneath to let air into a certain spot to help ensure that the entire pile charred evenly.

Particular attention had to be paid to the vents around the base of the oven. During the first few days of the charring process, thick white smoke poured out of the vents, indicative of the water being driven out of the wood in the form of steam. Then yellowish smoke began to appear, followed by blue smoke. Blue smoke indicated that the oven was very hot and the charring process nearly complete. At regular intervals during the process a worker would walk on top of the pile to determine how far down the fire had burned by listening for a crunching sound, indicating that he was standing on charcoal. The pile continued to be closely monitored and the air vents manipulated until all the wood had been reduced to charcoal.

When the charcoal makers judged that all the wood had been reduced to charcoal with the desired stage of hardness, all the oven openings were sealed up and the fire smothered. This cooling process took 7 to 10 days. Care and experience were needed in judging when to unseal the oven because if it was opened too soon, the charcoal could re-ignite and burn up. For this reason, the unsealing of the oven was done very gradually. A worker would remove a section of the soil covering about 4 or 5 feet wide and run it through a screen to reduce the soil to a fine texture. He then replaced the fine-screened soil on the pile and moved to another 4-5 feet wide section and repeated the screening process. He continued systematically like this until all the soil atop the oven had been sifted, screened and replaced. This was done to choke the fire out. In about 2 days' time, the outer layer of charcoal in the surface oven had cooled enough so that it could be removed. However, this dismantling/unloading process had to be done very gradually as well. As the cooled charcoal was removed from the oven/pile it was broken into short chunks about 6 inches long and put into sacks. After removing the cooled charcoal from a section of the pile/surface oven, a layer of screened soil was placed atop the next layer that was still warm/hot in order to further smother the hot coals. All the time this process of gradually removing the soil covering and removing cooled layers of charcoal was being done, barrels of water were kept nearby as a precaution in case the hot coals beneath the cooled layer burst into flame. When water had to be applied, as little water as possible was used to avoid saturating the charcoal. This soil screening, smothering, cooling/removal process was repeated systematically until the entire charcoal pile had been placed in sacks. The full sacks were then loaded onto horse-drawn wagons and taken to the nearest railroad station or train stop for shipment to San Francisco. Sonoma County resident Lewis Giovannini, whose father and grandfather had been in the charcoal, coal and wood business in San Francisco from circa 1865 through 1912, recalled that the going price for such charcoal in 1910, delivered to the railroad car in Occidental (Sonoma County), was 25 cents a sack [each sack held about 50 lbs. of charcoal] (Lee 1979:184).

In general, a pile of four-foot long logs, stacked on end 10 to 14 feet high at the center

and 30 feet in diameter at the base, comprised about 30 cords of wood [a cord being a stack 4 feet high, 4 feet wide, and 8 feet long/128 cubic feet]. The amount of charcoal produced from a cord of wood varied, depending on the species. In 1917, the U.S. Forest Products Laboratory conducted a series of tests with charcoal yield per cord of California Black Oak (*Quercus kelloggii*). Their tests indicated that one cord of that species, weighing about 4,000 pounds before distillation, yielded 1,389 pounds of charcoal after distillation per cord of "slab wood" and 1,640 pounds of charcoal per cord of limb wood (May 1956). Although about 25 parts in 100 of the wood used in charcoal making consist of moisture, approximately half of the remaining 75 parts (i.e., 37.5%) of the gross weight of the wood is carbon, and nearly half of that is lost during the partial combustion/distillation of wood into charcoal in a heap or surface oven (Kent 1912:805).

Although set in the Eastern U. S., author Eric Sloane grippingly depicted the raw and rough nature of the charcoal making experience:

> At its best, the job of making charcoal was not for any normal human being. The time required for charring a small mound varied from one to two weeks, but with mounds of wood thirty feet or more round, a month was average. During all that time, through every kind of weather, the maker of charcoal lived with his mound, sleeping only in dozes for fear a flame might start and explode into a full fire which would demolish the mound. There was no time for washing; there was seldom more shelter than a bark lean-to. And there were so many things to watch for in a "live mound" that the man became almost part of it._Until the heat subsided, the mound never stopped "working" and neither did the man. By the end of each charring, his body had become completely black outside and exhausted inside. Knowing how and when to walk on the mound was an art in itself and many a man fell through into the furnace-like heat (Sloane 1965:57-58).

INVENTORY OF CHARCOAL MAKING SITES RECORDED AT ANNADEL AND SUGARLOAF RIDGE STATE PARKS

In the course of cultural resource inventory surveys conducted at Annadel and Sugarloaf Ridge State Parks intermittently between 1969 and 1995, a number of circular flats, cut and filled from the naturally sloping terrain, have been identified and recorded. These flats measure 30 to 40 feet in diameter and are usually situated along minor streams (Holman et al. 1969; Lortie 1979; Whatford 1993a, 1993b, 1995a-f; Whatford et al. 1992a-c). Most of these features were found to contain deposits of black soil with abundant chunks and pieces of charcoal but no other cultural materials. Three sites recorded at Annadel SP contain the remains of five surface ovens and the remnants of three access/haul roads. Five sites recorded at Sugarloaf Ridge SP contain remains of 12 surface charcoal ovens and the remnants of three access/haul roads. All but two of these were located near or adjacent to seasonal streams and, at several locations, on terraces adjacent to perennial Sonoma Creek.

Annadel State Park.

At Annadel SP, three sites with the remains of five circular flats, two of which are supported by dry-laid rock retaining walls and remnants of two access/haul roads were found on terraces near seasonal drainages at the base of wooded hillslopes. One of these sites, CA-SON-2000H, includes a narrow road along the south side of a seasonal stream that leads to a small flat situated at the base of a hill in an oak woodland. The flat, which contains deposits of black soil with small pieces of charcoal in the top six inches of soil, is supported on the downhill side by a dry-laid field stone retaining wall about 4 feet high. The other two charcoal making sites at Annadel are located on midslope terraces situated within 1000 yards of seasonal drainages where the vegetation presently consists of mixed hardwoods.

Sugarloaf Ridge State Park.

At Sugarloaf Ridge State Park, five sites consisting of twelve circular flats and remnants of three access/haul roads, all adjacent to seasonal creeks, were recorded. Like the charcoal sites at Annadel, all but one of these flats have deposits of

black soil mixed with charcoal but no other cultural constituents.

Site CA-SON-2143H includes six flats 30 to 40 feet in diameter and situated on a terrace near Sonoma Creek with deposits of black soil and charcoal. The vegetation on the terrace consists of grassland now being overtaken by yellow star thistle while vegetation on the adjacent hillslopes is oak woodland.

Sites CA-SON-2144H and CA-SON-2145H each contain a small circular flat about 35 feet in diameter. Both sites are situated on terraces adjacent to drainages. The vegetation at site CA-SON-2144H consists of grassland blending into oak woodland. CA-SON-2145H is situated in an area of mixed evergreen forest that includes such species as oak, bay, Douglas fir, and madrone.

Site CA-SON-2147H consists of three circular flats connected by remnants of a narrow dirt road along the bank of an intermittent drainage. Cutting and filling of the naturally sloping terrain created all three flats. One flat is located at the toe of a grassy hillslope adjacent to a riparian corridor growing along the watercourse, the second is situated on a terrace in the "Y" formed where two small drainages meet within an area of mixed evergreen forest and the third flat is situated on a bench cut into the hillslope above the confluence.

CA-SON-2148H includes a narrow access/haul road extending about 250 feet along the bank of a drainage to a small circular flat about 25 feet in diameter. Although no charcoal was observed at this feature, it is otherwise visually similar to the others and located on an alluvial terrace adjacent to an unnamed seasonal creek where the vegetation consists of oak savannah.

CONCLUSION

Cultural resource inventories at Annadel and Sugarloaf Ridge State Parks have provided only a limited picture of Sonoma County's Italian-immigrant charcoal makers and the local charcoal industry. These locations where charcoal was made now appear as merely grass-covered flats and second-growth oak woodlands. Although initial studies of this kind very rarely yield spectacular or dramatic results, these studies have made a contribution through the discovery and documentation of some 24 surface archaeological surface features that may be 80+ years old.

The overall goal of the research was to learn as much as possible about the local charcoal industry and the people who participated in it. To date, research into the archaeological record of charcoal making at these two state parks has provided little specific information. Although a search of the documentary record of this industry has been a little more successful, thus far precious little precise historical information about the charcoal making activities at these 24 sites has been retrieved. As a result, much of the information presented in this paper came about from initially finding the charcoal making sites in the field, estimating their period of operation, and attempting to determine how the charcoal was made as well as how and where it was transported. Although not a very accurate method, the estimation of the period of operation, when little or no precise direct documentation was available, was done after inspection of the physical remains and by inference based on accounts of how the charcoal making process was conducted in other parts of the county during approximately the same time period by members of the same ethnic group (i.e., Italians). In preparing this presentation, information in oral history accounts found in local library archives and references published in local histories reporting about charcoal making in other parts of Sonoma County as well as neighboring Mendocino County were applied and compared to the remains of temporary surface ovens and remnants of roads recorded at Annadel and Sugarloaf State Parks.

Hopefully, further research will locate information about this local industry that may still be found in ledgers, family Bibles, and note books on shelves of local attics, garages, libraries and used bookstores. As well, there are probably more charcoal making sites still hidden in the hills and mountains yet to be found and recorded and the resulting information assimilated into the growing bank of knowledge about the Sonoma County charcoal making experience.

NOTES

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