Paleoindian rock art: establishing the antiquity of Great Basin Carved Abstract petroglyphs in the northern Great Basin

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A B S T R A C T

One of the principal ways that researchers date archaeological sites is by using temporally diagnostic projectile points as index fossils; however, this practice has not been widely employed to date rock art sites. We use this approach here to test the hypothesis that the Great Basin Carved Abstract (GBCA) petroglyph style found in the northern Great Basin was produced by Paleoindians. Using frequencies of projectile points at 55 GBCA sites, we demonstrate that Paleoindian points are significantly over-represented relative to their occurrence on the general landscape, providing evidence that Great Basin populations produced rock art sometime during the Terminal Pleistocene/Early Holocene (TP/EH), ~12,500–8000 radiocarbon years ago. Additionally, we examine several environmental variables at GBCA sites and propose a model of Paleoindian land-use in the northern Great Basin that highlights seasonal visits to uplands to procure geophytes (i.e., root crops).

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1. Introduction

Our ability to reconstruct prehistory is dependent on materials preserved in the archaeological record. In the Great Basin, where most sites occur in open-air settings with limited potential for organic preservation, remains are biased towards durable items (e.g., flaked stone artifacts). Such artifacts have allowed researchers to investigate some aspects of Paleoindian behavior, including technological organization (Duke and Young, 2007; Goebel, 2007; Smith, 2007), during the terminal Pleistocene/early Holocene (TP/EH), ~12,500–8000 radiocarbon years before present (14C B.P.) (~14,650–8875 calendar years ago [cal B.P.]). While other artifact types, including perishable technology (Barker et al., 2012; Connolly and Barker, 2004) and subsistence residues (Hockett, 2007; Rhode and Louderback, 2007), have also informed our understanding of Paleoindian lifeways, their paucity at early sites limits their utility in developing behavioral models. Although petroglyphs, like flaked stone artifacts, are not subject to rapid decomposition like organic remains, they have traditionally not figured prominently in treatments of Paleoindian lifeways. Many researchers eschew rock art because of the difficulty in assigning it to particular time periods (Woody and Quinlan, 2009). In this paper, we present the results of our analysis of 55 archaeological sites in the northern Great Basin that contain a particular style of petroglyphs – Great Basin Carved Abstract (GBCA) – that some researchers (Cannon and Ricks, 1986, 2007; Ricks, 1999; Ricks and Cannon, 1993) suggest was produced by Paleoindians. Using associated temporally diagnostic projectile points as index fossils, we demonstrate that Paleoindian points are significantly over-represented at GBCA sites relative to their occurrence on the general landscape, suggesting that early populations produced the petroglyphs. We also present the results of our analysis of two environmental variables – elevation and vegetation – of GBCA sites and argue that current models of Paleoindian lifeways do not fully account for how and why early groups used uplands in the region.
marshes occupied many valley floors and provided abundant re-
sources (Goebel et al., 2011; Madsen, 2007). As the early Holocene
(10,000–8000 14C B.P.; 11,475–8875 cal B.P.) unfolded, warmer
conditions and decreased precipitation altered the landscape
(Grayson, 2011). The vertical distribution of some vegetation
communities, such as juniper and conifer woodlands, shifted in
response to these changes (Wigand and Rhode, 2002). For example,
at Patterson Lake in northeastern California (~9900 feet above sea
level [ASL]), western pine did not become common until after
~7000 14C B.P. (~7850 cal B.P.) and at Dead Horse Lake, Oregon
(~7400 feet ASL), a mixed community of subalpine fir/western
pine was replaced by an exclusively western pine forest by ~7900
14C B.P. (~8725 cal B.P.) (Minckley et al., 2007). Other vegetation
communities may have been less affected during the early Holocene.
At Bicycle Pond, Oregon (~5800 feet ASL), for example, sagebrush-grass steppe has characterized that location since
~8500 14C B.P. (~9500 cal B.P.) (Wigand and Rhode, 2002) and a
sagebrush-grassland community persisted at Fish Lake, Oregon
(~7400 feet ASL) throughout much of the early Holocene (Mehringer, 1985). Geophytes — perennial plants with underground
bulbs (e.g., bitterroot, biscuitroot, yampa, wild onion) — whose
spatial distributions are influenced more by soil characteristics
than climatic conditions and are relatively resistant to climate
fluctuations (Boeken, 1989; Dafni et al., 1981; Housley, 1994; Prouty,
1994), may have been found in the same general areas as today
although their abundance within those areas likely fluctuated
(Dave Rhodes, personal communication, 2013; Housley, 1994;
Prouty, 1994; Ricks, 1999; Schlessman, 1984). Current data suggest that humans arrived in the northern Great Basin ~12,000 14C B.P. (~13,850 cal B.P.) (Jenkins et al., 2012). TP/EH lifeways are generally portrayed as having included frequent, distant residential moves with wetlands serving as centers of set-
tlement and subsistence activities (Elston and Zeanah, 2002; Goebel et al., 2011; Jones et al., 2003; Smith, 2010). Such views are based on multiple lines of evidence: (1) most diagnostic Paleo-
indian artifacts (stemmed and concave-base projectile points, crescents) (Fig. 1) are associated with TP/EH wetlands (Duke and Young, 2007; Jones et al., 2003; Smith, 2007); (2) early sites exhibit high tool-to-debitage ratios (Oviatt et al., 2003; Schmitt et al., 2007); (3) source provenance data suggest that artifacts were transported substantial distances (Jones et al., 2003; Smith, 2010); (4) architectural and storage features are essentially nonexistent (Elston and Zeanah, 2002; Jones and Beck, 1999); and (5) Paleoindian tools appear to have been multifunctional (Beck and Jones, 2009; Lafayette and Smith, 2012). Direct evidence of Paleoindian subsistence is limited, but a variety of resources
including large and small game, birds, fish, and wetland plants
were likely consumed (Eiselt, 1997; Hockett, 2007; Napton, 1997;
Pinson, 2007). Indirect evidence for subsistence pursuits, such as
site location and lithic technology, suggest that hunting near wet-
lands was common (Elston and Zeanah, 2002). Although some
notable exceptions, including Bonneville Estates Rockshelter
(Goebel, 2007), Last Supper Cave (Layton and Davis, 1978), and
Smith Creek Cave (Bryan, 1979) exist, substantial open-air concave-
base and stemmed point sites are generally not found at higher
elevations (Grayson, 2011; Jones et al., 2003; Taylor, 2002).

2.2. The Great Basin Carved Abstract style

Rock art has traditionally not figured prominently in treatments of Paleoindian lifeways in the Great Basin because direct dating techniques (some of which remain experimental) are not widely
applied (Quinlan, 2007; Woody and Quinlan, 2009; see Benson
et al., 2013; Ritter et al., 2007; Whitley, 2013 for recent efforts).
Because many researchers assume that we cannot date petro-
glyphs, they are often not assigned to particular cultural periods.
Despite this issue, however, a few researchers have argued that
some petroglyphs date to the TP/EH. For example, Cannon and
that Paleoindians produced a distinctive style of petroglyphs in
the northern Great Basin. The style, which they termed Great Basin
Carved Abstract (GBCA), was initially defined at Long Lake, Oregon
(see below) and additional discoveries of similar panels at 54 other
sites indicate that it occurs throughout the northern Great Basin
(Fig. 2). Cannon and Ricks, who have recorded the majority of GBCA
sites, argue that the petroglyph style differs from other styles in the
Great Basin in three ways:

(1) GBCA panels are distinguished by the depth of carving (up to
1/4" or more). Deeply-incised GBCA panels are best described
as bas- or low-relief carvings and are clearly different from the
lightly pecked designs characteristic of other styles;

(2) GBCA panels are highly or completely revarnished, returning
to the same color and texture as the surrounding unmodified
rock surface. This attribute is different than other styles,
which take advantage of the difference in color between the
darker overlying varnish and lighter underlying rock; and

(3) GBCA panels lack “white space”: panels are often entirely
filled with highly integrated design elements of curvilinear
and rectilinear abstract lines, circles, and dots (Fig. 3). This
use of space gives the panels an aspect of composition, rather
than a collection of isolated elements that often characterizes
panels containing other styles.

These attributes have led Cannon and Ricks and others (e.g.,
Ritter et al., 2007) to conclude that GBCA panels are distinctive
enough to warrant a separate stylistic classification.

Several lines of evidence suggest that GBCA petroglyphs are
older than other styles of rock art in the region. GBCA panels are
always the most revarnished panels at sites containing multiple
styles, and when GBCA petroglyphs are associated with other
styles, GBCA panels consistently underlie them (Cannon and Ricks,
2007). Both facts provide evidence for the relative antiquity of the
GBCA style; however, they suggest only that GBCA petroglyphs
predate other styles by some unknown amount of time. Evidence
for the absolute age of GBCA rock art is found at Long Lake, Oregon
(35LK514), a rock art concentration along a 2.5-mile-long basalt
rim. There, two GBCA panels were discovered partially buried
beneath the current ground surface (see Fig. 3). Excavations
revealed that the panels extend 94 cm below the ground surface;
from ~70 to 90 cm below the surface, a layer of Mazama tephra

![Fig. 1. Diagnostic Paleoindian artifacts from the northern Great Basin (redrawn from Smith, 2007): (A) concave-base point; (B) crescent; and (C–E) stemmed points.](image-url)
deposited ~6850 $^{14}$C B.P. (~7700 cal B.P.) (Bacon, 1983) was noted (Ricks and Cannon, 1993) (Fig. 4). Because of its stratigraphic position below Mazama tephra, the GBCA panels must predate ~6850 $^{14}$C B.P. (~7700 cal B.P.) (Cannon and Ricks, 2007; Quinlan, 2009; Ricks and Cannon, 1993).

Recent research conducted by Benson et al. (2013) offers additional evidence for the absolute age of GBCA petroglyphs. At Winnemucca Lake (26WA3329), a site first described by Connick and Connick (1992), Benson et al. (2013) radiocarbon dated carbonate deposits covering a tufa formation into which a GBCA panel was carved as well as a carbonate crust continuous with carbonate coating the motifs. These carbonates were produced when the tufa formation was submerged underwater; thus, Benson et al. (2013) argue that the dates obtained on those materials reflect the times that bracket the production of the rock art. Based on the dates they obtained, Benson et al. (2013) argue that the GBCA panel was produced either ~12,550–11,300 $^{14}$C B.P. (~14,800–13,200 cal B.P.) or ~9900–9300 $^{14}$C B.P. (~11,300–10,500 cal B.P.).

Long Lake and Winnemucca Lake currently provide the only direct associations between dated materials and GBCA panels. Other GBCA sites lacking such associations suffer from the issue of assigning undated petroglyph panels to particular time periods. In the remainder of this paper, we test the hypothesis that GBCA petroglyphs date to the TP/EH at other locations using diagnostic projectile points found at GBCA sites as index fossils to evaluate the style’s antiquity in the northern Great Basin. Our results indicate that Paleoindian points (i.e., concave-base and stemmed points, crescents) are significantly overrepresented at GBCA sites relative...
to their occurrence at numerous and varied other locations in the northern Great Basin, suggesting that GBCA petroglyphs were produced during the TP/EH. We then evaluate the distribution of GBCA sites on the landscape and argue that Paleoindians utilized upland zones to a greater extent than has previously been recognized. An analysis of vegetation at GBCA sites suggests that seasonal geophyte processing may have been an impetus for trips to higher elevations, and that a model of transhumance land-use developed by Cannon et al. (1990) and Ricks (1995) for the past 7000 radiocarbon years (~7825 calendar years) in Oregon’s Warner Valley may be extended to the TP/EH.


Data used here were obtained from GBCA rock art sites in southcentral Oregon’s Lake County (n = 50) and northwestern Nevada’s Washoe County (n = 5). GBCA petroglyphs were identified at each of the Oregon sites by Cannon and Ricks (the individuals who defined the style) as part of the ongoing Lake County Oregon Rock Art Inventory. GBCA sites in Nevada were identified by Ritter et al. (2007) (n = 3), Benson et al. (2013) (n = 1), and Ricks (1998) (n = 1). These researchers used Ricks and Cannon’s (1993) definition of the GBCA style to identify it in Nevada. Currently, our sample comprises all known GBCA sites and we believe that because most of them were recorded by the individuals who defined the GBCA style, the likelihood that panels were misclassified by less experienced analysts is low. At least 47 of the 55 GBCA (~85%) sites also contain other styles of rock art defined by Heizer and Baumhoff.
(1962) that are both superimposed on and less revarnished than the GBCA panels, suggesting that those styles postdate the GBCA style and the sites were revisited over many millennia.2

To test the hypothesis GBCA panels were produced by Paleoindians, we first compiled counts of diagnostic projectile points found at GBCA sites using information from site forms, technical reports, artifact catalogs from surface collections and excavations, and published sources (Fagan, 1974; Fowler, 1993; Fowler et al., 1989; Konoske, 2006; Ricks, 1998; Tipps, 1997; Weide, 1968). Using Oetting’s (1994) projectile point chronology, which he developed specifically for the northern Great Basin by compiling data from multiple point samples from radiocarbon-dated contexts in the northern and western Great Basin, we assigned these points to particular cultural periods (Table 1). Point totals for each cultural period were summed across all sites, producing frequencies of diagnostic points from each cultural period at all GBCA rock art sites combined.

Second, we compiled totals of time-sensitive projectile points reported by other researchers working within or near the geographic distribution of GBCA sites: (1) the Fort Rock Basin, Oregon (Aikens and Jenkins, 1994); (2) the Chewaucan-Abert Basin, Oregon (Oetting, 1995); (3) Steens Mountain, Oregon (Jones, 1984); and (4) the Massacre Lake Basin, Nevada (Leach, 1988) (see Fig. 2). These projects were conducted in varied environmental and topographic settings, many of which were systematically and randomly sampled.3 As such, these “study areas” provide what Bettinger (1995: 69) calls a “census” of projectile points that together represent a reasonable approximation of the frequencies of projectile points found across the general landscape in different areas within the overall distribution of GBCA rock art sites.

Third, we compared counts of projectile points at GBCA sites and each of the four study areas using Pearson’s chi-square tests. Chi-square tests are used to determine if there are significant relationships between categorical variables (e.g., projectile point types and groups of archaeological sites). Because chi-square tests alone only indicate that a significant difference exists between two variables but do not show where such differences exist, we also calculated the standardized residuals for each comparison. Standardized residuals are a measure of the deviance of observed values (o) from expected values (e) in each cell within the contingency table and are calculated as follows:

Standardized Residual = \( \frac{o - e}{\sqrt{e}} \)

Standardized residuals of \( >+1.96 \) indicate that a cell’s observed frequency is significantly greater than its expected frequency and standardized residuals of \( <-1.96 \) indicate that a cell’s observed frequency is significantly less than its expected frequency. As a final test of the relationship between GBCA rock art sites and projectile points from different periods, we grouped points from all four study areas into one sample and compared it to the point frequencies from GBCA sites using the same methods outlined above. We expect that if GBCA petroglyphs were produced during the TP/EH, then Paleoindian points should be significantly and consistently overrepresented at GBCA sites compared to each of the four study areas, which comprise a very diverse sample of the northern Great Basin landscape.

Following these comparisons, we examined two environmental variables of GBCA sites – elevation and onsite vegetation – to understand how (and potentially why) GBCA sites are distributed on the landscape. Regarding elevation, we totaled the number of GBCA sites at which geophytes (e.g., bitterroot, wild onion and carrot, sego lily, yampa, biscuitroot) were reported on site forms. Additionally, because Ricks (1999) suggests that a low sage community may serve as a proxy for geophytes because both groups of taxa favor well-drained lithosols, we used the presence of low sage at GBCA sites as a proxy for geophytes and noted the number of GBCA sites at which low sage was reported. A list of all known GBCA sites and counts of diagnostic points, elevation data, and onsite vegetation is provided in Table 3.

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2 Data are not available for the remaining eight sites with GBCA panels so it is currently unknown if those sites also contain other, presumably later, styles of rock art.

3 Bettinger (1999) provides the projectile point totals used in our four comparative study areas; we compiled the data presented below. Point frequencies for the Fort Rock Basin were derived from ~ 350 sites and ~ 415 isolated points recovered during systematic random and non-random surveys and, to a lesser extent, excavations at Paulina Marsh, Buffalo Flat, Far View Butte, Duncan Creek, Boulder Village, Teri’s House, Scott’s Village, and Playa 9 (Robert Bettinger, personal communication, 2013). These efforts, which are reported throughout Aikens and Jenkins (1994), cumulatively resulted in ~ 73 km2 ranging in elevation from 4300 to 5700 feet ASL being surveyed. Oetting’s (1995) Chewaucan-Abert Basin point frequencies were derived from 58 archaeological sites and 12 isolated points recorded during the Rivers End Ranch Project, a non-random 800-acre survey ranging in elevation from 4275 to 4280 feet ASL. Jones’ (1984) point frequencies were derived from 81 sites and 375 isolated points recorded during a systematic random survey of uplands and lowlands surrounding Steens Mountain totaling ~ 81 km2 and ranging in elevation from 4000 to 9733 feet ASL. Finally, Leach’s (1988) point frequencies were compiled from 573 sites and 291 isolated artifacts recorded during her systematic random survey of 115 km2 and review of previously recorded sites within 10 ecological zones in the Massacre Lake Basin, which ranges in elevation from 5615 to 6600 feet ASL.

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### Table 1

<table>
<thead>
<tr>
<th>Cultural period</th>
<th>Age range (¹⁴C B.P.)</th>
<th>Diagnostic artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleoindian</td>
<td>pre~7500</td>
<td>Fluted and unfluted concave-base and stemmed points, crescents</td>
</tr>
<tr>
<td>Early Archaic</td>
<td>7500~5000</td>
<td>Northern Side-notched points, Humboldt, Gatedfluid, and Elle points</td>
</tr>
<tr>
<td>Middle Archaic</td>
<td>5000~1500</td>
<td>Rosegate points</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>1500~700</td>
<td>Desert side-notched and cottonwood points</td>
</tr>
<tr>
<td>Late Prehistoric</td>
<td>post~700</td>
<td></td>
</tr>
</tbody>
</table>

Note: Diagnostic artifacts and associated cultural periods are derived from Oetting (1994), who assigned age ranges to the point types using data compiled from multiple researchers who, in turn, examined assemblages from radiocarbon-dated contexts in the northern and western Great Basin.

### Table 2

<table>
<thead>
<tr>
<th>Study region</th>
<th>Elevation zone (feet above sea level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southcentral Oregon</td>
<td>Lowland &lt;4800, Intermediate/ Midland 5651~6101, Upland &gt;5651</td>
</tr>
<tr>
<td>Northwestern Nevada</td>
<td>Lowland &lt;5850, Intermediate/ Midland 5851~6101, Upland &gt;6101</td>
</tr>
</tbody>
</table>

Reference: (1988)
4. Results

4.1. Establishing the age of GBCA petroglyphs

Of the 55 GBCA sites listed in Table 3, 60 percent \( (n = 33) \) contained at least one temporally diagnostic projectile point. Of those 33 sites, 76 percent \( (n = 25) \) contained at least one Paleoindian point as well as points from later periods. Finally, four of the 33 sites containing diagnostic points (12 percent) contain only Paleoindian points and no points from later periods. In sum, Paleoindian points occur at most of the GBCA sites containing diagnostic points.

Table 4 summarizes the paired comparisons of time-sensitive projectile points at GBCA sites and each of the four northern Great Basin study areas as well as the comparison of GBCA sites to all study areas combined. Regardless of whether point frequencies at GBCA sites are compared to point frequencies from the individual or combined study areas, two trends are clear: (1) Paleoindian points are overrepresented at GBCA sites relative to their occurrence in the other study areas; and (2) with one exception (the Fort Rock Basin), Early Archaic and later points are not significantly overrepresented at GBCA sites. The first trend is important because it demonstrates that Paleoindian points and GBCA petroglyphs...
panels are significantly associated. In spite of the different topographic and environmental settings of the four study areas, as well as their different occupational histories (as evidenced by the considerable variability in their respective projectile point frequencies), Paleoindian points are consistently and significantly overrepresented at GBCA sites compared to other parts of the region in which GBCA sites occur. We interpret this to mean that Paleoindians produced GBCA rock art in the northern Great Basin. The second trend is important because it demonstrates that Early Archaic points and GBCA rock art sites are not strongly associated, which suggests that most GBCA rock art was not produced during that period (a possibility given that the stratigraphic relationship between the Long Lake panels and Mazama tephra indicates only that the panels likely predate ~6850 14C B.P. (~7700 cal B.P.) but do not necessarily date to the TP/EH). The second trend is also important because it demonstrates that Middle and Late Archaic as well as Late Prehistoric groups likely also did not produce GBCA rock art.

There are at least two reasons to think that the projectile point frequencies presented above do not fully represent the Paleoindian presence at GBCA sites (as well as on the general landscape). First, Jones and Beck (1999: 87) argue that Paleoindian points were:

more highly prized by their users, more highly curated than their Archaic equivalents (Beck and Jones, 1997), and thus less
frequently discarded. It is therefore unrealistic to assume
that two stemmed points may herald a very significant TP/EH occupation."

In other words, because Paleoindian points were more heavily "curated" than later points — a view shared by many researchers (e.g., Goebel et al., 2011; Jones et al., 2003; Smith, 2007) — they may have been discarded on the landscape at lower rates than later points. Thus, that Paleoindian points are overrepresented at GBCA sites may be especially telling about the initial period of occupation at those sites. Second, most (78 percent) GBCA sites are located in mid- to upper-elevation zones (Table 5), in what would have been very different habitats than TP/EH wetlands. We believe that the fact that Paleoindian points are overrepresented at GBCA sites, most of which occur away from the pluvial environments with which Great Basin researchers (e.g., Bedwell, 1973; Elston and Zeannah, 2002; Jones et al., 2003) typically associate early populations, offers additional support for the hypothesis that the petroglyph style dates to the TP/EH.

4.2. Vegetation at GBCA sites

Table 6 shows the frequency of GBCA sites that have geophytes and/or a low sage community on site. Various geophytes were listed on site forms for 35 percent (n = 19) of GBCA sites. It is likely that the number of GBCA sites associated with geophytes is higher, but that such taxa were not noted because many remain underground for much of the year with no vegetative structures apparent. A low sage community was reported on 87 percent (n = 48) of GBCA site forms. These results, derived from the most comprehensive list of GBCA sites compiled to date, indicate that at least one-third of GBCA rock art sites — and many more if low sage is used as a proxy — are associated with the geophyte communities that ethnographic and prehistoric groups exploited (Couture et al., 1986; Housley, 1994; Prouty, 1994). Although more fine-grained paleoenvironmental records are needed to better understand if and how vegetation communities including geophytes changed over time, because root crop distributions are closely tied to soil type (Boeken, 1989; Dafni et al., 1981; Housley, 1994; Prouty, 1994), their distribution may have varied less over time than other vegetation types (Housley, 1994; Prouty, 1994; Schlessman, 1984). As such, while we await more detailed records of environmental change, we suggest that the distribution of geophytes today roughly approximates their

Table 4

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<tr>
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<td>25 (46%)</td>
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Note. Obs = observed values; Exp. = expected values; SR = standardized residuals with significant values bolded.

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5 Using Paleoindian projectile points as index fossils to date GBCA rock art allows only coarse-grained estimates of when the panels were produced. Concave-base points remain very poorly-dated and ~70 percent of the radiocarbon dates associated with stemmed points fall between 10,000 and 7500 14C B.P. (~11,475 and 8325 cal B.P.) (Beck and Jones, 1997). Excluding the GBCA sites with directly dated materials (Long Lake and Winnemucca Lake), we do not know exactly when during the TP/EH most of GBCA panels were produced.

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Note. Obs = observed values; Exp. = expected values; SR = standardized residuals with significant values bolded.
distribution during the TP/EH and that root crops were a potential reason why Paleoindians ventured into upland zones.

It is interesting to note that Cannon and Ricks (1999) have observed that GBCA sites frequently contain large, well-used bedrock metate surfaces that are completely revarnished in the same manner as the GBCA rock art. Long Lake, for example, contains more than 70 large bedrock grinding surfaces, many of which are partially or completely revarnished. While we lack exact counts of grinding surfaces found at all GBCA sites in the northern Great Basin, Cannon and Ricks (1999) suggest that they are frequently found together and potentially coeval given similar degrees of weathering. Future research could include compiling counts of revarnished grinding surfaces at each of the 55 GBCA sites presented here and quantitatively evaluating the possibility that TP/EH groups used grinding surfaces to process geophytes. Ethnographically, after being roasted and/or dried, root crops were sometimes mashed or pounded on ground stone surfaces and turned into flour (Couture, 1978; Couture et al., 1986; Housley, 1994; Prouty, 1994, 2001; Schroth, 1996; Stewart, 1942).

5. Discussion

The results of our analysis indicate that: (1) Paleoindian projectile points are significantly overrepresented at GBCA sites relative to the general landscape; (2) most GBCA sites are in upland settings; and (3) many GBCA sites are associated with geophytes and/or low sage communities. Together, these trends hint at an aspect of early lifeways that has generally not been incorporated into models of Paleoindian adaptation in the Great Basin. Based on these trends, we suggest, as Cannon and Ricks (1999) have, that Paleoindians ventured into higher elevation settings not only to hunt but perhaps also to harvest root crops. While subsistence residues — in particular those related to plant consumption — are rare at TP/EH sites, there is some direct evidence for geophyte processing from that period in the northern Great Basin. Prouty (2004: 163) recovered biscuitroot in a context dated to ~8800 14C B.P. (~9825 cal B.P.) at the Locality III Site in the Fort Rock Basin. Additionally, recent work at the Paisley Caves has produced a human coprolite dated to ~12,300 14C B.P. (~14,200 cal B.P.) that contains ~9000 Apiaceae (a family of geophytes that includes wild carrots, desert parsley, and biscuitroot) pollen grains per cubic centimeter. Furthermore, Apiaceae starch was recovered from the surface of a polished and battered handstone found in a stratum dated to 11,560 and 12,425 14C B.P. (~13,400 and ~14,500 cal B.P.) at that site (Dennis Jenkins, personal communication, 2013). Finally, although located some distance from the northern Great Basin, Reddy and Erlanson (2012) report that Brodiaea (a genus of edible geophytes that include blue dicks, Ithuriel’s spear, and cluster lilies) corms were recovered from cultural strata dated to between ~8500 and ~7700 14C B.P. (~10,000 and ~8500 cal B.P.) at Daisy Cave on California’s Channel Islands. Although few in number, these examples provide direct evidence for root crop consumption in the northern Great Basin and Far West during the TP/EH that support our suggestion of early geophyte processing. Based on experimental and ethnographic data, which indicate return rates of 2000–4000 kcal/h may be achieved for some root foods, Trammell et al. (2008) suggest that geophytes should be listed among the highest ranked plant resources. Thus, that Paleoindians appear to have exploited them is not especially surprising.

Over 20 years ago, Mary F. Ricks and William J. Cannon (Cannon et al., 1990; Ricks, 1995) developed a model of prehistoric land-use for Oregon’s Warner Valley in which groups occupied marshside camps during the winter months and moved to higher-elevation camps during the spring and summer. They argued in addition to large mammal hunting, root crop harvesting was a major impetus for moving to the uplands and suggested that this strategy of seasonal land-use had been used in Warner Valley for the past 7000 radiocarbon years (~7825 calendar years). The co-occurrence of projectile points, groundstone, and GBCA rock art in geophyte-rich upland locales presented in this paper may mark some of these upland camps, and given the over-representation of Paleoindian points at such places, Ricks and Cannons’ model may be extended both into the TP/EH and across the portion of the northern Great Basin in which GBCA sites have been recorded. Their model, in which uplands were a critical part of a seasonal round, differs substantially from most treatments of Paleoindian lifeways, which emphasize the importance of lower-elevation zones (e.g., pluvial wetlands) and downplay the importance of higher-elevation zones. While we acknowledge the importance of lacustrine settings to TP/EH populations and the fact that most substantial Paleoindian sites are found there, our results suggest that early groups also used uplands in the northern Great Basin. This fact has not generally been acknowledged, likely due to the relative paucity of traditional TP/EH index fossils (e.g., projectile points) there. Root crop procurement may have been a primary subsistence pursuit in mid- and upper-elevation zones—a activity unlikely to produce large numbers of diagnostic projectile points. Roots were likely procured using wooden digging sticks like they were during ethnographic times (Couture et al., 1986; Prouty, 1994). Such activities are unlikely to leave much evidence except perhaps unmodified stone flakes or spokeshaves used to manufacture/maintain digging sticks or peel roots, and perhaps groundstone used to process the geophytes (Couture, 1978; Couture et al., 1986; Housley, 1994; Prouty, 1994, 2001). The latter of these artifact types — groundstone — is well represented at GBCA sites (Bill Cannon, personal communication, 2013).

6. Conclusion

Upon recognizing the difficulties associated with reconstructing TP/EH lifeways using a record dominated by flaked stone artifacts, Jones et al. (2003: 8) argue that “we need to recast our expectations to make use of other sources of information.” Barker et al. (2012) echo this sentiment, acknowledging that much of our understanding of Paleoindian lifeways comes from a single source — lithic scatters. While these data permit an understanding of lithic technological organization, expanding the study of this period to include other aspects of Paleoindian behavior has proven difficult. In this paper, we have demonstrated that Paleoindian projectile points are significantly overrepresented at GBCA sites in the northern Great Basin relative to their occurrence on the general landscape. Because most GBCA sites are not associated with relict TP/EH wetlands but are instead found primarily in mid- and upper-elevation zones, we find this consistent and strong association between the petroglyph style and Paleoindian projectile points especially telling and interpret it to mean that Great Basin populations produced rock art during the TP/EH — an argument that Cannon and Ricks (1986; Ricks, 1995, 1999; Ricks and Cannon, 1993) and Benson et al. (2013) have made for specific sites. Our interpretations are in line with other recent rock art studies in Western North America. For example, Whitley’s (2013) application of two independent rock varnish dating techniques (cation-ratio and varnish microlamination) to

Table 6

<table>
<thead>
<tr>
<th>Study area</th>
<th>Geophytes</th>
<th>Low sage community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>GBCA sites</td>
<td>19 (35%)</td>
<td>36 (65%)</td>
</tr>
</tbody>
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abstract and representational petroglyphs in the western Great Basin suggests that those styles may also have been produced as early as the TP/EH. Similarly, Francis and Loendorf’s (2002) study of Dinwoody petroglyphs from Wyoming’s Bighorn and Wind River basins based on rock varnish AMS and microlamination dates suggests that style may have first been produced during the early Holocene. Thus, although attempts to date petroglyphs are uncommon and some methods remain experimental, several studies from different geographic areas seem to indicate that Paleoindians produced rock art in Western North America.

After demonstrating that Paleoindian points and GBCA sites are significantly associated, we proposed that a model in which early groups utilized uplands on a seasonal basis to collect and process root crops, similar to the one developed by Cannon et al. (1990) for later periods in Warner Valley, likely also characterized the TP/EH. This model remains a hypothesis to be tested with additional surveys of onsite vegetation and high-resolution paleoenvironmental records within the distribution of GBCA sites.

While this study employed all currently known GBCA sites in the northern Great Basin, there are undoubtedly additional undiscovered GBCA sites. In fact, several additional GBCA sites — some with revarnished groundstone — have recently been found in Lake County, Oregon (Bill Cannon, personal communication, 2013) and should be included in future studies. Targeted research like the Lake County Oregon Rock Art Inventory will likely continue to identify more GBCA petroglyphs. Should land managers and other researchers working in Oregon, Nevada, California, and Washington undertake similar surveys, more sites may be discovered and the geographic distribution of the GBCA style expanded. Furthermore, the model of land-use presented here would benefit from an analysis of vegetation communities within the geographic distribution of GBCA sites to help determine if the association between GBCA sites and geophyte taxa is unique to these rock art sites, or if other non-rock art sites on the landscape also exhibit similar trends.

Finally, previously recorded GBCA sites should be revisited to look for evidence associated with root crop procurement and processing (e.g., flake tools, groundstone); in particular, the completely revarnished bedrock metates that Cannon and Ricks (1999) have noted. These efforts should serve to support or refute the model of Paleoindian land use proposed here and continue to refine our understanding of TP/EH lifeways in the northern Great Basin.

Acknowledgments

William Cannon generously provided the hypothesis that Paleoindian points occur at upland GBCA sites and Paleoindians collected and processed geophytes at those places, in addition to freely sharing his time, expertise, and support of this study, which is a much condensed version of Middleton’s (2013) Master’s thesis. The Great Basin Paleoindian Research Unit (GBPRU), Department of Anthropology, University of Nevada, Reno, supported Middleton’s research on Paleoindian rock art. Dave Rhode, Bob Elston, Pat Barker, and Peter Goin provided helpful comments on earlier versions of this paper. Catherine Fowler and Pat Barker provided information regarding the role of grinding stones in geophyte processing, and David Whitley and Bob Buttering provided additional details about their respective studies. Suggestions made by four anonymous reviewers helped to make the final version of the paper better.

References


