between the loci. An examination of Rincon 44 at the time of the original Frey Creek surveys resulted in the recovery of a partially reconstructable ceramic olla, several pieces of bone, at least one piece of worked wood, and several other pieces of wood which probably were culturally modified. The olla was accessioned at the Anthropology Museum at UCLA (accession # 280), and the remaining artifacts have been curated for the past 15 years in the Department of Anthropology Research Facility, University of California, Davis. The association between the olla and the other artifacts appears reasonably good, and it is at least possible that the indicated artifacts were at one time within the olla prior to its disintegration.

A radiocarbon age determination from one piece of the wooden implement resulted in an approximate date of A.D. 1570 (plus or minus 50 years). This does not, of course, actually date the pottery nor does it necessarily date the advent of what we are calling San Luis Rey II. *In conjunction with* the suite of determinations from the nearby Rincon 73 midden, however, the radiocarbon date suggests that at least pottery was still rare in San Luis Rey contexts well into the 1500s and may have not been common until the 18th century.

The quite limited sample of radiometric dates so far available requires that caution be exercised in any conclusions drawn, but it seems likely that the San Luis Rey Complex as it is presently recognized was indeed late in time, that Meighan's 1954 guess-estimate was impressively accurate, and that the San Luis Rey II elaboration took place almost entirely within the two centuries immediately preceding the Mission period.

REFERENCES

Meighan, C. W.
1954 A Late Complex in Southern California Prehistory. Southwestern Journal of Anthropology 10:215-227.

True, D. L.
n.d. Site Location Patterns and Water Supply: A Perspective From Northern San Diego County, California. Manuscript in preparation.

True, D. L., and G. Waugh
1981 Archaeological Investigations in Northern San Diego County, California: Frey Creek. Journal of California and Great Basin Anthropology 3(1):84-115.

1982 Proposed Settlement Shifts During San Luis Rey Times: Northern San Diego County, California. Journal of California and Great Basin Anthropology 4(2):34-54.

A Note Concerning the Archaeology of Annadel State Park

EDWARD BRECK PARKMAN

Archaeologists have been aware of the Annadel obsidian source for over sixty years, and the local Southern Pomo have known of it for an even longer time. The surrounding area, however, is somewhat less well known. Today, this area is part of the 2,000 ha. Annadel State Park, located several km. east of Santa Rosa in northern California's Sonoma County (Fig. 1). Recently, the Department of Parks and Recreation (DPR) initiated an inventory of the park's archaeological resources (Parkman and Hood 1982; Parkman and McGuire 1981). To date, 67 cultural resources have been recorded within the park. These consist of 18 historic EuroAmerican and 49 prehistoric native American archaeo-

Edward Breck Parkman, Calif. Dept. of Parks and Recreation, Northern Region Headquarters, 3033 Cleveland Ave., Suite 110, Santa Rosa, CA 95401.

Fig. 1. Location of Annadel State Park.

logical sites. Most of the sites appear to be associated with the procurement of raw stone material. The EuroAmerican sites include numerous basalt quarries, and have been recently discussed by Chris Higgins (1983). Most of the native American sites are in one way or another associated with the local obsidian industry.

The recent DPR investigations have been directed toward a better understanding of the Annadel prehistoric archaeological record. One goal of this work has been to delineate the boundaries of the park's primary obsidian source (i.e., the "Annadel" source). Special attention has also been given to x-ray fluorescence spectrography and obsidian hydration studies. These studies have helped to better illustrate the chemical variability of the local obsidian, and to better define the local chronological sequence (Origer 1982; Origer and Wickstrom 1982). Perhaps the most interesting survey finding has been the tentative identification of a previously undetected obsidian source occurring within and adjacent to the park. This paper is a brief discussion of these recent findings.

THE ANNADEL OBSIDIAN SOURCE

The Annadel obsidian source consists of a series of obsidian quarries and workshops located along Santa Rosa Creek in the northern portion of Annadel State Park. The surrounding area is characterized by an even greater number of workshop and camp sites. Three major quarry-workshops mark the Annadel source, and have been recorded as archaeological sites SON-29, -1226, and -1415. The three sites appear to be relatively contiguous, and, together, measure about 20 ha.

SON-29, the largest of the three sites, measures about 12-15 ha. in extent. It is located on a heavily forested hillside, and in a large, grassy meadow below. The site was first recorded by Jesse Peter in the 1920s. L. L. Loud visited the site and observed two quarry depressions surrounded by about two acres of quarry debris (Heizer and Treganza 1944: 304). SON-1226 is considerably smaller in extent, measuring only about one ha. in size. The surface of this site is extremely dense with quarry debris, and there are several possible quarry depressions visible. It is quite possible that SON-1226 is the site described by Loud. The third site, SON-1415, has not been completely delineated, but appears to be about 5 ha. in size.

The entire surface of the Annadel source area is littered with quarry and workshop debris. Some of the material is waterworn, and appears to have been relocated downhill by stream action. For that reason, the prehistoric extent of the source area may have been somewhat less than the 20 ha. mapped. Very little of the surface material is unmodified, and areas of natural obsidian outcropping have not been identified. The unmodified material tends to range from 5 to 10 cm. in diameter. Based on surface indications, it appears that preforms and bifaces were being produced onsite for transport elsewhere.

A small archaeological excavation was recently conducted at SON-29 (Parkman and Simpson 1983). A single 2-m.-square unit was excavated 2.54 m. to bedrock. Although the unit was intentionally located in an area of low to moderate archaeological sensitivity, an enormous amount of quarry material was recovered from its excavation. With few exceptions, the collection consists of obsidian chipping debris and chipped-stone tools. The exceptions include several basalt, chert, and quartz flakes, and two quartz crystal fragments. The projectile points recovered from the excavation suggest 3,000 to 5,000 years of antiquity (Greg White, personal communication 1983). Among these artifacts are a small, corner-notched point from a depth of 20-30 cm., and several leaf-shaped and flat-based Archaic points from depths of 100-200 cm. Preforms and bifaces are especially numerous in the collection.

OBSIDIAN STUDIES

In 1981, obsidian samples were surface collected from sites throughout the park for the purpose of source determination analysis. Forty-four samples from nine archaeological sites were sourced for DPR by Thomas Origer at Sonoma State University (Hood 1982). The results show that many of the samples originated at the Annadel source (N = 29 [66%]), although some exotic material was also present (Table 1). Five samples (11%) proved to be Napa obsidian, including all four of the chipped-stone tools (Fig. 2) chosen for sourcing. Ten additional samples (23%) exhibited a trace-element profile distinct from those of either Annadel or Napa obsidian. This material proved quite high in zirconium, and tended to cluster tightly. Its chemical code is illustrated by the ratios of the trace elements rubidium (Rb), strontium (Sr), and zirconium (Zr), thus having a code with the following ratio: Rb., .10-.11; Sr., .00-.01; and Zr., .88-.89. Most of this obsidian was collected from a single site, SON-681, and all of it came from the southern portion of the park. The material is exclusively green in color, and occurs as small nodules eroding from the local hillsides in exceptionally small quantities. It has been observed in natural context at SON-681, -995, -1354, and -1428 (Amaroli 1982; Parkman and Simpson 1983), suggesting a source area about one km. square, located one and one-half km. southeast of the main Annadel source. This green obsidian appears to represent a source geographically distinct from the Annadel source. It also appears to be chemically distinct from the Annadel obsidian, although additional study is called for. For the present time, the source area of the green obsidian is being referred to as "Bennett Mountain," due to its proximity to that landmark.

Table 1

OBSIDIAN SOURCE DETERMINATION FOR FORTY-FOUR SAMPLES COLLECTED FROM NINE ANNADEL STATE PARK SITES

Site	Annadel	Bennett Mtn.	Napa
SON-85	-	-	1
SON-671	8	1	1
SON-678	-	-	1
SON-680	-	1	-
SON-681	19	6	-
SON-694	2	1	-
SON-1352	-	1	-
SON-1356	-	-	1
SON-1366	-	-	1

Four chipped-stone tools (Fig. 2) were included among the 44 samples sourced and, as mentioned above, all four proved to be Napa obsidian. These specimens were also subjected to hydration analysis, resulting in a wide range of measurements (Table 2). A small, corner-notched projectile point (Fig. 2B) resulted in a measurement of 1.1 microns, placing its manufacture in the Upper Emergent Period of Fredrickson's (1973) North Coast Ranges chronology (Origer 1982: 85). The three other hydration measurements fall into the earlier Archaic Period (Fredrickson

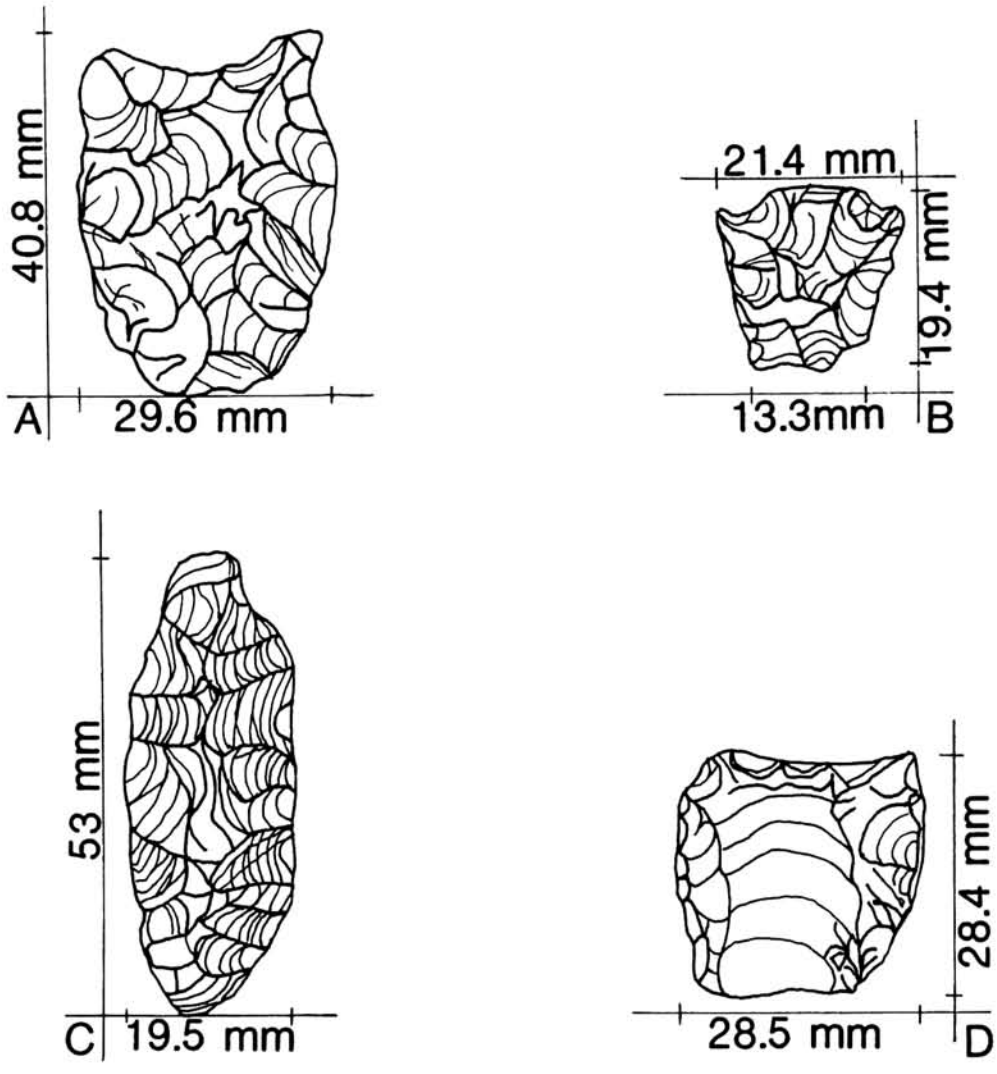

Fig. 2. Artifacts from Annadel State Park that were subjected to obsidian hydration analysis (after Hood 1982).

Table 2

OBSIDIAN HYDRATION MEASUREMENTS FOR FOUR TOOLS COLLECTED FROM FOUR ANNADEL STATE PARK SITES

Sample No.	Fig. No.	Description	Provenience	Measurement (in Microns)	Source
1	2A	concave-based projectile point	SON-1366	3.4	Napa
2	2B	corner-notched projectile point	SON-678	1.1	Napa
3	2C	leaf-shaped projectile point	SON-85	4.9	Napa
4	2D	biface fragment	SON-1356	4.9	Napa

1973; Origer 1982). Origer (1982: 186) has sourced and hydrated 11 additional projectile points from four park sites, with somewhat similar results. Of these 11 points, however, 8 proved to be manufactured from Annadel obsidian, while only three were of Napa material.

CONCLUSIONS

The hydration measurement of obsidian artifacts from Annadel State Park suggests that the area was occupied for a period of 2,500 years or longer. Field reconnaissance within the park has recorded 49 native American archaeological sites, most of which appear to be associated with the procurement of obsidian. Apparently, the local Southern Pomo visited the area in order to obtain obsidian from the primary "Annadel" source and, to a lesser extent, from a recently detected, secondary source ("Bennett Mountain").

The findings of the recent excavation at SON-29 should provide additional information concerning the Annadel obsidian source. These findings are especially likely to better our understanding of the chronology and mechanics of quarrying practices at Annadel. It is also likely that the obsidian hydration analysis of the projectile points recovered in the excavation will extend the park's recorded occupation even further into the prehistoric past.

ACKNOWLEDGEMENTS

I would like to acknowledge the continuing assistance of Dr. David A. Fredrickson, Thomas Origer, Greg White, Brian Wickstrom, and Paul Amaroli, of Sonoma State University, and Lisa Hagel and Christian Gerike, of the Northwest Information Center. I would also like to acknowledge the assistance of Grant Smith, who has shown me the beauty and wisdom of the Pomo way.

REFERENCES

Amaroli, Paul E.
1982 An Archaeological Investigation at CA-SON-995, Sonoma County, California. Manuscript on file at the Northwest Information Center, Sonoma State University.

Fredrickson, David A.
1973 Early Cultures of the North Coast Ranges, California. Ph.D. dissertation, Department of Anthropology, University of California, Davis.

Heizer, Robert F., and Adan E. Treganza
1944 Mines and Quarries of the Indians of California. California Journal of Mines and Geology 40: 291-359.

Higgins, Chris T.
1983 Geology of Annadel State Park, Sonoma County. California Geology 36(11): 235-241.

Hood, Joe D.
1982 An Inventory of Archaeological Materials Collected from Annadel State Park and the Results of their Scientific Study. Manuscript on file at the California Department of Parks and Recreation, Sacramento.

Origer, Thomas M.
1982 Temporal Control in the Southern North Coast Ranges of California: The Application of Obsidian Hydration Analysis. M.A. thesis, Department of Anthropology, San Francisco State University.

Origer, Thomas M., and Brian P. Wickstrom
1982 The Use of Hydration Measurements to Date Obsidian Materials from Sonoma County, California. Journal of California and Great Basin Anthropology 4(1): 123-131.

Parkman, E. Breck, and Joe D. Hood
1982 The Archaeology of Annadel State Park, Sonoma County, California. Manuscript on file at the California Department of Parks and Recreation, Sacramento.

Parkman, E. Breck, and Pamela McGuire
1981 A Preliminary Survey of Cultural Resources at Annadel State Park. Manuscript on file at the California Department of Parks and Recreation, Sacramento.

Parkman, E. Breck, and Susan Simpson
1983 Archaeological Investigations in the North Coast Ranges. Paper presented at the Northern Data-Sharing Meeting of the Society for California Archaeology, October 15, 1983, Sacramento.