

IMPLEMENTATION OF A GEOGRAPHIC INFORMATION SYSTEM:
PRELIMINARY RESULTS FROM SEQUOIA AND KINGS CANYON
NATIONAL PARKS

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ABSTRACT

Fieldwork in Sequoia and Kings Canyon National Parks, conducted as part of the Archaeology Theme for the Geographic Information System (GIS), began in July of 1986. This paper outlines the results of the first season of fieldwork, which entailed the surface survey of five areas of the Parks ranging in elevation from 8400 to 10,880 feet above sea level. A limited program of obsidian sourcing and hydration analysis was conducted as part of this investigation, the results of which suggest patterns of obsidian exchange that differ from patterns identified by research in adjacent areas.

INTRODUCTION

Management of cultural resources is dependent upon accurate and comprehensive information. Managing both the cultural and natural resources and the visitor services and related facilities of national parks such as Sequoia and Kings Canyon has become progressively more complex as pressure on these resources and number of park visitors have increased. Neither the information base nor its study and interpretation has kept pace with these increasing pressures. For Sequoia and Kings Canyon, as for Yosemite, much of the information about cultural resources was collected during the 1950s and early 1960s. With few exceptions, this database is no longer adequate to manage the parks: it lacks the locational and descriptive precision currently employed within the Park Service and its interpretation, as it reflects prehistoric human behavior, leaves us with a static picture of a dynamic system. The Geographic Information System project (GIS) sets in motion a process to update the information base and to manage that information more efficiently. As resource monitoring comes to play an increasing role in the protection of park resources, the GIS becomes critical to the management of multi-dimensional information.

The goal of this project, then, is to develop a high-quality, comprehensive database describing the parks' natural and cultural resources, and to integrate this information into a computer-based system that can easily be accessed and modified over time. As presented by Carpenter (1985) and briefly summarized here, the classes of information both currently targeted and anticipated in the

near future include: the distribution of vegetation and animal species in space and their changes over time; various aspects of the terrain including slope, elevation, aspect, and water; bedrock geology and soil taxonomy; features of the cultural landscape including boundaries, roads, trails, and management zones; fire history and fuel structures; and, finally, archaeological sites and historic and contemporary structures. The gathered information is keyed to a map base and stored as themes. These can be visualized as map overlays all registered to one another, permitting relational syntheses and analyses among different information classes or themes. A singular benefit of this system is that it is not geared to any one particular "crisis" and is anticipated to continue through the various phases of data acquisition and integration of resources data indefinitely through monitoring and periodic new surveys.

In contrast with Yosemite, which attracts large numbers of front-country visitors and thus benefits, so to say, from the research projects attached to the various visitor-related construction activities, project-related archaeological investigations are few and generally of a limited nature in Sequoia and Kings Canyon, providing little opportunity to collect information regarding cultural resources, much less interpret and synthesize these data. A particular advantage of the GIS project for Sequoia and Kings Canyon is the opportunity the survey gives us to observe back-country use and related adverse impacts to archaeological deposits. This is also important in that, unlike Yosemite with its major east-west road which allows access to high elevation areas, Sequoia and Kings Canyon are accessed by roads only on their western edges.

1986 FIELDWORK RESULTS

Fieldwork for the natural resource elements of the GIS began in Sequoia and Kings Canyon in 1985. During the second field season in 1986 the author joined the GIS field crew and spent the majority of the summer surveying in various front- and back-country locations. A total of 15 new archaeological sites were recorded in addition to the relocation of three previously recorded sites. Elevations for the site areas ranged from 8800 to 11,000+ feet above sea level. For the most part the resources identified included light to high density lithic scatters; however, bedrock milling areas and midden deposits were also identified with one midden noted at an elevation of 10,000 feet, just below the Sierra crest. Two areas are of particular interest, the first being the Tablelands area at the headwaters of the Marble Fork of the Kaweah River. Small lithic scatters were recorded at lower elevations of about 10,000 feet along the Marble Fork. The largest and most complex site, however, was located above these sites

at an elevation of over 11,000 feet, adjacent to the shores of Dome Lake.

A second area of interest is the Siberian Outpost/Rock Creek area, reached via Cottonwood Pass which overlooks Owens Valley and the mountains to the east. The Outpost is at an elevation of 11,000 feet. Six previously unrecorded lithic debitage and tool scatters were identified, and two previously known sites were also visited. It was somewhat difficult to identify individual use areas in that the entire Outpost area can be characterized as a sparse- to medium-density deposit of lithic remains. The high elevation midden deposit previously mentioned was situated below the Outpost on Rock Creek, located about two miles north of the Outpost. In addition to the midden deposit, lithic and ceramic materials were also identified along with an historic component dating to the early twentieth century and reflecting high-elevation stock grazing. A brief project-related inspection of a portion of Crabtree Meadow, located approximately seven miles to the north of Rock Creek, resulted in the identification of another sparse lithic scatter. Due to its environmental characteristics, it is anticipated that Crabtree Meadows is rich in archaeological deposits. This and other areas, including selected portions of Kings Canyon, will be visited in the summer of 1987 when the GIS continues into its third back-country field season.

Lower elevation survey conducted during the spring of 1987 has resulted in the identification of four additional archaeological sites. Of particular importance, rich midden deposits have been noted on ridges high above stream courses which contain many bedrock milling areas but no lithic or other cultural remains. This particular site-settlement pattern has not been previously noted within the parks. Auxillary studies which will address age and duration of occupation of these sites will be completed in the fall of 1987.

Following the 1986 field season survey during which samples of obsidian debitage and tools were collected, obsidian sourcing and hydration studies were performed on 103 specimens from the parks. The specimens were drawn from those collected during the GIS survey and also from a small test excavation at CA-TUL-1198 in Dorst Campground, Sequoia National Park (Wickstrom 1987). Figure 1 presents the various obsidian sources for east-central California in relation to the parks. Based on previous archaeological investigations of areas surrounding the Parks, it had been suggested that the interface of Casa Diablo and Coso obsidian distributions would be found in the Sequoia and Kings Canyon Parks area, that is, somewhere in the area drained by the Kings and Kaweah rivers (Ericson 1977a; Theodoratus and ACRS 1984). What was discovered following x-ray fluorescence studies was that a third geochemical source, Fish Springs, located near the town of Big Pine in Owens Valley, served as the major source of obsidian

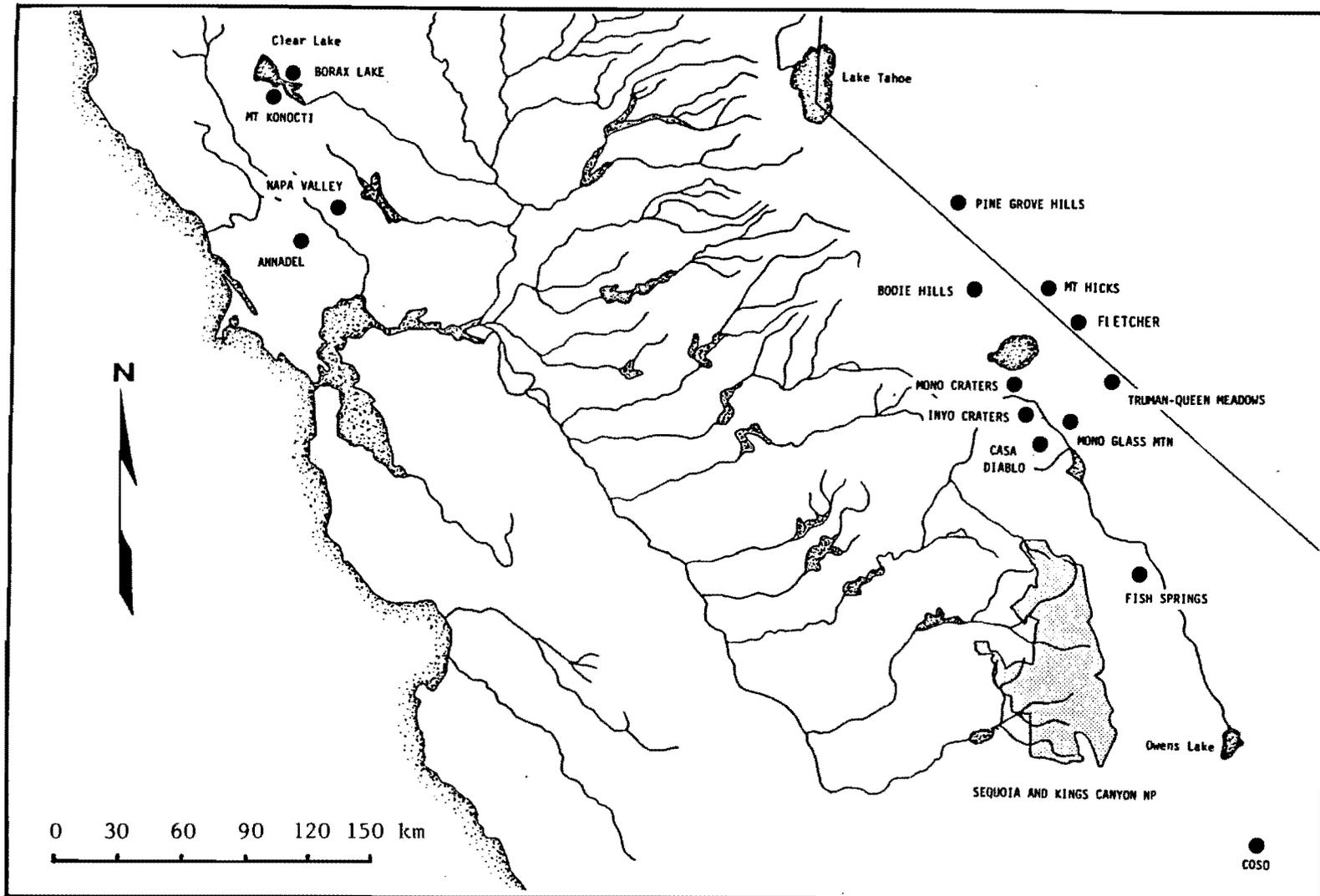


FIGURE 1. Location of east-central California obsidian sources in relation to Sequoia and Kings Canyon National Parks.

procurement for the western portions of the parks, specifically at Dorst Creek and at Clover Creek near JO Pass.

Dorst Creek Study Area

Dorst Creek Campground is located on Dorst Creek, which drains into the North Fork of the Kaweah River, at an elevation of 6700 feet above sea level (Figure 2). CA-TUL-1198, located above Dorst Creek, consists of a midden deposit, an associated flake and tool scatter, and three milling features with a total of 15 mortar cups. Four small milling areas are located within one kilometer of this site. Also present at CA-TUL-1198 are nine granite basins, a discussion of which awaits another occasion. Figure 3 depicts the source-specific hydration results from a randomly selected sample of obsidian flakes and tools recovered from CA-TUL-1198 by source and by depth below surface. Fish Springs obsidian comprises approximately 68% of the total obsidian sampled. In addition to Fish Springs, obsidian from the Coso and Casa Diablo sources were also present in smaller quantities. Two specimens were geochemically classified as unknown. Due to the small sample size, interpretation of the values must be viewed as approximations of the range of time in microns, and not as intensities of site use. As can be seen from the vertical graphing of the samples by level, there appears to be vertical stratigraphy with the range of smaller hydration values clustering in the upper levels and the range of larger hydration values clustering in the lower, deeper levels with an area of mixing between 30-50 centimeters. From examination of the Fish Springs obsidian hydration values, there appear to be at least two components represented with a possible intermediate one. Also of note here and at every other site analyzed, the range of Coso hydration values are largest, with Casa Diablo slightly less, and those of Fish Springs representing the smallest hydration values. It appears that while all three appear to hydrate similarly initially, Coso, followed by Casa Diablo, hydrates more rapidly as time goes on.

Clover Creek and Tablelands Study Areas

The next three sites were located in the Clover Creek and Tablelands areas already mentioned (Figure 2). All eight surface collected obsidian debitage samples from Clover Creek were from Fish Springs with an hydration range of 1.0 to 3.6 microns (Figure 4). A minimum of five sources are represented at the Tablelands sites including the only specimen of Fletcher obsidian noted in the parks to date. Fish Springs obsidian comprises the majority of the specimens sampled with the Coso to Fish Springs rate differentiation just mentioned also suggested here. Insofar as the unknown sources are concerned, it is quite possible that a previously unsampled, yet geochemically similar, locality in the Coso volcanic field is represented

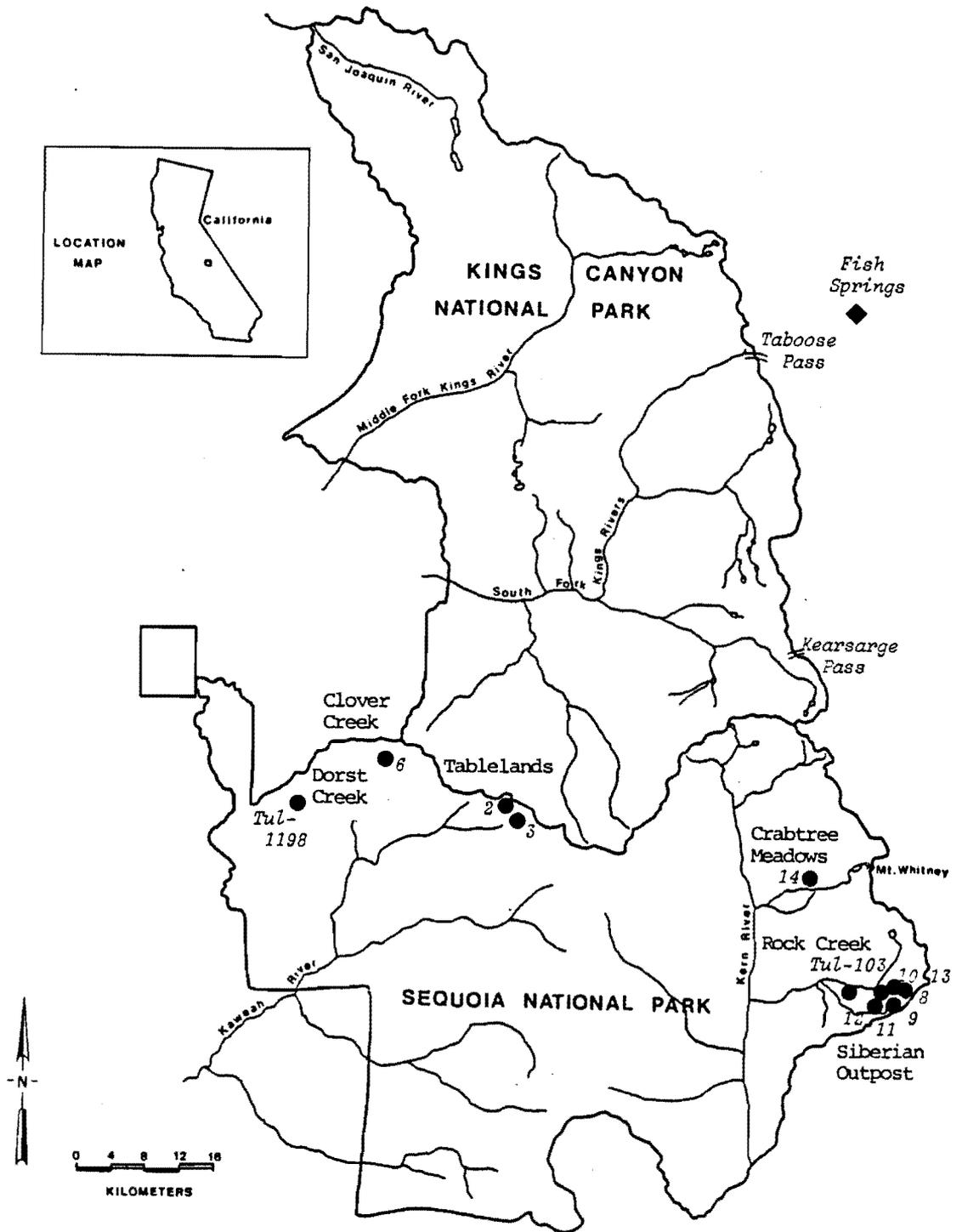
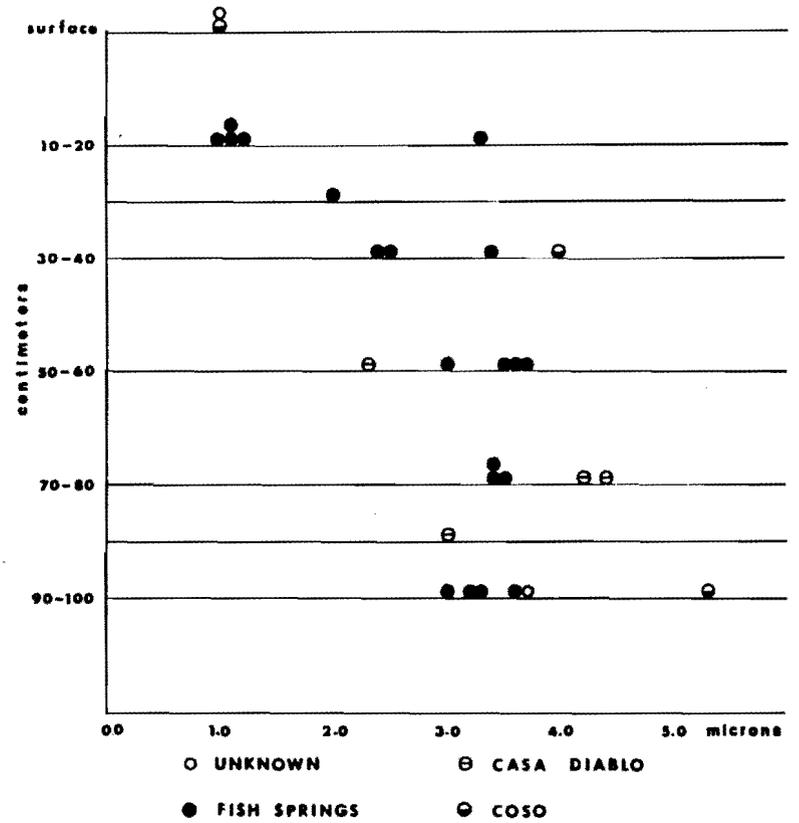
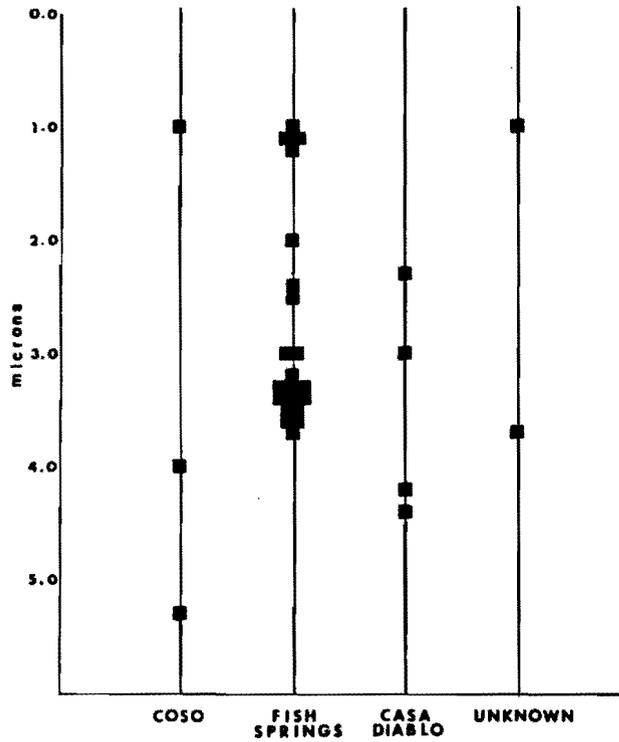


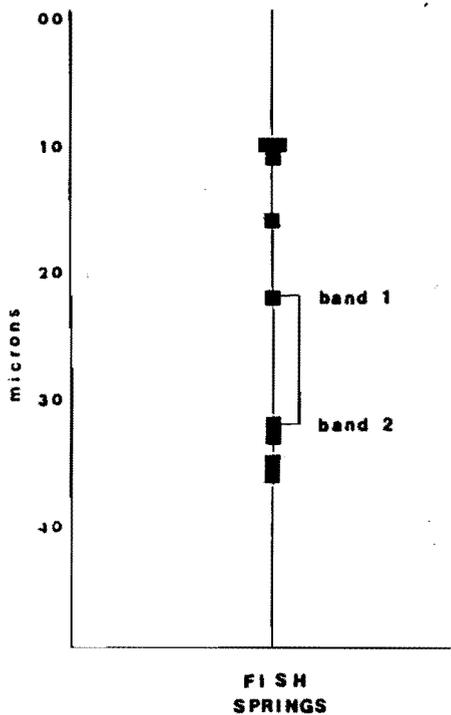
FIGURE 2. Location of study areas discussed in text.

FIGURE 3. Hydration analysis results for site CA-TUL-1198 by source and by depth below surface.

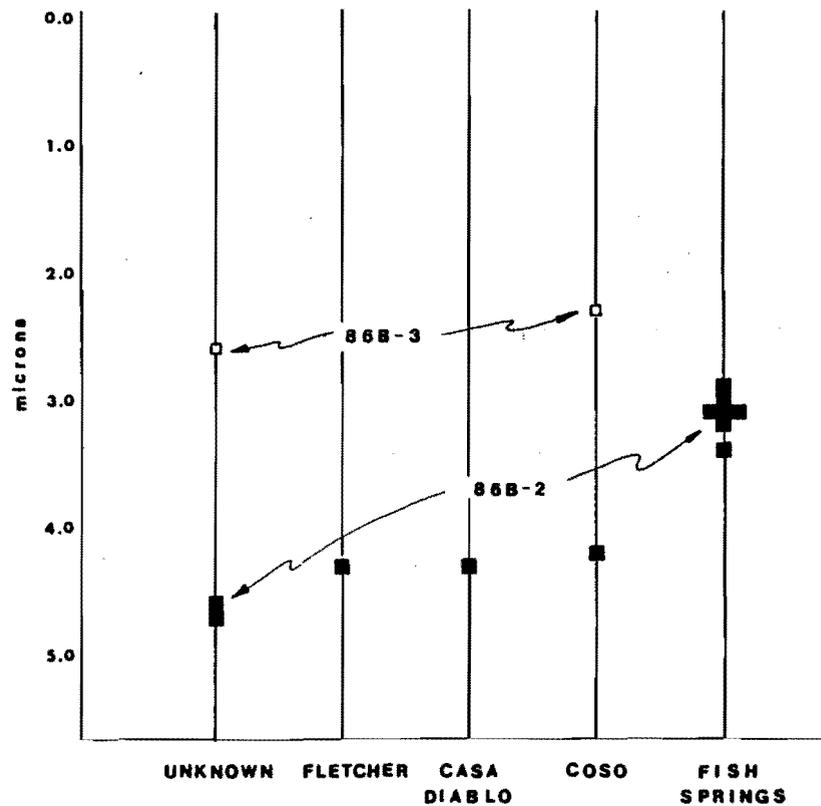


CA - TUL - 1198
DORST CREEK

FIGURE 4. Source-specific hydration analysis results for the Clover Creek and Tablelands study areas.



SEKI-86B-6
CLOVER CREEK



SEKI-86B-2, -3
TABLELANDS

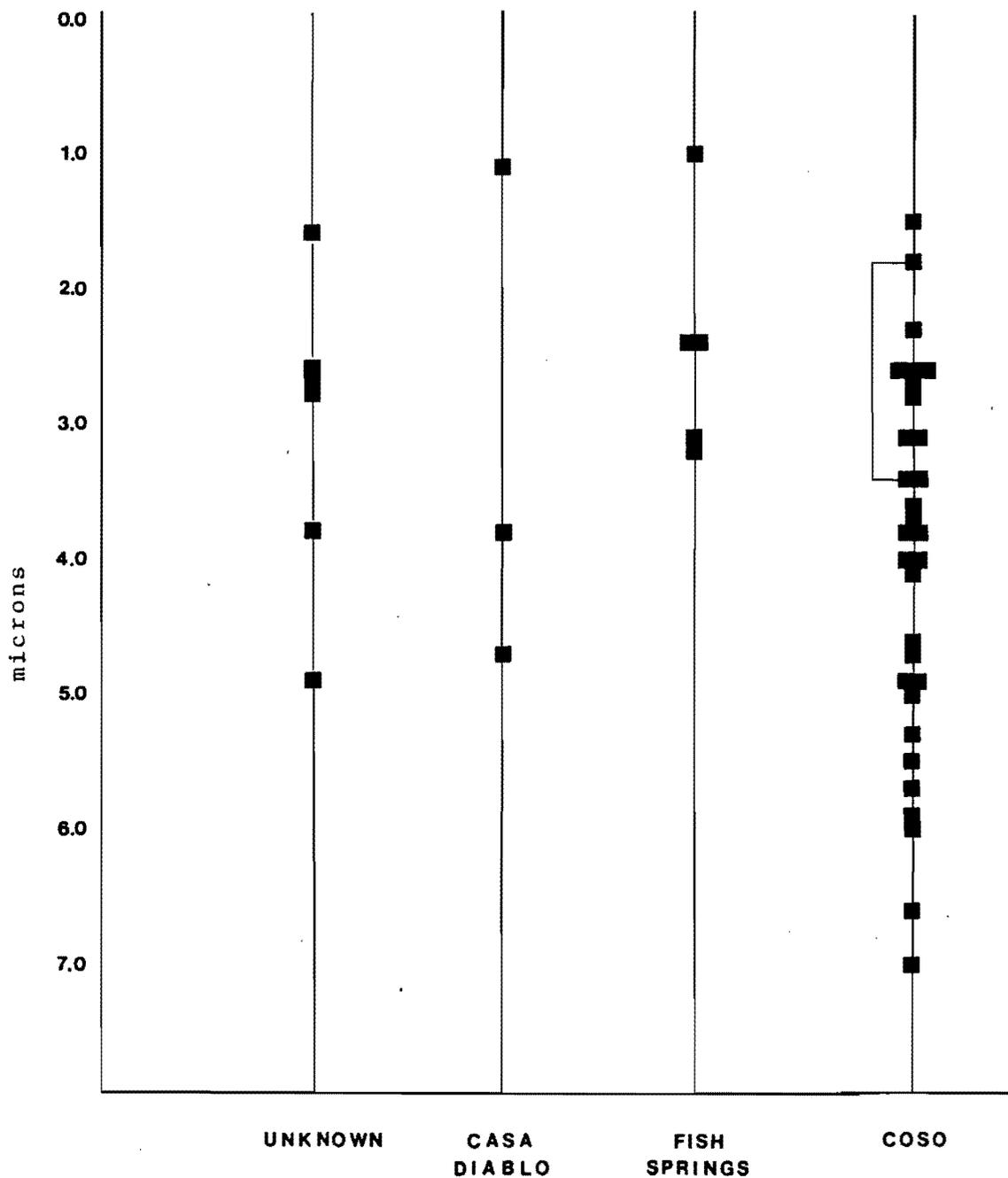
here in that almost without exception the hydration values for the unknown specimens parallel that of the Coso specimens at each site.

Siberian Outpost, Rock Creek, and Crabtree Meadows Study Areas

The third and final areas considered are the Siberian Outpost, Rock Creek, and Crabtree Meadows localities previously mentioned. A total of five sites in the Outpost were sampled in addition to CA-TUL-103, located on Rock Creek, and the lithic scatter located in Crabtree Meadow (Figure 2). Figure 5 presents the hydration values for surface collected obsidian flake and tool samples from all five sites in the Outpost, illustrating a long span of utilization of the area. Here, as anticipated, the predominant obsidian source represented is Coso; however, minor amounts of Fish Springs and Casa Diablo obsidian are also present and appear to have been utilized and deposited at a later time, around 3.0 microns on Fish Springs specimens. This perhaps corresponds with a slightly more intensive use of the area as represented by the possible clustering of Coso specimens between 2.5 and 4.0 microns. Due to the small sample size, additional analyses will have to be performed to specifically address these possibilities.

Figure 6 presents the hydration values for individual sites in the Outpost. Trinomials have not yet been assigned, therefore each site is referred to by its temporary field designation. The smallest hydration value for the Outpost is from site 8 and is from a Rose Spring Corner-notched projectile point. The hydration value for this point style contrasts with the range posited for Rose Spring Corner-notched type points at CA-INY-30 (Basgall et al. 1986). The other values are from a large basally-notched fragment and two small concave base point fragments. Specimens from site 12 consist entirely of biface fragments deposited over a span of time represented by a hydration range of 1.8 to 4.0 microns on Coso specimens. Again, note the possible rate differentiation between Fish Springs, Coso, and Casa Diablo. An example of the hydration values of the unknown source materials paralleling the values for Coso specimens is apparent at site 13. Finally, the hydration results from sites CA-TUL-103 on Rock Creek and site 14 at Crabtree Meadow are graphed in Figure 7. Three specimens from the Mono Glass Mountain/Mono Craters area were noted at CA-TUL-103, but no Fish Springs. Again, a larger sample is needed. The value for the Fish Springs specimen from site 14 is small, consistent with those from the Outpost.

A selection of point and point fragments from the Outpost, with their corresponding hydration values and sources, are presented in Figure 8. The large serrated square stem point appears to be a form unique to the southern Sierra and Great Basin areas.



SEKI - 86B - 8, - 9, - 10, - 11, - 12, - 13

SIBERIAN . OUTPOST

FIGURE 5. Combined source-specific hydration results for the Siberian Outpost area.

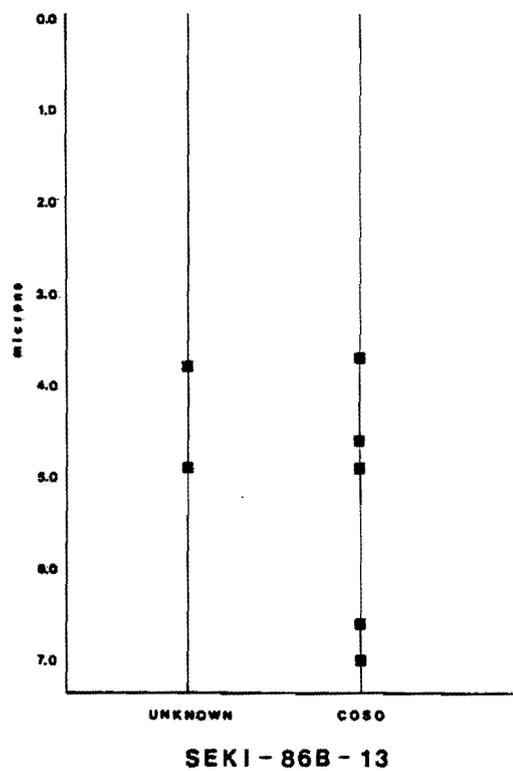
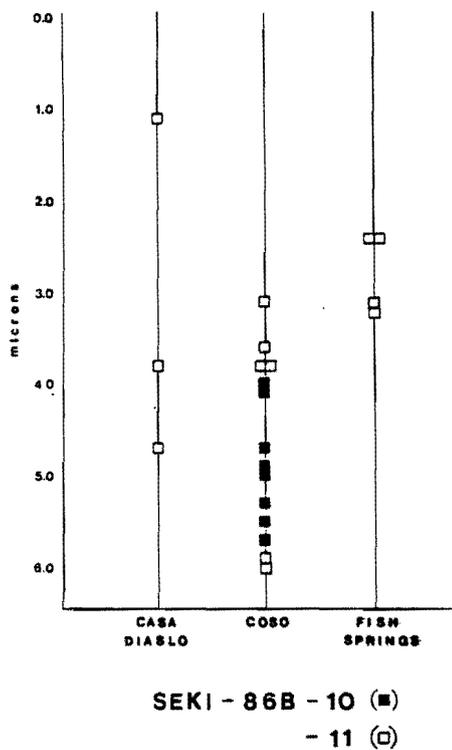
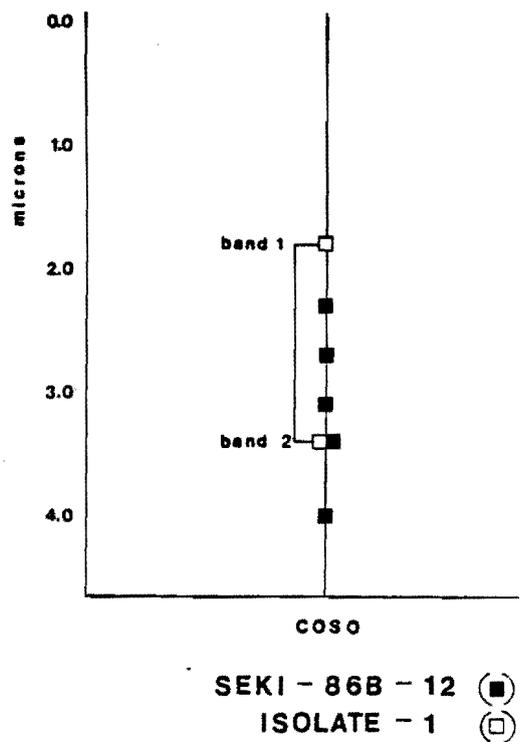
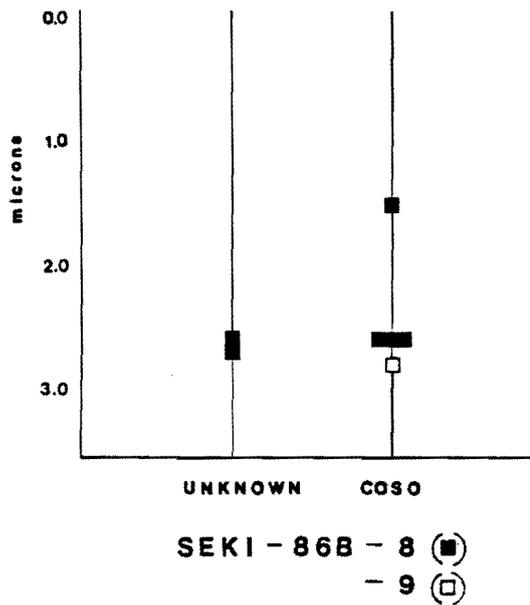


FIGURE 6. Source-specific hydration analysis results for individual sites within the Siberian Outpost study area.

FIGURE 7. Source-specific hydration analysis results for the Rock Creek and Crabtree Meadows study areas.

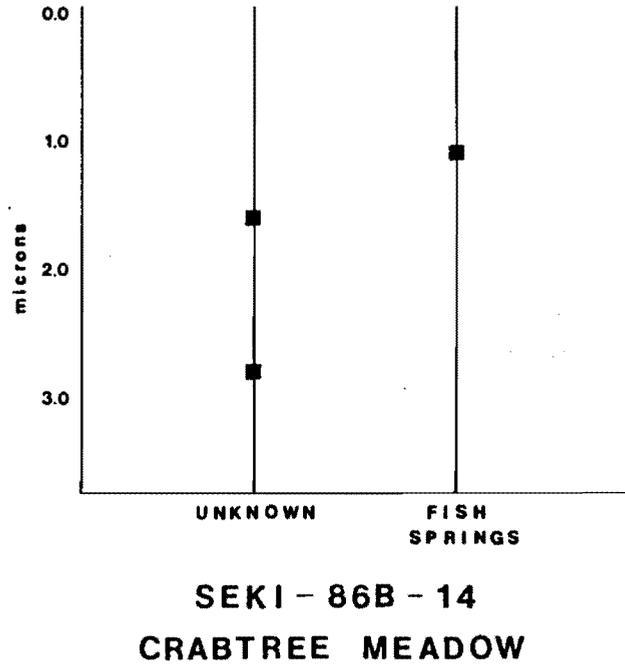
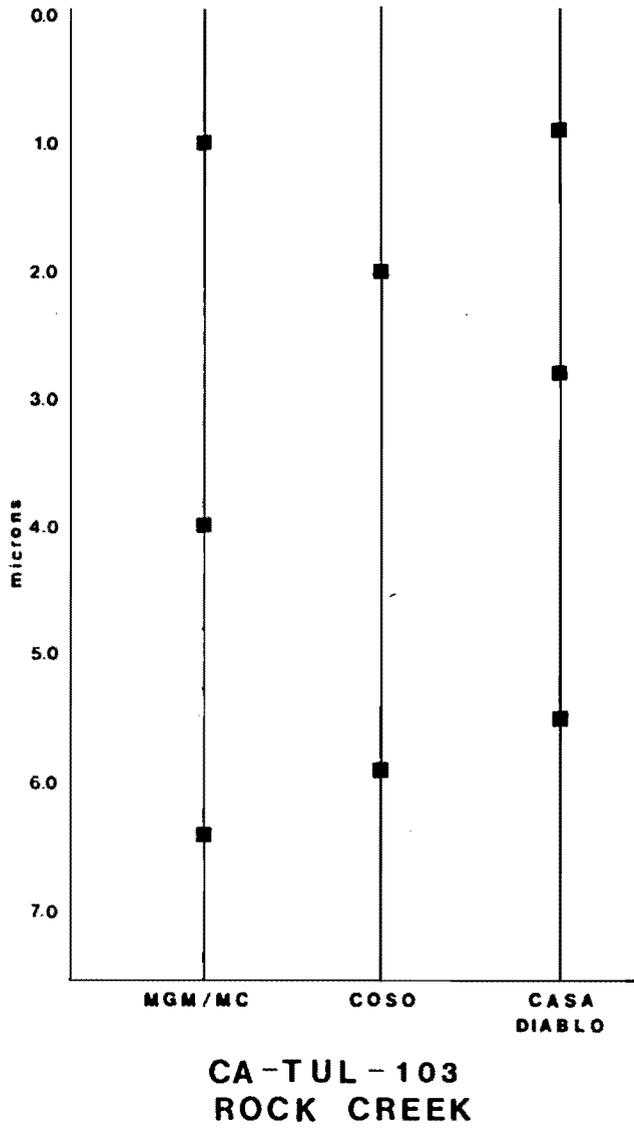
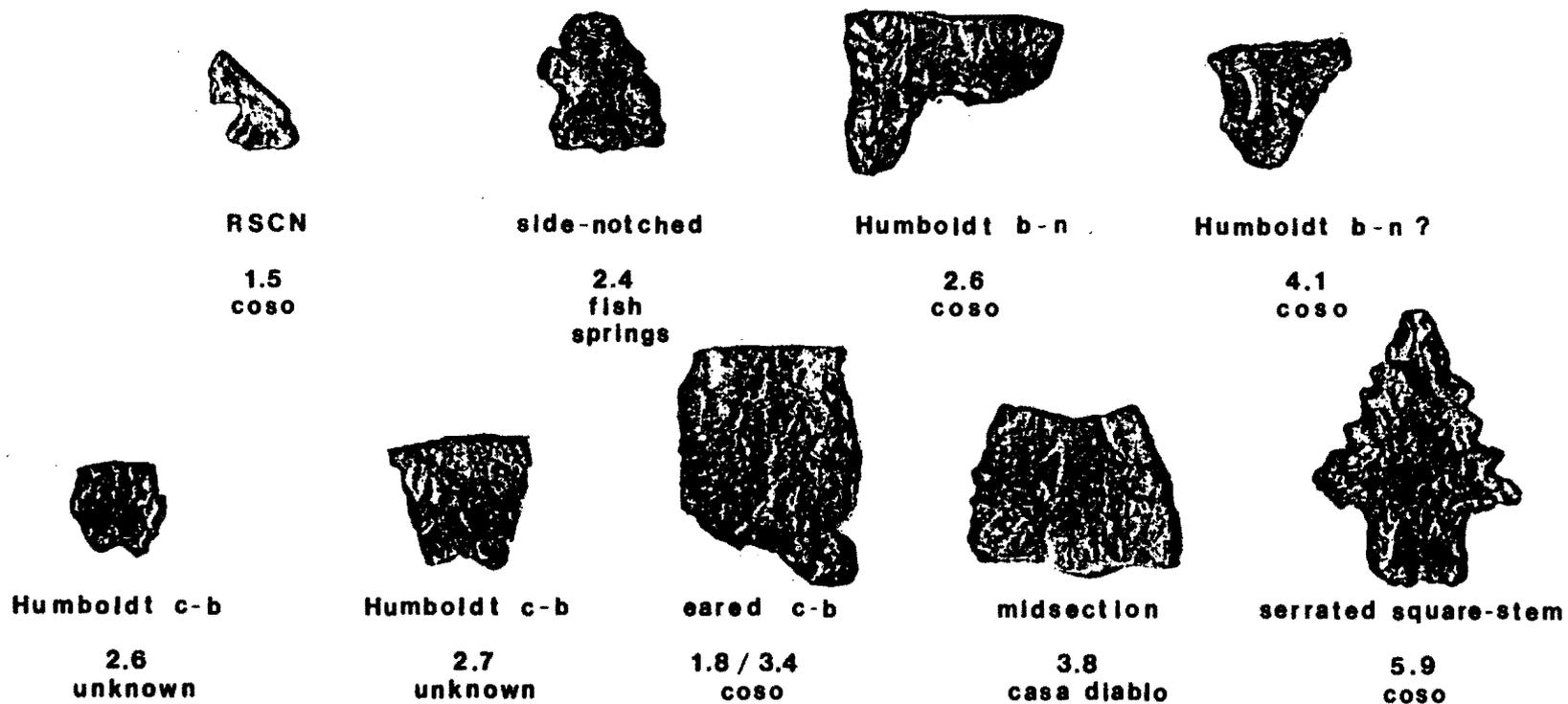


FIGURE 8. Selected point and point fragments from the Siberian Outpost. [RSCN = Rose Spring Corner-notched; b-n = basal notched; c-b = concave base].



SELECTED ARTIFACTS — SIBERIAN OUTPOST

DISCUSSION

As previously mentioned, the large amounts of Fish Springs obsidian collected from the various site localities just discussed are somewhat surprising in that prior investigations have documented obsidian from this source as being restricted to the general source area (Bettinger 1982). According to Ericson (1977b:123), the range of Fish Springs obsidian is limited to a 68 kilometer radius from its source near Big Pine in Inyo County. Some samples have been recovered in other excavations on the west side of the Sierra but nothing approaching the densities observed within the parks (Jack 1976; Jackson and Dietz 1984). Tom Jackson (personal communication 1987) has recently sourced obsidian specimens from Taboose Pass which is located just west of the source locality on the Sierra crest. Surprisingly, Casa Diablo obsidian was the major source material represented. Kearsarge Pass, located on the Sierra crest approximately 43 aerial kilometers southwest of the Fish Springs source locality, provides access to a major east-west route leading down to the Dorst Creek and adjacent areas. Perhaps the large percentages of Fish Springs obsidian noted in the western areas of Sequoia and Kings Canyon National Parks reflect the establishment of exchange relations with Owens Valley groups utilizing this access route to western Sierra localities. Archaeological survey for the GIS will concentrate in this area during the 1987 summer season and collection and later analysis of obsidian specimens from this area and from an excavation in Cedar Grove conducted by Davis in 1960 will hopefully shed more light on the distribution of Fish Springs obsidian west of the Sierra Crest.

Also of interest is the fact that no Desert Side-notched or Cottonwood Triangular point types were found at any of the sites discussed herein, and hydration analyses yielded few values less than 2.0 microns. Speculating widely, this general lack of late period or protohistoric point forms and corresponding hydration values may be attributed to a proposed period of glacial advance (Curry 1969), beginning approximately 1000 years before present, which would have made the higher elevation areas of the Sierra less desirable as resource procurement localities. This would also correspond with the ethnographic record which gives the distinct impression of little high elevation use other than for travelling back and forth from Owens to Eshom valleys for the purposes of exchange. Other research directions might consider how obsidian acquisition patterns reflect possible population replacement and/or settlement-subsistence shifts (Hughes 1986) which may have occurred prehistorically in the southern Sierra Nevada region.

It is emphasized that many of the scenarios advanced in this paper are speculative; however, they serve well as working hypotheses to guide future research.

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