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Coso Rock Art Within Its Archaeological Context

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Prehistoric rock art is a most obvious part of the archaeological record, yet some interpretative models increasingly distance this art from its archaeological context. This is particularly true for the Coso rock art area, which has emerged as a "type locality" for a shamanic approach to rock art interpretation. The fundamental thesis of the current paper is that the meaning and antiquity of prehistoric rock art are best understood by placing the art within its contemporaneous archaeological context using routine analytical methods. We advocate a return to the archaeological approach of interpreting rock art and argue against the perpetuation of increasingly complex and confounding "explanations" based on untestable hypotheses extrapolated from ethnographic data with questionable linkages to the archaeological record.

Reviews of local and regional chronological data, settlement patterns, and subsistence practices indicate that the production of Coso rock art tracked closely with the rise and fall of bighorn sheep hunting in the southwestern Great Basin. During the Newberry period (3,500–1,350 cal B.P.), when darts and atlatls provided the main technology, the hunting of bighorn sheep was a major component of the adaptation. When the bow and arrow were adopted during the Haiwee period (1,350–650 cal B.P.), hunting efficiency increased and ultimately contributed to the depletion of sheep throughout the region. We conclude that the proliferation of bighorn sheep petroglyphs during the Haiwee period reflects a unique local response to a regional problem. Responding to the over-exploitation of a key food resource—bighorn sheep—local groups intensified their ritualistic practices, and did so in a way that vividly marked their territory and signaled their distinctiveness from neighboring groups in California and in other parts of the Great Basin.

THE COSO RANGE of eastern California is home to a most spectacular concentration of prehistoric petroglyphs (Figs. 1 and 2). This basalt-dominated landform contains extraordinary galleries within the more prominent canyons, and widely scattered designs on the boulders and lava blisters that spread across the intervening mesa tops and highlands. The incredible abundance of representational rock art concentrated in the Coso Range stands in significant contrast to the mostly abstract designs that tend to be scattered in relatively low densities elsewhere throughout the Great Basin. Professional archaeologists and members of the public have long been fascinated by Coso rock art and its vivid representational glyphs. In fact, representational elements account for nearly three-quarters of the designs here, with bighorn sheep alone accounting for just over half of all elements, abstract and representational combined (Gilreath 1999:37–38). The significance of this concentrated focus on bighorn has been debated for some time.

There are two competing explanations for the origin and development of Coso rock art. The first was initially developed by Heizer and Baumhoff (1962) and subsequently adapted by Grant et al. (1968) to explain the local Coso phenomenon. Heizer and Baumhoff's Great Basin-wide review of rock art found that a large proportion of petroglyphs occurred in places with game trails and springs, often in association with hunting blinds. Based on these findings, Heizer and Baumhoff (1962) concluded that much of the rock art in the Great Basin was a form of sympathetic magic used to facilitate successful hunting of large game.

Later work by Grant et al. (1968) elaborated on the sympathetic magic explanation, and they concluded from their study of Coso rock art "that most of the immense number of sheep drawings were connected with hunting magic" (1968:113). In Grant et al.'s reconstruction, there was an economic reliance on bighorn sheep, and they envisioned the development of a "sheep cult" which used

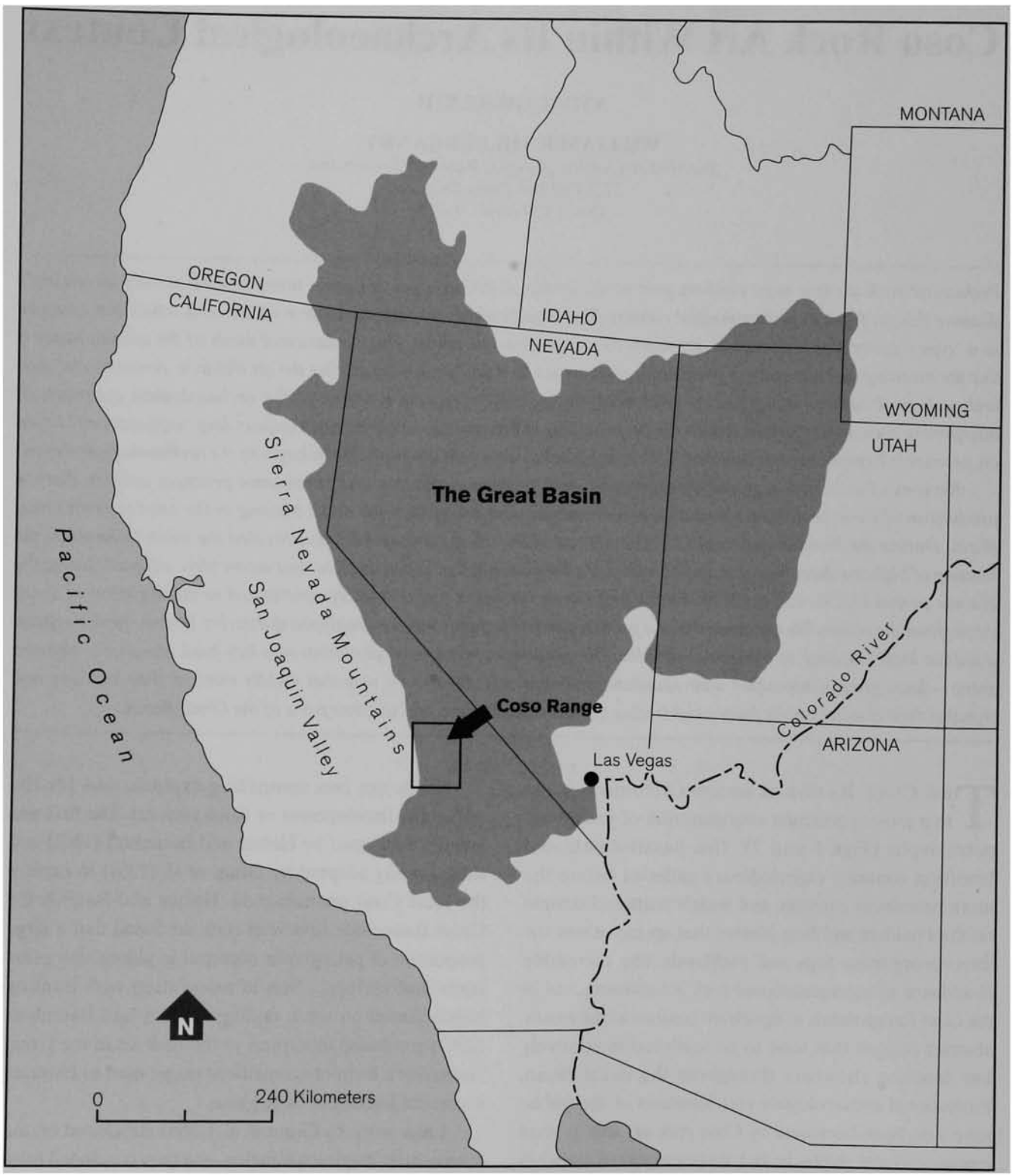

Figure 1. Geographic location of the Coso Range.

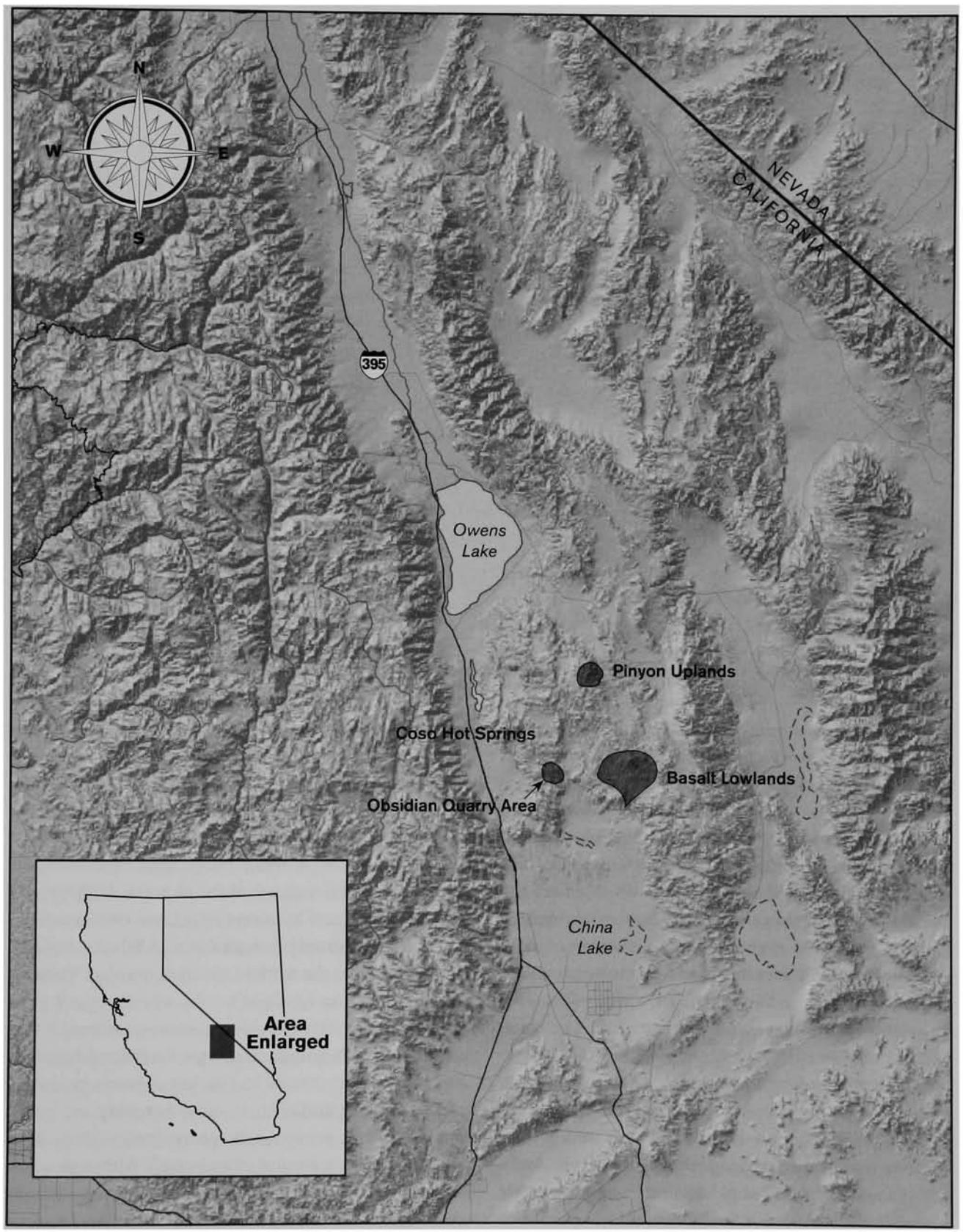

Figure 2. Locations of the Basalt Lowlands, Pinyon Uplands, Obsidian Quarries, and Coso Hot Springs.

Figure 3. Hunting scene with bowman, dogs, and bighorn sheep from Coso Basalt Lowlands.

hunting magic to intensify the production of animals in response to the depletion of local herds. The advent of the bow and arrow and the associated restructuring of hunting strategies, which were presumably more efficient than earlier atlatl and dart hunting strategies, brought on "good times" for a while, with successful hunts sustaining a growing human population. "Somewhere along the line, however, the point of overkill and insupportable harassment of the bighorn was reached" (Grant et al. 1968:42). Rock art drawings, initially sympathetic magic venerating the hunted animal, took on increased ceremonial and economic significance, and the production of rock art—particularly the depiction of Coso-style bighorn and anthropomorphs (Figs. 3 through 6)—was intensified in an attempt to bring back the sheep. "With the sheep gone, the cult died out and with it, the long tradition of making rock pictures" (1968:42). The cessation of rock art production at approximately 1,000 B.P. created a discontinuity between the producers of this rich cultural tradition and the local Coso Shoshone and Owens Valley Paiute, both Numic-speaking groups who claim no knowledge of its origins.

Whitley (1987, 1992a, 1992b, 1994a, 1994b, 1996) and colleagues (Whitley et al. 1999) have developed an alternative interpretation for Coso rock art that questions the overall validity of the hunting magic hypothesis and the chronological ordering of the rock art. Working with Lewis-Williams and Dowson (1988; Lewis-Williams 1986) to develop a neuropsychological model, Whitley explains Coso rock art as the work of shamans drawing "natural" symbols—those brought to the mind's eye during different states of altered consciousness—and images that are culturally determined, or have traditional meaning and use. The former take in a variety of geometric motifs (dots, spirals, parallel lines, cross-hatching, etc.) that are entoptic or phosphenetic phenomena (i.e., patterns that can be seen behind closed eyes). Although other researchers have acknowledged that certain abstract petroglyphs may relate to altered states of consciousness, they argue that the carefully engraved hunting scenes

Figure 4. Coso-style bighorn sheep from Coso Basalt Lowlands.

found throughout the Coso Range represent realistic biological and cultural events that are unencumbered by metaphor (see Garfinkle 2006; Hildebrandt and McGuire 2002; Matheny et al. 1997).

In contrast to this position, Whitley feels that both abstract and representational images were produced during altered states of consciousness, and their form is the product of a particular culture. Understanding the significance of these culturally determined motifs, he argues, requires an analysis of the ethnographic record. Specifically, he attributes Coso rock art to Numic rain shamans from throughout the Great Basin, who came to this locality on spiritual/religious quests. He contends that Numic people considered the Coso Range a "particularly likely place to acquire the power to control weather," and that the bighorn sheep motif was prevalent because it was the "special spirit helper of Rain Shamans" (1996:49).

Over the past several years, Whitley has highlighted a number of different variables that are crucial to his shamanistic model. In the mid 1990s (1994a), he cited gender-conflict as being at the root of a purported late-period (post-650 B.P.) florescence in Coso rock art, drawing inspiration from ethnographic information for a neighboring tribe with territorial lands centered along the Colorado River (Kelly 1936), 225 kilometers farther out in the desert (see Fig. 1). Whitley finds a Chemehuevi ethnographic connection between rain shamans and bighorn sheep: he contends they used bighorn sheep paraphernalia in their rituals and visualized bighorn sheep when in altered states of consciousness. By controlling rain and, by extension, plant growth, men exercised some measure of control over the subsistence productivity of women. Because the subsistence shift from hunting to a greater emphasis on gathering was accompanied by a change in the respective prestige of the genders, certain men (largely shamans) deflected this erosion in male prestige by specializing in the production of rock art as a means of making rain.

A careful reading of Chemehuevi shamanic practices, however, shows that *there is no direct linkage*

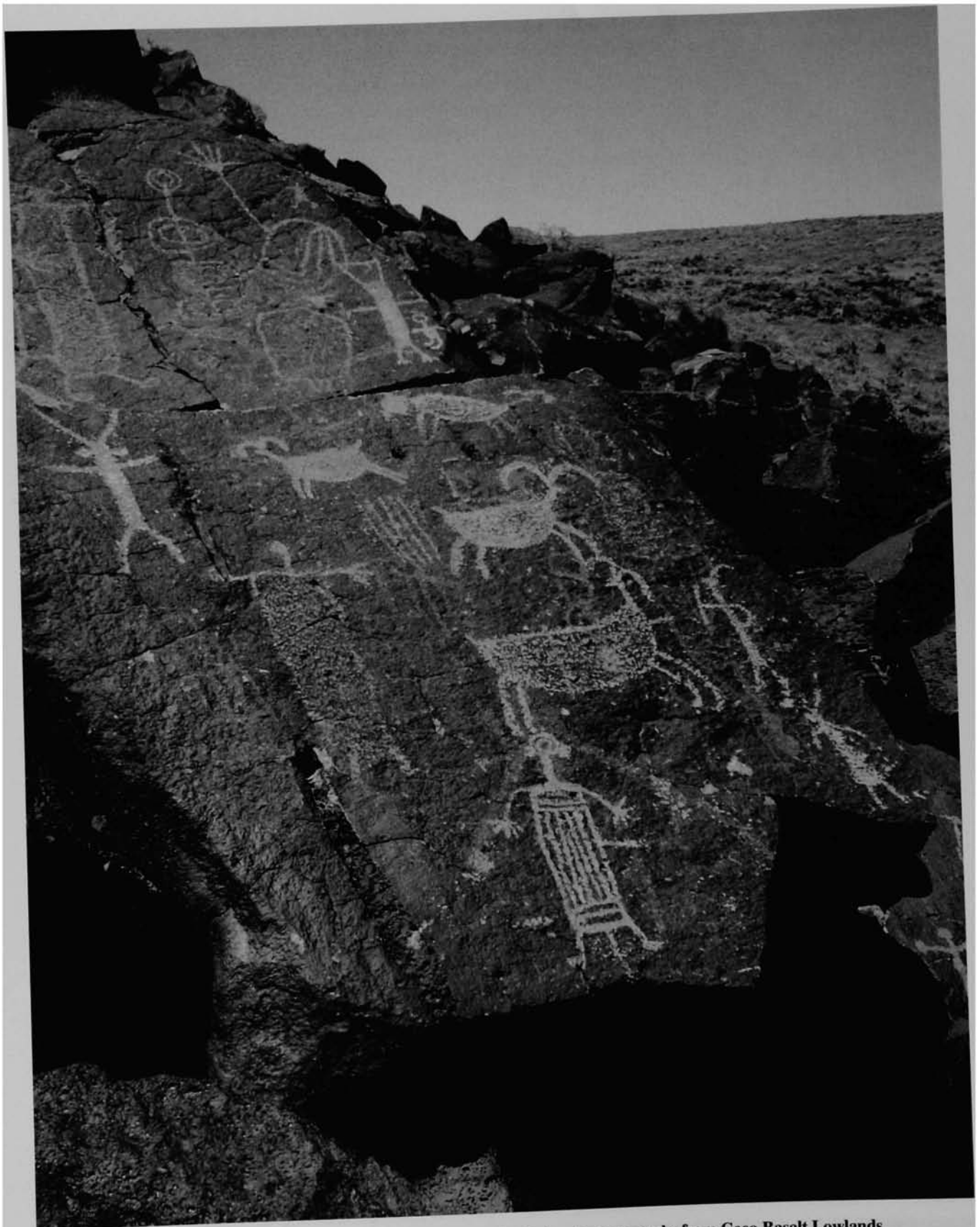

Figure 5. Coso-style bighorn sheep with patterned-bodied anthropomorphs from Coso Basalt Lowlands.

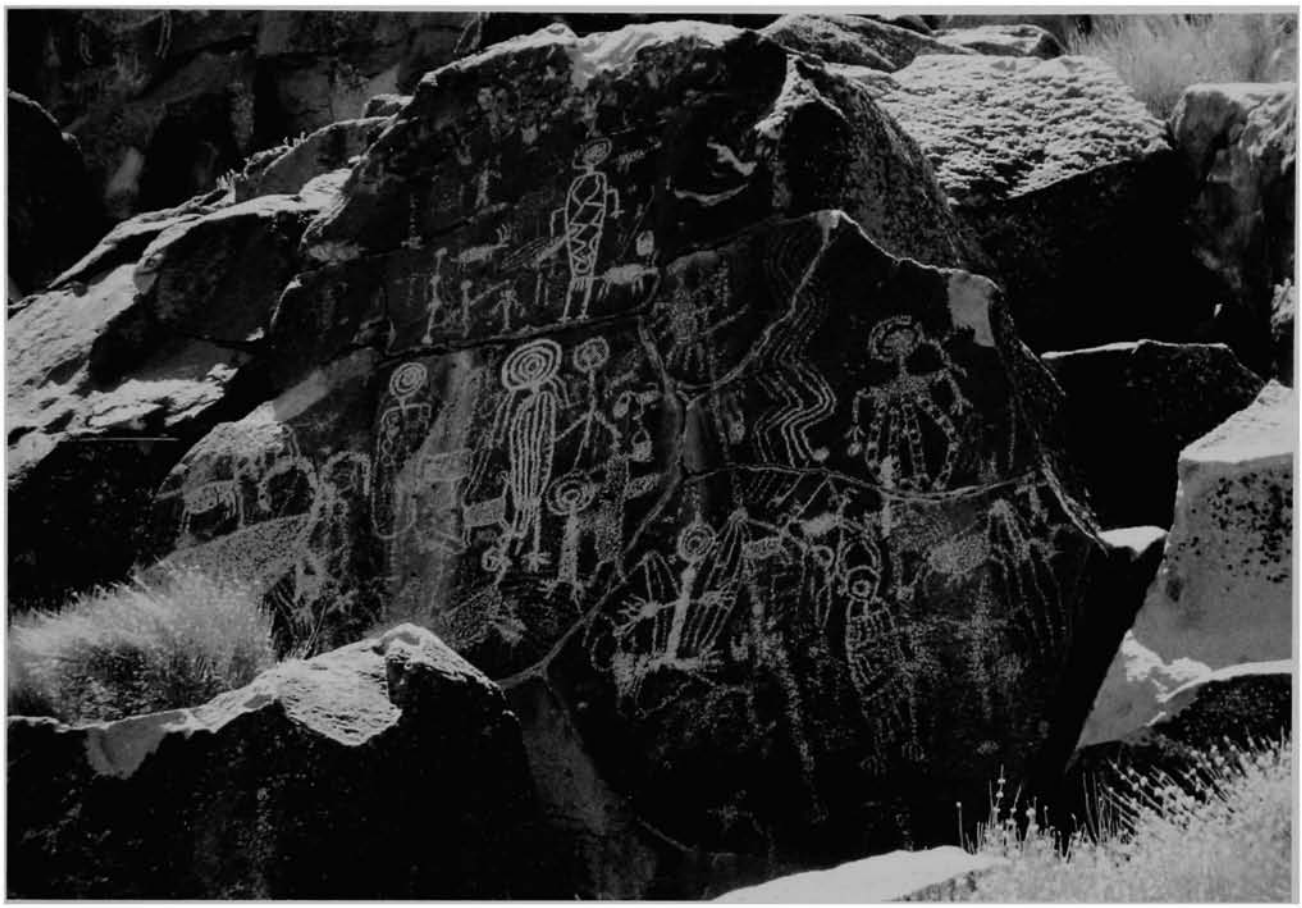

Figure 6. Patterned-bodied anthropomorphs from the Coso Basalt Lowlands.

between those practices and the production of petroglyphs in the Cosos, or in any other area. In fact, Kelly tells us (1936:138–139) that Chemehuevi mountain sheep dreamers were game charmers, and that weather shamans had no guardian spirits. (For a detailed comparison of southern Californian ethnographic information *contra* Whitley's interpretation of that information, see Hedges 2001.) Nor is there evidence that the Chemehuevi core territory extended into the Coso Range in the recent past.

In the same study, Whitley (1994a) then moves to a neighboring tribe, southwest of the Coso Range, to argue that "the last living Numic rain shaman traveled specifically to the Cosos to make rain" (Whitley 1994a:363–365). Again, this reference provides no direct linkage with the production of rock art. Whitley cites Zigmond's (1977:89) description of Bob Rabbit, a Kawaiisu shaman, making rain by using tree lichen at Coso Hot Springs, but with no reference to the Coso rock art zone:

> There is still another method of causing precipitation and...it is available to everyone. It is the use of the tree-lichen, paaziomo'ora (*Ramalina menziesii*). Bob had employed it himself and told how he went to Koso Hot Spring (to the north) and put paaziomo'ora in the water there. He claimed that it brought rain with cool weather [Zigmond 1977:89].

Neither Zigmond nor his consultant mention or allude to Coso rock art in this passage. Only Whitley draws this connection: "Thus, while there is no reason to assume that only weather control power could be obtained in the Cosos, it is none the less apparent that this was a major emphasis of the vision questing and resulting production of rock engravings in the region" (Whitley 1994a:363–364).

Whitley's approaches to the dating of Coso rock art have also produced questionable results. Whitley and Dorn (1988), for example, report cation-ratio analyses of 23 Coso rock art glyphs showing an age-range of 18,200 to 550 B.P. Included are dates on nine bighorn sheep

elements, which produced an average date of 6,039 B.P., accompanied by an equally large standard deviation of 5,840, indicating that bighorn sheep petroglyphs originated in the late Pleistocene and persisted throughout most of the Holocene. These results imply that Paleo-Indian people produced the same motifs as the Numic-speaking people who occupied the area to protohistoric times (and, in fact, to this day), despite the fact that several fundamental adaptive and cultural changes occurred during this 12,000-year interval. Six years later, when relying more heavily on ethnographic analogy, Whitley (1994a) changes course, arguing for a late-period age for the Coso bighorn sheep motif, citing a lack or minimal amount of "revarnishing" on the petroglyphs (which apparently occurs within 100 years), and highlighting the two (9%) previously obtained cation-ratio results with mean dates of 650 B.P. and 550 B.P., while down-playing the other 21 (91%): the "Numic phase experienced not simply continued rock art manufacture, but in fact an accelerated production, specifically of anthropomorphs, mountain sheep and 'hunter' motifs, that far exceeded the number of engravings made during earlier periods" (Whitley 1994a:361). More recently, Whitley wrote that some of the rock art "may have been made as long ago as 19,000 years, although most of the engravings appear to be 1,000 to 1,500 years old or less" (1996:51–52). Most recently, he slides it a bit further back in time: "the majority of these petroglyphs were made in the last 1,000 to 2,000 years" (Whitley et al. 1999:24). Despite these alterations, the disconnect between Whitley's age estimates and the cation-ratio dating results continues even with Dorn's (1998:80) revisions, which now place the oldest dated element at 16,500 ±1,000 B.P. and the youngest at 1,100 B.P. According to Dorn (1998), no date for an element falls within the last 1,000 years (which corresponds to Whitley's Numic phase), and only four (17%) fall between 1,000 and 2,000 years ago.

Whitley's dating and ethnic attribution of the Coso rock art also conflict with interpretations by other Great Basin archaeologists and ethnographers. As a succinct example of the former, Bettinger and Baumhoff (1982:493) write: "It has been long held that Prenumic, rather than Numic, groups were chiefly responsible for the elaborate rock art that is so widespread in the Great Basin (Heizer and Baumhoff 1962:14–15, 226–230, 293; Heizer and Clewlow 1973:25; Thomas and Thomas 1972), there being no evidence of its production, or even an oral tradition explaining its origins, among Numic speakers." Steward emphasizes the latter point in the following statement:

> My own fairly extensive study, between thirty and forty years ago, of Shoshonean Indians disclosed that they knew nothing of the authorship or meaning of the petroglyphs, and that their culture seemed unlikely to manifest itself in this medium [1968:viii].

Most of the considerable ethnographic data for the Owens Valley Paiute and Coso Shoshone were collected by Steward, and when those data relate directly to rock art, they are unambiguous in indicating that the Owens Valley Paiute/Coso Shoshone do not take credit for the rock art found here (see also Quinlan 2000). One could argue that consultants were disingenuous on this point, out of an unwillingness to reveal sensitive information; however, Steward, as well as contemporary Great Basin ethnographers (e.g., Catherine Fowler, Steven J. Crumb) all believe this was not the case, and that such a deception would be out of character given the personalities of their tribal consultants. It should also be stressed that these individuals freely identified other topics for which they could provide little insight, largely because they had little knowledge or first-hand experience with the subject.

DEFINITION OF PROBLEM

Both of the competing explanations for the origin and function of Coso rock art suffer from a variety of weaknesses. Grant et al. (1968) provide inadequate evidence for the demise of large game animals subsequent to the introduction of the bow and arrow. Moreover, if the florescence of Coso rock art was simply a response to over-hunting, a condition which likely extended to groups throughout the Great Basin, the explanation does not address why it is a local rather than a regional phenomenon. Their contention that rock art is associated with game trails, watering holes, and hunting features (blinds and dummy hunters) is also unverified, and made further suspect by the fact that rock art is often present at habitation sites throughout the Great Basin. Finally, their chronology, which is largely based on the seriation of hunting technology (i.e., bow-and-arrow versus atlatl-dart) requires additional scrutiny.

Whitley's hypothesis also suffers from an inadequate demonstration of the age of the rock art, and—

by extension—the relevance of the ethnographic information he uses. We will let others with better expertise in the fields of cognitive theory, interpretation of ethnographic and historical information, and Native American belief systems debate the strengths and weaknesses of the shamanistic-neuropsychological approach (Bednarik 1990; Hedges 2001; Helvenston and Bahn 2006; Layton 1988; Solomon 1997).

As a result of these interpretive difficulties, we feel a more fruitful approach to the problem is to examine Coso rock art in its archaeological context, making use of contemporary archaeological models that are applied to the western Great Basin. In Tacon and Chippindale's (1998:7–8) terminology, methodologically this is a formal, in contrast to an informed, approach. We build this context by first characterizing the natural setting of the Coso locality, and reviewing the diachronic settlement/subsistence patterns that characterized the prehistoric peoples of the region. We then turn to a variety of chronological data from the Coso Range and assess how these data relate to the rock art. These findings then allow us to examine how Coso rock art articulated with the larger prehistoric cultural systems of the region.

NATURAL CONTEXT

From the Coso Range, the arid Great Basin spreads like a fan for 800 kilometers to the north and northeast, and 400 kilometers to the east. This contiguous, internal-draining hydrographic unit covers some 165,000 square miles (Grayson 1993:11), with tall, narrow, north-south-trending mountain ranges interspersed with large, open valleys. Peaks reaching 3,050 meters (10,000 feet) above mean sea level are not uncommon, while the intervening valleys range in elevation between 1,220 and 1,830 meters (4,000 to 6,000 feet), and often contain barren salt flats and playas. Mean annual temperatures in the Great Basin span from about 7°C (45°F) in the north to about 19°C (66°F) in the south. Throughout most of the Great Basin, annual rainfall averages between 20 and 30 centimeters (8 to 12 inches), while annual lake evaporation rates average about 100 centimeters (40 inches) in the north, and 174 centimeters (70 inches) in the south.

In contrast to most of the Great Basin, biodiversity is relatively high in the Coso Range, a product of its location at the juncture of the Sierra Nevada, Great Basin, and Mojave Desert floristic provinces. Dense pinyon pine groves cover the higher elevations of the Coso Range and the adjacent Sierra Nevada, and these are quite conceivably the richest, southern-most pinyon groves in the greater Great Basin (Hildebrandt and Ruby 2006; Zeanah 2002). Oak trees also spill over the Sierra Nevada crest from cismontane California, creating one of the few locations in western North America where these two important staples co-occur in a single place. Several non-subsistence resources further enhance the Coso's appeal to desert-oriented hunter-gatherers. Behemoth quarries of high-quality obsidian at the south end of the Coso Range constitute the southern-most in the long line of such quarries scattered along the western edge of the Great Basin.

In the not-too-distant past, bighorn sheep were distributed throughout the Great Basin. Degraded habitat and competition from domestic livestock (sheep, cattle, and horses) and other large game (elk and deer), however, have had drastic effects on their population and range. The largest relict population has a northern limit covering the Coso Range and extending south-southeast beyond the U.S.-Mexico border (Buechner 1960: Figs. 1 and 2). The last few resident bighorn in the Cosos died in the 1970s, but historical records regarding the size and health of local livestock herds indicate that the area was capable of supporting a substantial bighorn population. There is a turn-of-the-nineteenth-century account, for example, of a single family taking 200 to 300 feral horses a year from the Coso Range, clearly documenting the productive nature of this location (Tetra Tech 1996:2–30).

Another exceptional natural resource within the Coso Range is the Coso Hot Springs. It consists of a cluster of variously colored mudpots and super-heated springs that were and are still renowned among a wide range of Native American groups for their curative, restorative, and spiritual powers. Geothermal energy development of areas near the hot springs prompted oral interviews with Shoshone and Paiute elders in the 1970s. Synopses of those interviews (Iroquois Research Institute 1979), as well as earlier ethnographic information, reflect the general consensus that the Coso Hot Springs is a powerful place; they commonly refer to shamans who used the Coso Hot Springs for healing purposes,

"sweats," prayers, and spiritual activities. One should not, however, presume that the spiritual significance and use of the Coso Hot Springs extend to other parts of the Coso Range, like the rock art, pinyon, and quarry zones.

ARCHAEOLOGICAL CONTEXT

Prehistoric use of the area, like that of the larger Great Basin, spanned the entire Holocene. Because our knowledge of the local archaeological record is much more developed for the latter half of this period, the following narrative describes prehistoric occupational patterns post-dating 7,000 cal B.P. (Table 1). This summary is based on studies conducted in the Coso obsidian quarry zone (Gilreath and Hildebrandt 1997), the Owens Valley area (Basgall and McGuire 1988; Bettinger 1975, 1989, 1991a; Bettinger et al. 1984; Delacorte 1990; Delacorte and McGuire 1993; Delacorte et al. 1995; Gilreath 1995; McGuire and Hildebrandt 2005), the northern and western portions of the Mojave Desert (Basgall 1993; Basgall and Hall 1992, 1994; Cleland and Spaulding 1992; Hall 1992; Sutton et al. 2007; Warren 1984; Warren and Crabtree 1986), and on Steward's presentation of the region's ethnographic record (1933, 1938).

Table 1

CHRONOLOGICAL SEQUENCE FOR THE COSO AREA

Time Period	Temporal Range
Marana	Post – 650 B.P.
Hasiee	1,350 – 650 B.P.
Newberry	4,000 – 1,350 B.P.
Litle Lake	7,000 – 4,000 B.P.
Mohave	10,000 – 7,000 B.P.

Middle Holocene (8,000–3,500 cal B.P.)

During the Middle Holocene, people are thought to have been residentially mobile, with frequent, periodic shifts in their occupational sites. Regional population levels were very low, and group size was small, probably limited to only a few families. Hunting strategies were quite generalized, with game taken on an opportunistic basis. As a result, a broad range of animals was eaten, but smaller animals like jackrabbits made up a larger proportion of the diet than large game such as deer and sheep. Meat was supplemented by small seeds and other plant foods. Resources within a relatively small foraging radius were depleted fairly quickly, prompting groups to relocate frequently. In addition, because people moved often, small, generalized tool kits were designed to accomplish a variety of tasks in multiple environmental settings (Kelly 1983, 1985, 1988; Shott 1986, 1989; Thomas 1983, 1984).

Newberry Period (3,500–1,350 cal B.P.)

Substantial settlement-subsistence changes occurred during the Newberry period, particularly after 2,500 B.P. Semi-permanent villages were established, many located at the eastern base of the Sierra Nevada. Many of these residential bases were regularly reused, as denoted by the presence of substantial pithouses, tool caches, and other features (Basgall and McGuire 1988; Hildebrandt and McGuire 2002; McGuire and Hildebrandt 2005; McGuire et al. 2007). Village occupants were sustained in part by resources from distant areas obtained by logistically organized excursions. For example, upland resources such as pinyon, mountain sheep, and marmots have been found in lowland late Newberry-period village middens (Basgall and McGuire 1988; Delacorte 1990; Delacorte and McGuire 1993), clearly indicating that hunting and gathering parties brought such resources back to these base camps. Other indications of logistical work organization are found at the obsidian quarries, where specialized biface production stations were established to facilitate the inter-regional exchange of obsidian. Composite obsidian hydration curves show that these activities peaked between 2,300 and 1,275 cal B.P. (Elston and Zeier 1984; Gilreath and Hildebrandt 1997).

The shift to semi-permanent villages supported by logistical forays to adjacent areas is also reflected by an increase in the hunting of large game. On a regional scale, late Newberry-period sites regularly occur in a wider range of environmental settings than earlier sites, and they often constitute the first obvious, patterned use of upland settings. Most of these upland sites reflect short-term logistical forays for the purpose of hunting large game (Bettinger 1991a; McGuire et al. 2007; Stevens 2002, 2005; Wickstrom 1993; Zeanah 2000).

Haiwee Period (1,350–650 cal B.P.)

The settlement pattern established in the late Newberry period was maintained into the early part of the Haiwee

period, though subsistence activities continued to intensify.[1] Village sites are more numerous than before, suggesting a still-growing population. Special-purpose "foray" sites from this period are well represented, including milling stations, hunting camps, and drive/butchering sites. Obsidian production for exchange continued into this period, but dropped quickly after 1,000 B.P.; production for local consumption also declined markedly. The reasons for the decreased use of obsidian were probably associated with the technological shift from large dart-sized to small arrow-sized points (requiring less raw material), but also with a decline in the importance of large game, and an increased reliance on seed-processing and the capture of small game. These latter changes may also be linked to declining environmental conditions during the Medieval Climatic Anomaly (Stine 1994), which Jones et al. (1999) think reduced subsistence productivity and disrupted many long term social relationships. The inter-regional exchange of obsidian certainly declined at this time, as coastal southern California and southern San Joaquin Valley groups, the major extra-local Coso obsidian consumers, shifted to using mostly local stone to meet their needs, like other groups throughout the arid west and southwest at this time.

Marana Period (post-650 cal B.P.)

The final period in local prehistory is quite distinct from the previous late Newberry and Haiwee periods, and conforms closely to the ethnographic record described by Steward (1938) for the Coso Shoshone. The late-period settlement pattern was characterized by a decrease in the number of large villages, with most of the area exploited throughout the year by small family groups. For these reasons, the late-period settlement pattern is more analogous to that of Jennings' Desert Culture than of the desert villages in Owens Valley characterized by Steward (1933, 1938) and Bettinger (1978). Continuing a pattern set in motion during the late Haiwee period, Numic peoples focused on the intensive exploitation of high-cost (i.e., labor intensive and time consumptive) plant resources and small game.

THE AGE OF COSO ROCK ART

We now turn our attention to the rock art, focusing on archaeological patterns that will help us determine the age of important elements and motifs. Our study begins with a comparison of the rock art found in the Basalt Lowlands of the Coso Range with that observed in the Pinyon Uplands, followed by an analysis of the superposition and degree of repatination. These findings agree rather closely with the original chronologies proposed by Grant et al. (1968), Heizer and Baumhoff (1962), and Bettinger and Baumhoff (1982), and are further corroborated by settlement chronology data generated from the two areas.

Geographic Distribution of Key Rock Art Categories

Three general petroglyph categories are recognized in the area: abstract pecked, representational pecked, and scratched designs. The abstract category tends to be the oldest, but we know little about when it was first produced. Most representational art probably dates between 3,500 and 1,000 cal B.P., given the drawings of some hunters using atlatls and others using the bow and arrow (the latter was introduced to the local area sometime after 1,500 cal B.P.). Scratching, in contrast, appears to be later, and is thought to be a Numic trait, sometimes used to deface the earlier art (Bettinger and Baumhoff 1982; cf., Ritter 1994).

Formal archaeological surveys in the Basalt Lowlands identified more than 15,000 elements (Fig. 7). Representational ones dominate the sample, outnumbering abstract designs by a factor of three to one, while scratched designs are rarely found (Gilreath 1999). These trends are reversed when moving to the Pinyon Uplands, where an analysis of more than 3,500 designs found that scratched ones were quite common, and abstract designs outnumber representational designs by nearly three to one (Gilreath 2003; Hildebrandt and Ruby 1999).

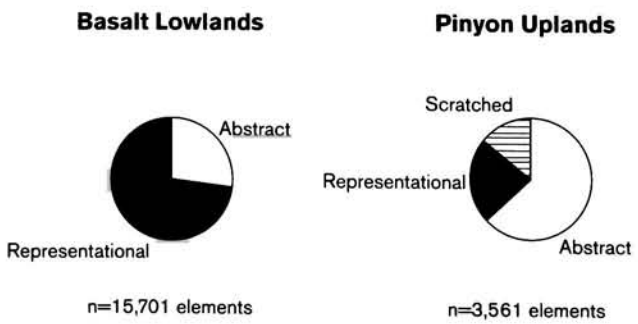

Figure 7. Design types from the Coso Basalt Lowlands and Pinyon Uplands.

A more fine-grained analysis of 163 panels in the Pinyon Uplands found that 38% had elements overlying one another, while the remainder did not (Gilreath 2003; Fig. 8). The majority of the panels with superposition have scratching over pecked designs (Fig. 9; either abstract or representational), in many cases deliberately marring the older underlying designs in a manner similar to that documented by Bettinger and Baumhoff (1982:494). The stratigraphic relationship between scratched and pecked designs is based on macroscopic field observations. The scratched designs were made with shallow, thin (hair) lines that barely scratched the surface of the rock. The pecked designs were routinely made with dense pockmarks that further penetrate the rock surface. Where the two co-occur, the scratches are evident over and extend beyond the dimensions of the pecked design. If pecking was synchronous with or subsequent to the scratching, the deep pecks would effectively obliterate the scratches, and the resultant effect would be of juxtaposed rather than overlapping designs. There were also several cases where pecked designs overlay other pecked designs, but we never observed pecking over scratched elements.

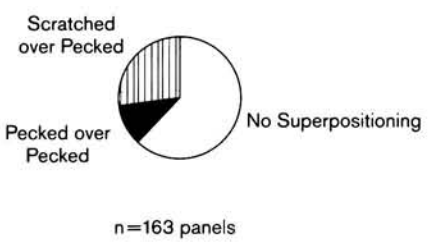

Figure 8. Design superpositioning in the Pinyon Uplands.

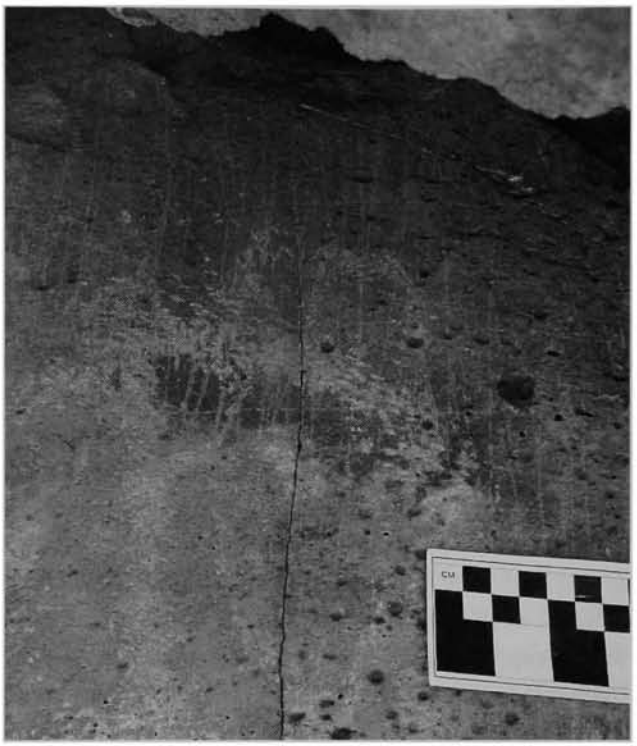

Figure 9. Scratched design overlying pecked abstract design in the Coso Range.

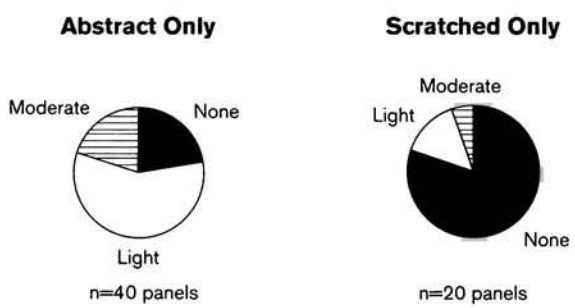

Figure 10. Degree of revarnishing in the Pinyon Uplands.

The degree of revarnishing follows a similar pattern (Fig. 10), although our observations are admittedly more subjective. Since many natural factors influence varnish (see Dorn 1998:71), this should be taken as a rough-and-ready index. Some 75% of the panels with only abstract designs had moderate to light amounts of revarnishing. Only 20% of the panels with only scratching showed revarnishing, providing additional support for the limited age of this activity.

Settlement Chronology

Given that the Basalt Lowlands are dominated by representational rock art, and the Pinyon Uplands have high relative frequencies of abstract art and scratching, it follows that the land-use histories of these locations should also differ from one another—with largely Haiwee (with some Newberry) occupation in the Basalt Lowlands, and Marana and Newberry (and earlier?) occupations in the Pinyon Uplands.

We evaluated the land-use histories for the Basalt Lowlands and Pinyon Uplands with roughly 700 obsidian hydration readings from over 70 archaeological localities spread throughout both zones (Gilreath 1999; Hildebrandt and Ruby 1999). Age estimates for these hydration values come from the work of King (2004), who calculated a local rate for Coso hydration which incorporates temperature differences between

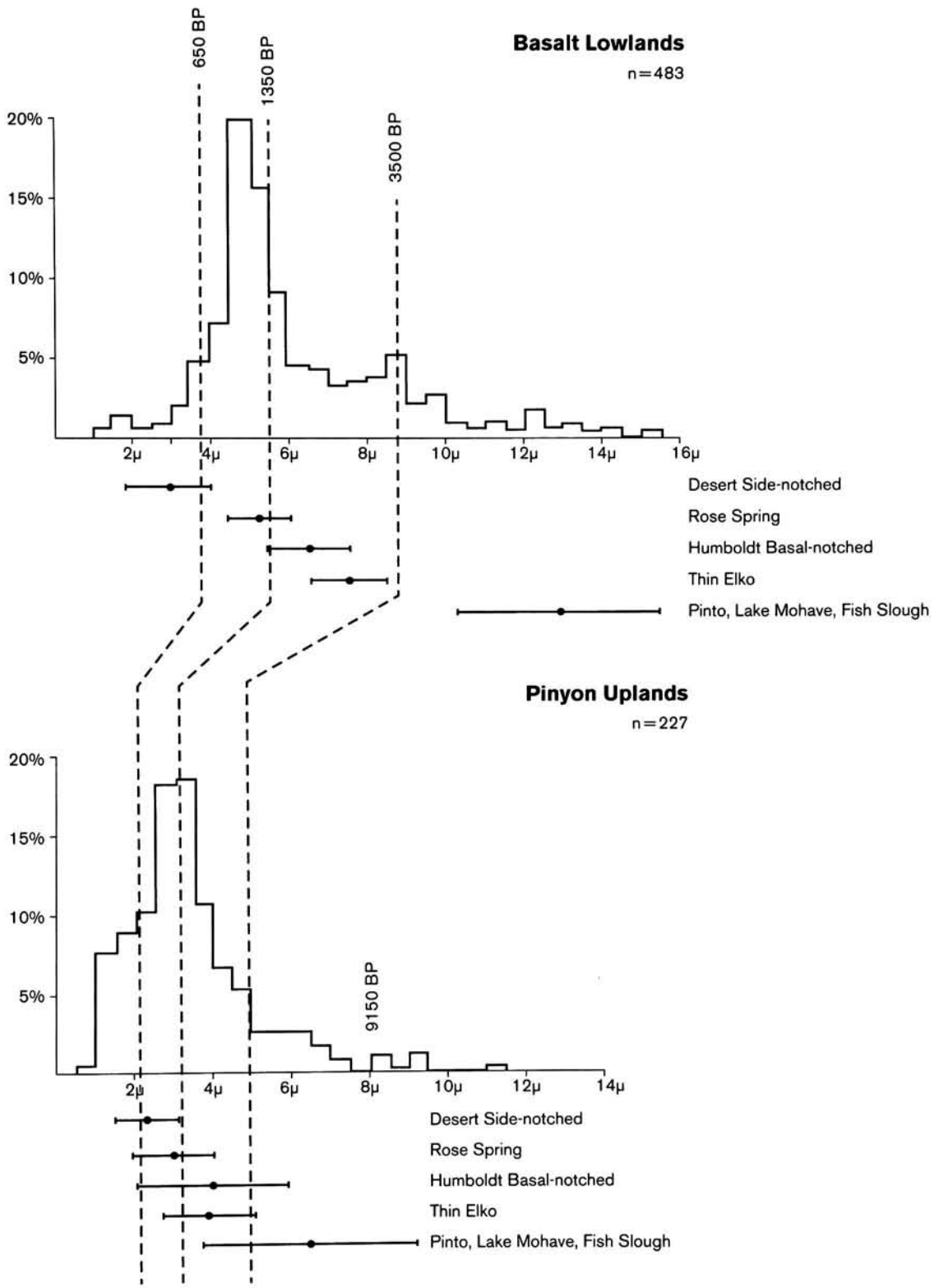

Figure 11. Obsidian hydration data from the Coso Basalt Lowlands and Pinyon Uplands.

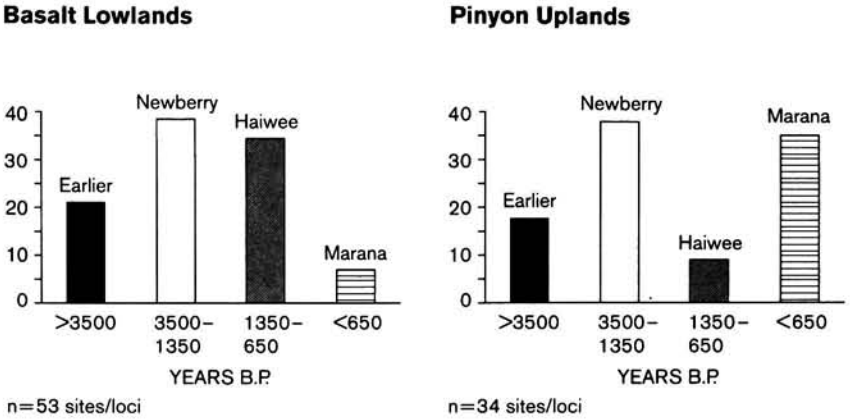

Figure 12. Frequency distribution of single component areas within the Basalt Lowlands and Pinyon Uplands.

contrasting environmental settings (Basalt Lowlands = 19.0°C; Pinyon Uplands = 11.7°C). The two rates are expressed by the following:

$$\text{Basalt Lowlands } (t = 44.67x^2)$$
$$\text{Pinyon Uplands } (t = 143.02x^2)$$

Where t equals time in years and x is the obsidian hydration rim value.

Figure 11 provides the composite profiles of the hydration values from the Basalt Lowlands and Pinyon Uplands. For the former, obsidian deposition was limited for a long period of time, but reached a dramatic peak just after 1,350 cal B.P. After about 1,000 cal B.P., obsidian use declined rapidly throughout the remainder of the Haiwee and Marana periods. For those more comfortable with projectile point-based chronologies, summary data on the diagnostic projectile points from the Coso Volcanic Field are depicted for cross-reference (Gilreath and Hildebrandt 1997). Mean hydration readings on Desert Side-notched, Rose Spring, Thin Elko (Gilreath and Hildebrandt 1997:71–84), Humboldt Basal-notched, and the older middle and early Holocene projectile point types all fall within their appropriate time periods. These data suggest that the use of the Basalt Lowlands escalated in the late Newberry Period to a peak in early Haiwee times, and rapidly declined thereafter.

Obsidian hydration data from the Pinyon Uplands have a much lower resolution due to cooler local temperatures and depressed rates of hydration rim development. Nevertheless, hydration means from Upland projectile points reported by Hildebrandt and Ruby (2006) correspond fairly well with their expected temporal intervals. The composite hydration sample also shows an increase during the Newberry and early Haiwee periods, but a much smaller drop in frequency later in time than was the case in the Basalt Lowlands. Instead, obsidian deposition remained relatively high well into the Marana Period, consistent with the high frequency of scratched petroglyphs found in this location.

These general patterns are replicated when viewing the frequency distribution of single component areas within the two locations (Fig. 12). Single component sites/loci found during surveys of the Basalt Lowlands are dated with obsidian hydration; they show that the area was used most heavily during the Newberry and Haiwee periods, but minimally thereafter (Gilreath 1999). The Pinyon Upland data set is somewhat different, as it comes from the excavation of 14 sites which were dated through various means, including both obsidian hydration and radiocarbon analyses (Hildebrandt and Ruby 2003). These data reveal significant use during the Newberry Period, less during Haiwee times, but intensive occupation focused on the use of pinyon nuts during the Marana Period.[2]

The Marana-period use of the Pinyon Uplands and its association with scratched petroglyphs can also be seen on a more detailed level at a site complex containing an early hunting camp (INY-130), a small Marana-period residential area (INY-6537/H), and a major concentration of rock art (INY-6536). The rock art concentration is composed of multiple panels on a nose of a basalt flow that crosses through several sites (Table 2;

Fig. 13). On the west side of the nose, the panels are dominated by abstract elements, with representational designs completely absent and scratched ones minimally present. Scratched designs are absent from the nose, while representational ones increase relative to abstract art within this portion of the site. On the east side, scratched elements reach their highest frequency, although abstract designs remain dominant. Like the region-wide patterns outlined above, about 75% of the scratched designs significantly overlie pecked glyphs, while the opposite form of superposition never occurs.

Projectile point data from the adjacent sites conform to these patterns. Adjacent to the west end, where abstract designs are abundant, projectile points from

Table 2

ROCK ART ELEMENTS AND PROJECTILE POINT TYPES FROM THE INY-130, -6537/H, AND -6536 SITE COMPLEX

	West End	Nose	East End	Total
Representational	–	7	19	26
Abstract	39	13	46	98
Scratching	4	–	23	27
Total	**43**	**20**	**88**	**151**
Desert Side-notched/Cottonwood	–	–	4[b]	4
Rose Spring	1[a]	–	–	1
Elko/Humboldt Basal-notched	4[a]	–	–	4
Pinto	3[a]	–	–	3
Total	**8**	**–**	**4**	**12**

[a] From INY-130
[b] From INY-6537/H

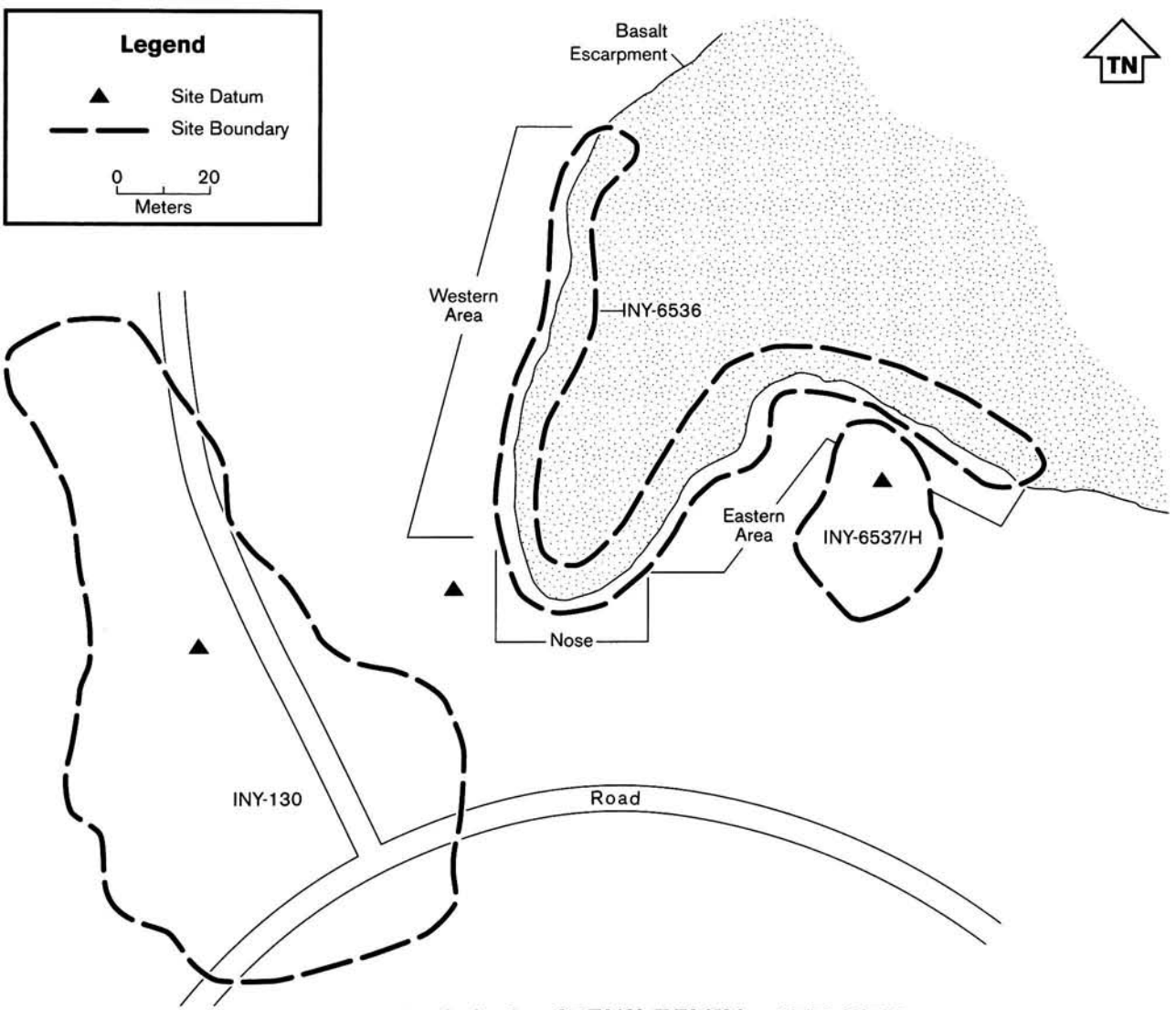

Figure 13. Spatial distribution of INY-130, INY-6536, and INY-6537/H.

INY-130 are dominated by older forms, including four Elko/Humboldt Basal-notched, three Pinto, and only one Rose Spring point. Near the east end, where scratching is abundant, only Desert Side-notched and Cottonwood forms are present at INY-6537/H. These Marana Period points are associated with brownware pottery, milling gear, and some biface fragments, and may represent the people who scratched over the earlier art. Although anecdotal, this example is a microcosm of the patterns observed in the larger Coso region, which provide strong support for the original chronological estimates of Heizer and Baumhoff (1962), Grant et al. (1968), and Bettinger and Baumhoff (1982).

FAUNAL REMAINS

Regional archaeological overviews have repeatedly identified a subsistence shift over the last 3,000 years, with a movement from a reliance on large game (such as bighorn, deer, and antelope) to a reliance on seeds and small game, with the former pattern associated with the Newberry/dart-point period, and the latter fully in practice during the Marana/bow-and-arrow period. A fundamental criticism of the Coso hunting magic interpretation has been that faunal profiles have never shown that bighorn sheep were an important component of local prehistoric diets. For example, Whitley et al. (1999:12–13) state that "archaeological excavations in the Coso region have failed to find any evidence that bighorn sheep hunting was an important part of regional subsistence practices.... In fact, if one looks at the distribution of bighorn sheep petroglyphs within the Great Basin...[one finds that] Bighorns were commonly hunted in areas where they were rarely included in the art and, where they are common in petroglyphs, little hunting of them occurred."

Faunal profiles from archaeological deposits in the southwestern Great Basin-northwest Mojave Desert, which approximates the "Coso region," tell another story. Faunal data published by Hildebrandt and McGuire (2002) and McGuire et al. (2007) from more than 75 prehistoric sites in the surrounding area (Inyo and San Bernardino counties) show a definitive shift in the importance of artiodactyls over time (Table 3). These data show that artiodactyls reached maximum frequencies during the Newberry Period, accounting for 70% of the assemblage. Artiodactyls account for only 53% of the subsequent Haiwee Period assemblage, and diminish to only 5% in Marana Period sites. Though species-level identifications within these samples are relatively rare,

Table 3

TERRESTRIAL FAUNAL PROFILES FROM SOUTHEASTERN CALIFORNIA

	Early/Middle Holocene (8,500–3,500 B.P.)		Newberry (3,500–1,350 B.P.)		Haiwee (1,350–650 B.P.)		Marana Post–650 B.P.		
	#	%	#	%	#	%	#	%	Total
Artiodactyl	670	18.8	6,083	64.3	1,313	51.7	162	4.0	8,228
Bighorn Sheep	14	0.4	510	5.4	28	1.1	16	0.4	568
Deer	44	1.2	8	0.1	2	0.1	3	0.1	57
Pronghorn	13	0.4	5	0.1	5	0.2	13	0.3	36
Subtotal	**741**	**20.8**	**6,608**	**69.8**	**1,348**	**53.1**	**194**	**4.8**	**8,889**
Marmot	–	–	1,357	14.3	1	–	–	–	1,358
Lagomorph	2,036	57.0	1,241	13.1	1,128	44.4	752	18.8	5,157
Subtotal	**2,036**	**57.0**	**2,598**	**27.4**	**1,129**	**44.4**	**752**	**18.8**	**6,515**
Herpetofauna	318	8.9	103	1.1	26	1.0	238	5.9	685
Desert Tortoise	474	13.3	159	1.7	36	1.4	2,826	70.5	3,495
Subtotal	**792**	**22.2**	**262**	**2.8**	**62**	**2.4**	**3,064**	**76.4**	**4,180**
Total	**3,569**	**100.0**	**9,466**	**100.0**	**2,539**	**100.0**	**4,010**	**100.0**	**19,584**

From Hildebrandt and McGuire (2002).

they nonetheless show an astounding 50-to-1 ratio of bighorn sheep to deer and pronghorn in the Newberry Period. Although Hildebrandt and McGuire's (2002) use of the large metadata sample could mask important local variability in hunting behavior, including locations where large-game hunting continued into the late period (see Allen n.d.), the regional trends show that artiodactyls, primarily bighorn sheep, were a key resource for local populations between 3,500 and 1,350 B.P., and that their importance fell drastically after that time, particularly after 650 cal B.P.

DISCUSSION

The above findings indicate very different land-use histories for the Basalt Lowlands and the Pinyon Uplands of the Coso Range. In the Basalt Lowlands, with its extraordinary concentration of bighorn sheep petroglyphs, obsidian from the manufacture of hunting implements was deposited in increasing amounts beginning about 3,500 cal B.P., reached maximum quantities around 1,400–1,000 cal B.P., and almost disappeared thereafter. Region-wide archaeofaunal profiles document a focus on bighorn sheep between 3,500 and 1,000 cal B.P. (during the main period of obsidian deposition and representational rock art), and a drastic reduction from the late Haiwee through the Marana periods (at the same time that obsidian use fell dramatically). This correlation between bighorn sheep hunting and the production of sheep petroglyphs is consistent with the original work by Heizer and Baumhoff (1962), Grant et al. (1968), Nissen (1982), and Bettinger and Baumhoff (1982), and has been linked more recently to the ascendance of prestige hunting throughout much of California and the Great Basin during this interval (Hildebrandt and McGuire 2002, 2003; McGuire and Hildebrandt 2005; McGuire et al. 2007), and to a sheep-cult ceremonial complex that developed in the local area (Garfinkle 2006).

The Pinyon Uplands, in contrast, were intensively occupied after 1,000 cal B.P., and local populations seem to have reduced their focus on the hunting of bighorn sheep by that time, probably due to increased hunting pressure stemming from higher human population densities, climatic change, and improved hunting technologies. Instead of using the Uplands for hunting, larger social groups focused on the intensive use of pine nuts (Hildebrandt and Ruby 2006). The local residents were not interested in producing elaborate rock art and, in fact, had a propensity to mar the work of artists who preceded them.

CONCLUSIONS

The hypothesis that rock art in much of western North America was causally linked to prehistoric hunting practices has been increasingly abandoned over the last 20 years, largely as a consequence of the growing popularity of a shamanic model. We have considered both interpretive models in light of new archaeological information from the western Great Basin and the Coso Range since Heizer and Baumhoff (1962) and Grant et al. (1968) presented their position some 40 years ago, and have come to understand that the local Coso rock art phenomenon is largely a ritualistic byproduct of the prehistoric hunting practices of local populations.

We have determined that the unprecedented concentrations of bighorn sheep petroglyphs within the Coso Range are embedded in an archaeological record that dates predominately between 2,500 and 1,000 years ago. In this window of time and at this location, where the Great Basin and California abut, local populations experienced (1) increasing human population densities, (2) a fundamental shift in hunting technology from the atlatl and dart to the more effective bow and arrow, and (3) a dramatic shift from the hunting of large game (primarily bighorn) to the use small game and seeds.

Under normal circumstances, optimal foraging theory would predict that hunters would respond to a decline in large game populations by switching to smaller, more abundant prey. This type of hunting strategy maximizes caloric return rates and lowers hunting pressure on depleted prey, allowing their populations to remain viable for long periods of time. But in the Coso situation, the importance of bighorn sheep went well beyond subsistence, providing successful hunters with high levels of prestige (Hildebrandt and McGuire 2002, 2003; McGuire and Hildebrandt 2005), and it ultimately became the central theme of large scale ritualistic activities (Grant et al. 1968; Garfinkle 2006). Studies among modern foraging populations have shown that once the currency for large game shifts from calories to prestige, hunters will go to great lengths to

find these rare but increasingly valuable prey animals. The interaction between prestige, religion, and hunting can reach runaway proportions, leading to extreme depletions of highly ranked prey (Bettinger 1991b; McGuire et al. 2007; Raven 1990). Judging from the crash in bighorn sheep bone frequencies in archaeological sites throughout the Coso region (see Table 3), it seems likely that this was the scenario that played out locally.

These findings indicate that local residents intensified rock art production to help restore bighorn sheep populations, but this ritualistic activity may have actually accelerated the demise of this important resource. But given that other neighboring populations were probably experiencing similar levels of subsistence stress, the question remains—why there was so much representational rock art at Coso compared to most other parts of the Great Basin? Part of the answer probably lies in the fact that the only other prehistoric cultures exhibiting this high level of representational petroglyph art were the western Anasazi and Fremont peoples located only 200 miles to the east. Although considerable debate exists regarding the origin and dispersal of northern Uto-Aztecan languages, Hill (2001) has linked this linguistic phenomenon to the arrival of early Anasazi peoples (i.e., Basketmaker II) in the Southwest from Mexico. Most researchers agree that between 3,500 and 2,500 years ago, dialects of northern Uto-Aztecan

> were probably spoken in a continuous band across the southern basin from the Colorado River to the Sierra Nevada, with a distinction slowly emerging between an eastern group ancestral to Hopi and the Numic subfamily and a western group ancestral to Tubatulabal and the Takic subfamily [Golla 2007:74].

The expansion of Takic languages into southern California probably occurred in multiple waves, the first around 2,000 B.P., while the northern movement of Numic populations across the western Great Basin probably took place after 1,000 B.P. (Golla 2007:75). It appears, therefore, that there are strong linkages between the distributions of early Uto-Aztecan languages and high frequencies of representational rock art. This cultural/historical association is also consistent with the higher degrees of sedentism that emerged among Basketmaker II and Newberry Period peoples (McGuire and Hildebrandt 2005), and provides a socio-economic context that satisfies Julian Steward's (1968:viii) requirement for the existence of a culture that would "manifest itself in this medium."

The combination of territorial expansion and resource competition can also be accompanied by intensive territorial behavior which ranges from increases in interpersonal violence (Lambert 1993) to less aggressive, stylistic expressions of group identity (Wobst 1977). We view the Coso Range as a boundary locality that experienced a brief period when residents drew prolific quantities of Coso-style sheep, a gesture that was aimed at propagating bighorn, but which also served to reinforce their group affiliation in response to escalating inter-group competition.

By the Marana Period, the sheep populations were reduced and human populations had dispersed into smaller, more mobile groups. This more mobile settlement system, a system documented by Julian Steward during his visits with local Paiute-Shoshone people, lacked a high degree of territoriality, and therefore had little need for intensive signaling behavior in the form of representational rock art. It is no surprise that Steward's consultants had no knowledge of the Coso rock art complex, as the vast majority was manufactured beyond the time depth of their cultural knowledge (Laylander 2006). It is also no surprise that a cultural florescence occurred locally during early Haiwee times, given that similar cultural climaxes were co-occurring in adjoining areas (i.e., the Fremont and western Anasazi). Moreover, just as those studying western Anasazi or Fremont prehistory would balk at using local Paiute-Shoshone ethnographies to interpret their prehistoric records (including their representational rock art), we, too, see the shortcomings of using ethnographic data to interpret ancient cultures of the Coso region.

NOTES

[1] In a recent publication, Sutton et al. (2007) recognize many of the same trends during the late Holocene that we do, but propose a revised chronology for the Mojave Desert that places these developments into a significantly different cultural context. Specifically, they move the introduction of the Rose Spring point (and the Haiwee/Saratoga Springs Period) considerably back in time, beginning at around 1,800 B.P. "or perhaps a little earlier" (Sutton et al. 2007:241), rather than the conventional 1,350 B.P. placement of Bettinger and Taylor (1974). Consequently, they disassociate several important developments that took place

during the Newberry/Gypsum Period, and move them into the revised Haiwee/Saratoga Springs Period between 1,800–900 B.P.

Excavations at several sites in Inyo County show that the Sutton et al. (2007) revisions do not apply to the Coso region. Basgall and McGuire's (1988) work at INY-30, for example, revealed four discrete house structures with seven radiocarbon dates ranging between 1,860 and 1,220 B.P. (and 1,840–1,460 B.P. when removing the high and low assays). These structures produced 27 Elko and Humboldt Basal-notched projectile points, and no Rose Spring points. Rose Spring points are present at the site, but are found in contexts post-dating the occupation of the houses. Additional discussion of the Newberry-Haiwee transition can be found in Gilreath and Hildebrandt (1997:166–167), particularly with regard to the chrono-stratigraphic relationships at the Rose Spring site (INY-372).

[2]The low density of Haiwee components encountered during the excavations contrasts with the high frequency of Rose Spring points found during a survey reported by Hildebrandt and Ruby (2006). It appears that these points are found in isolated contexts more often than forms dating to other time periods and probably represent a more specialized use of the pinyon zone during this interval.

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