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THE AVOCATIONIST'S CORNER

REPORTS

CERAMIC PRODUCTION, FREMONT FORAGERS, AND THE LATE ARCHAIC PREHISTORY OF THE NORTH-CENTRAL GREAT BASIN

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Recent excavations at the Scorpion Ridge site, combined with chemical and petrographic analyses of the ceramic sherds recovered from that site and others in the area, suggest that Fremont plain wares were locally manufactured in the Upper Humboldt drainage by at least 1200 B.P. Thus, local ceramic production in portions of the central Great Basin occurred at least seven centuries earlier than the initial manufacture of Intermountain Brownware. Nevertheless, all of the Fremont and Intermountain Brownware ceramic samples analyzed here from the Upper Humboldt drainage basin were tempered with a schistose biotite granodiorite that contrasts with the monzonite temper found in plain wares from Ruby Valley, located on the east side of the Ruby Mountains. Fremont wares from the west Bonneville Basin region were tempered with materials unlike those of the Upper Humboldt River basin, and at least one of these vessels was probably manufactured in central or southern Utah. The projectile points from Scorpion Ridge include Nawthis Side-notched, and this may be the oldest and northernmost occurrence of this type found to date. The relationship of the inhabitants of the Scorpion Ridge site to farmers inhabiting the Fremont core region is uncertain, but it once stretched into the central Great Basin.

The Fremont were a mix of horticulturalists and foragers who occupied much of the eastern Great Basin from about 1500 to 500 years ago (Madsen 1980, 1989; Marwitt 1986). The Fremont also occupied areas to the east, north and south of the hydrographic Great Basin, including portions of southwestern Wyoming, northwestern Colorado, southeastern Idaho and southern Utah (Madsen and Simms 1998: Figure 1; Smith 1992). The Fremont occupation of regions west of the eastern Great Basin (west of the Bonneville Basin and the highlands that drain that basin) is not well defined or understood.

In a recent synthesis, Madsen and Simms (1998) suggest that the Fremont archaeological culture represents a variety of peoples who engaged in a diverse suite of subsistence practices, including full-time foraging, full-time horticulture, and a mix of foraging/horticulture that was very fluid in nature (see also Simms 1986, 1999). Within the Fremont culture, a diverse suite of ideologies concerning social norms and political organizations may have been practiced (Barker 1994; Hockett 1998; Janetski 2002; Talbot et al. 2000). Despite this diversity, these groups were somehow linked through the manufacture and trade of distinctive material items such as ceramics, projectile points, and textiles (Marwitt 1970; Morss 1931). Madsen and Simms (1998) defined this linkage as a "Fremont Behavioral Complex", in many respects similar to the "Hopewellian Interaction Sphere" defined earlier for sites in the midwestern and eastern

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United States. Consider, for example, the following quotation from Ritzenthaler (1985:48), suggesting a similar conclusion is being drawn for the Fremont phenomenon:

> People still had their local ways of doing things, but Hopewell was a broad-scale phenomenon which overlaid these regional traditions. While Hopewell was not a separate culture, it is not necessarily clear what it represented. The closest term that archaeologists have come to accept is 'interaction sphere'.

One of the central issues to investigate in Fremont studies is the relationship between settled farmers at the center and foragers at the margins. Were the foragers along the Fremont periphery once farmers who left the center in search of new lands to cultivate? Were they folks who simply adopted some material items through contact with farmers? How far west did the Fremont Behavioral Complex extend? Madsen (1989) noted that Fremont ceramics have been found as far west as Grass Valley in central Nevada. However, research into these questions has been hampered by a number of assumptions about Late Archaic (post-1500 B.P.) prehistory west of the Bonneville Basin that may be in error. For example, it is well known that Eastgate and Rose Spring projectile points are common throughout the Intermountain West in sites that are clearly Fremont in character and in those that clearly are not (e.g., Holmer 1986). How are we to interpret a prehistoric campsite near the margins of the Bonneville Basin that contains Eastgate points but no ceramics? Should we assume that the site was left behind by a group who had no involvement in the Fremont Behavioral Complex? In addition, plain ware ceramics located west of the Bonneville Basin are often assumed to be Intermountain Brownware vessels that postdate ca. 700 B.P. Is this always the case? If Fremont ceramics are identified west of the Bonneville Basin, should we assume that they were manufactured elsewhere and traded into the western periphery?

Recent data collected from the Scorpion Ridge site in the central Great Basin (Figure 1) cast new light on these problems and assumptions. Among the artifacts recovered from Scorpion Ridge are 15 Eastgate points, one Fremont-style Nawthis Side-notched point, and approximately 150 gray to gray-brown plain ware ceramic sherds surrounding two hearths dating to approximately 1200 B.P. Plain wares are defined here as any non-painted vessel that may display various shades of color, including brown, tan, gray, and red. Results of chemical and petrographic thin sections of the ceramics from the Scorpion Ridge site and other plain and painted ware sherds from the region reported here for the first time suggest that the Scorpion Ridge vessels were manufactured from local clays and tempers procured from the Upper Humboldt drainage basin. These sherds extend the known age of locally manufactured plain wares by seven centuries, challenging previous assumptions about the age of ceramic production and the distribution of Fremont foraging cultures west of the Bonneville Basin.

LATE ARCHAIC CERAMICS AND PROJECTILE POINTS IN THE NORTH-CENTRAL GREAT BASIN: PREVIOUS RESEARCH

The north-central Great Basin is defined here as an arbitrary subregion of the cultural Great Basin as discussed in Grayson (1993). The northeastern one-quarter of Nevada encompasses most of this subregion (Figure 1), and this 16,000 square-kilometer area serves as the focus of this paper. The introduction of the bow-and-arrow about 1300 years ago marks the beginning of the Late Archaic in the north-central Great Basin (see Table 1).

The time period between 1300 and 600 B.P. represents the Maggie Creek Phase of the Upper Humboldt local chronological sequence (Elston and Katzer 1990), and it is characterized by the presence of Eastgate and Rose Spring projectile points (Holmer 1986). Fremont ceramics have occasionally been recovered in Maggie Creek Phase assemblages (e.g.,

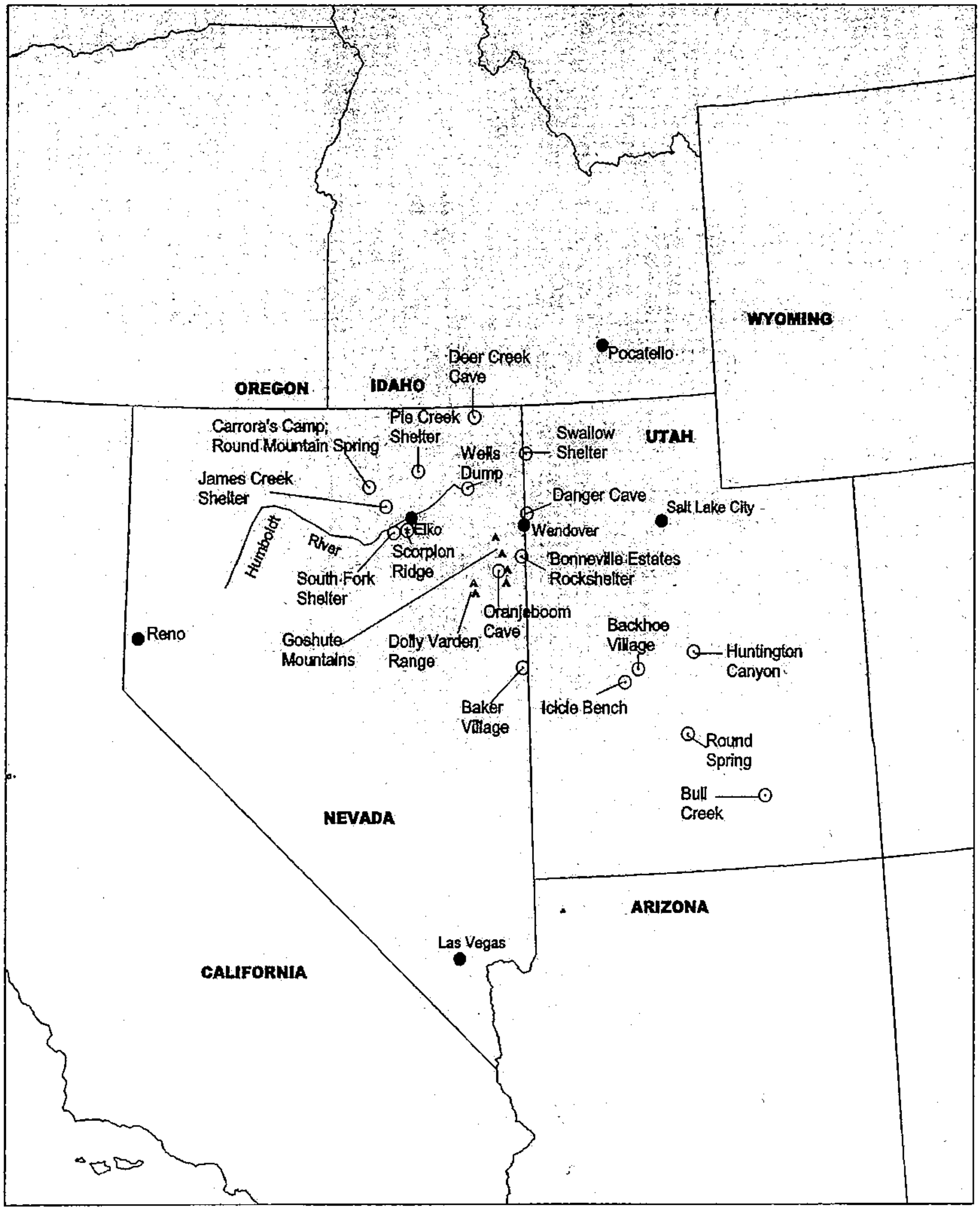


Figure 1. Location of sites mentioned in text. The ceramic sherds listed by "CRNV" numbers were all found at open-air sites located along the Humboldt River between the headwaters of the Humboldt (the location of the Wells Dump site) to the east and the city of Elko to the west.

Table 1. Radiocarbon results and associated features, projectile points, and ceramics from single-component open-air sites and stratified occupations in caves and rockshelters excavated in northeastern Nevada through 2002. All reported dates are either unadjusted radiocarbon years B.P. or conventional radiocarbon B.P. dates adjusted for $^{13}C/^{12}C$ fractionation.

Site	^{14}C Age (B.P.)	Associated Artifacts	Reference
26EK4688, Locus 6	80 +/- 40	hearth; DSN point	Birnie (2001)
26EK6487	150 +/- 50	hearth; DSN point; ceramic sherd	Birnie (2000)
Dry Susie Creek	210 +/- 70	hearths; Cottonwood points; "Shoshone knife"	Reust et al. (1994)
26EK4688, Locus 8[a]	210 +/- 50	hearth; DSN and Cottonwood points	Birnie (2001)
James Creek Shelter	240 +/- 50	hearths; DSN points	Budy and Katzer (1990); Drews (1990)
Max's Retreat	250 +/- 50	hearths; DSN and Cottonwood points; brownware ceramics	Hall (1985)
CRNV-11-9371	280 +/- 50	hearth; DSN point; brownware ceramics	Vierra and Langheim (2002)
James Creek Shelter	280 +/- 50	hearths; DSN points	Budy and Katzer (1990); Drews (1990)
26EK3106	300 +/- 70	hearth; DSN points	Ataman and Drews (1992)
James Creek Shelter	300 +/- 50	hearths; DSN points	Budy and Katzer (1990); Drews (1990)
CRNV-11-8979	320 +/- 40	living/house floor; DSN point on floor	Hockett et al. (1999)
26EK5270	330 +/- 60	hearth; DSN and Cottonwood points	Tipps (1996)
Max's Retreat	340 +/- 50	hearths; DSN and Cottonwood points; brownware ceramics	Hall (1985)
CRNV-11-12103	470 +/- 50	hearth; DSN and Cottonwood points	Hockett (2003)
Round Mountain Camp	480 +/- 60	hearth; DSN points; brownware ceramics	Bright (1998)
26EU1505	490 +/- 110	hearth; DSN points	Tipps and Stratford (1996)
Carorra's Camp	590 +/- 50	hearth; DSN and Cottonwood points	Tipps (1988)
Wells Dump	750 +/- 70	hearth, Eastgate point; brownware ceramics; bison remains	Murphy (1988)
James Creek Shelter	750 +/- 50	hearths; Rose Spring and Eastgate points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	850 +/- 50	hearths; Rose Spring and Eastgate points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	930 +/- 60	hearths; Rose Spring and Eastgate points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	970 +/- 70	hearths; Rose Spring and Eastgate points; Fremont-style grayware?	Budy and Katzer (1990); Drews (1990)
Oranjeboom Cave	1100 +/- 40	hearths; Eastgate points; Fremont-style ceramics	Buck et al. (2003)
Swallow Shelter[b]	1120 +/- 110	hearths; mainly Rose Spring and Eastgate points; a few Elko points	Dalley (1976)
James Creek Shelter[c]	1190 +/- 60	hearths; mainly Rose Spring and Eastgate points; a few Elko points; Fremont-style grayware?	Budy and Katzer (1990); Drews (1990)
Scorpion Ridge	1200 +/- 40	hearths; Eastgate points; two Elko points; Nawthis Side-notched point; brown/gray ware ceramics	this report
Oranjeboom Cave	1220 +/- 60	hearths; Eastgate points; Fremont-style ceramics	Buck et al. (2003)
James Creek Shelter	1240 +/- 50	hearths; mainly Rose Spring and Eastgate points; a few Elko points	Budy and Katzer (1990); Drews (1990)
Scorpion Ridge	1290 +/- 40	hearths; Eastgate points; two Elko points; Nawthis Side-notched point; brown/gray ware ceramics	this report
Pie Creek Shelter[d]	1580 +/- 70	hearth; mainly Late Archaic and Elko points	McGuire et al. (2003)

Site	^{14}C Age (B.P.)	Associated Artifacts	Reference
CRNV-11-12177	1710 +/- 60	hearth; Elko point	Hockett (2002)
Ander Wright	1850 +/- 60	hearth; mainly Gatecliff points; several Elko points	Zeanah and Elston (1997)
Ander Wright	1890 +/- 60	hearth; mainly Gatecliff points; several Elko points	Zeanah and Elston (1997)
Ander Wright	1900 +/- 60	hearth; mainly Gatecliff points; several Elko points	Zeanah and Elston (1997)
James Creek Shelter	1940 +/- 60	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	2350 +/- 100	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
Pie Creek Shelter[d]	2510 +/- 60	hearth; mainly Elko points	McGuire et al. (2003)
James Creek Shelter	2630 +/- 100	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
Swallow Shelter[b]	2630 +/- 110	hearths; mainly Elko points	Dalley (1976)
Dry Susie Creek	2640 +/- 70	house floors; hearths; Elko points; "Shoshone knife"	Reust et al. (1994)
Pie Creek Shelter	2740 +/- 40	hearth; mainly Elko points	McGuire et al. (2003)
James Creek Shelter	2750 +/- 70	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	2780 +/- 120	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
Swallow Shelter	2850 +/- 100	hearths; mainly Elko and Gatecliff points	Dalley (1976)
Dry Susie Creek	2890 +/- 60	house floors; hearths; Elko points; "Shoshone knife"	Reust et al. (1994)
Dry Susie Creek	3030 +/- 70	house floors; hearths; Elko points; "Shoshone knife"	Reust et al. (1994)
Pie Creek Shelter	3060 +/- 40	hearth; mainly Elko points	McGuire et al. (2003)
James Creek Shelter	3160 +/- 100	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
James Creek Shelter	3280 +/- 70	hearths; Elko points	Budy and Katzer (1990); Drews (1990)
South Fork Shelter[e]	3320 +/- 200	"midden" deposit; mainly Elko points	Heizer et al. (1968)
Pie Creek Shelter[d]	3350 +/- 90	hearths; mainly Gatecliff points	McGuire et al. (2003)
Swallow Shelter	3500 +/- 100	hearths; mainly Gatecliff, Humboldt, and Elko points	Dalley (1976)
Pie Creek Shelter	3740 +/- 40	hearths; mainly Gatecliff points	McGuire et al. (2003)
James Creek Shelter[c]	3890 +/- 100	mainly Gatecliff points	Budy and Katzer (1990); Drews (1990)
Pie Creek Shelter[d]	3930 +/- 40	Humboldt points	McGuire et al. (2003)
Pie Creek Shelter	3960 +/- 70	hearths; mainly Gatecliff points	McGuire et al. (2003)
Pie Creek Shelter[d]	4300 +/- 70	hearths; large side-notched points; untyped stemmed and leaf-shaped varieties	McGuire (2003)
Pie Creek Shelter	4640 +/- 40	Humboldt points	McGuire (2003)
Pie Creek Shelter	4840 +/- 80	hearths; large side-notched points; untyped stemmed and leaf-shaped varieties	McGuire (2003)
Bonneville Estates Rockshelter[f]	6040 +/- 80	Northern Side-notched points; Pinto-like points; untyped side-notched points with convex-bases and "keyhole" basal notches	Schroedl and Coulam (1989); Graf et al. (2002)
Bonneville Estates Rockshelter	6100 +/- 50	Northern Side-notched points; Pinto-like points; untyped side-notched points with convex-bases and "keyhole" basal notches	Graf et al. (2002)
Bonneville Estates Rockshelter	6100 +/- 80	hearths; large side-notched points	Graf et al. (2002)
Bonneville Estates Rockshelter	6280 +/- 40	hearths; large side-notched points	Graf et al. (2002)

Site	^{14}C Age (B.P.)	Associated Artifacts	Reference
Bonneville Estates Rockshelter	7190 +/- 50	hearths; large side-notched points	Graf et al. (2002)
Bonneville Estates Rockshelter	7280 +/- 50	hearths; large side-notched points	Graf et al. (2002)
Bonneville Estates Rockshelter	7420 +/- 50	hearth; just below strata yielding large side-notched points	Graf et al. (2002)
Bonneville Estates Rockshelter	9520 +/- 60	hearth; stratigraphically associated with strata yielding stemmed points	Graf et al. (2002)
Bonneville Estates Rockshelter	10,040 +/- 70	hearth; Great Basin stemmed points	Graf et al. (2002)
Bonneville Estates Rockshelter	10,080 +/- 50	hearth; Great Basin Stemmed points	Graf et al. (2002)
Deer Creek Cave[g]	10,085 +/- 400	hearth	Shutler and Shutler (1963)
Bonneville Estates Rockshelter	10,130 +/- 60	hearth; Great Basin Stemmed points	Graf et al. (2002)

[a] A total of eight DSN points, five Cottonwood points, and one Rose Spring point was recovered from Locus 8. Given the relatively large sample of projectile points recovered, and the fact that 13 of the 14 points were either DSN or Cottonwood, the locus is listed as a good candidate for dating DSN and Cottonwood points. The date of manufacture of the Rose Spring point may or may not date to this time.

[b] Swallow Shelter is located along the Nevada-Utah border in extreme northwest Utah (see Figure 1). At Swallow Shelter, 27 of the 30 Rose Spring and Eastgate points (90%) post-date stratum 9, which was dated to ca. 1120 B.P. A total of 75 of the 77 Elko points recovered (97%) date between ca. 3500 and 1000 B.P. A total of 66 of the 77 Elko points (86%) date between ca. 3500 and 1120 B.P. A total of 25 of the 27 Gatecliff points (93%) and 5 of the 7 Humboldt points (71%) date between ca. 3500 and 2800 B.P.

[c] At James Creek Shelter, 22 of the 23 Elko points (96%) post-date ca. 3300 B.P. Three of the 23 Elko points (13%) were found in strata dating to ca. 1200 B.P., similar in age to those found at the Scorpion Ridge site. One Elko (4.3%) was found in the stratum dating to ca. 3900 B.P. The Gatecliff points all came from the stratum dating to ca. 3900 B.P.

[d] At Pie Creek Shelter, 12 of the 14 Rose Spring and Eastgate points (86%) were recovered from sediments post-dating ca. 1600 B.P., as were all of the DSN and Cottonwood points. These data suggest that arrow points generally post-date ca. 1600 B.P., and this date may closely approximate the earliest dates for Rose Spring and Eastgate points in the region. In addition, as suggested by the projectile points from Scorpion Ridge, as well as other Fremont assemblages in the eastern Great Basin (see discussions, this report), the Pie Creek data suggest that Elko points continued to be manufactured after the arrival of the bow-and-arrow. Six of the 12 Elko points (50%) post-date ca. 1600 B.P. Four Elko points were found in Stratum 6, dating between 3060 and 2510 B.P.; thus, 10 of the 12 Elko points (83%) post-date ca. 3100 B.P. at Pie Creek Shelter. A total of 7 of the 8 Gatecliff points (88%) pre-date ca. 3350 B.P., and these 7 points were bracketed by dates of ca. 4000 to 3350 B.P. All of the Humboldt, large side-notched, and untyped leaf and stemmed varieties pre-date ca. 3900 B.P.

[e] At lower South Fork Shelter, all 38 Elko Corner-notched and Elko-Eared points were found at least six inches above the layer dated to ca. 3300 B.P. Thus, a total of 145 of the 150 Elko points (97%) from Pie Creek Shelter, James Creek Shelter, South Fork Shelter, and Swallow Shelter was recovered from sediments that post-date ca. 3500 B.P. The single purported "Elko" point associated with a large side-notched point and a 5800 B.P. date at Upper South Fork Shelter (Spencer et al. 1987) may, in fact, be a Gatecliff point. However, as indicated above at Pie Creek Shelter, James Creek Shelter, and Swallow Shelter there are hints that Elko points may have occasionally been produced before ca. 3500 B.P. in northeastern Nevada, albeit in very low numbers. A statistical comparison of obsidian hydration measurements on Elko and Gatecliff points reported in Hockett (1995) showed that hydration bands on Elko points were significantly thinner than those on Gatecliff points, suggesting again that the vast majority of Elko points post-date Gatecliff points in northeastern Nevada.

[f] At Bonneville Estates, Schroedl and Coulam (1989) typed several side-notched points that exhibit convex bases and "keyhole" notches in the base as Elko-Eared points in the ca. 6000 B.P. layer. These points clearly are not Elko Series, and probably represent a new form of side-notched point as yet unnamed in the region. Interestingly, Schroedl and Coulam (1989) noted that similar points were also recovered from the lower strata at both Danger Cave (Jennings 1957) and Hogup Cave (Aikens 1970). Thus, this unnamed point style probably has a distribution over much of the Bonneville Basin. On-going excavations at Bonneville Estates, with its 10,000 B.P.+ cultural record, may clarify this issue and will add a substantial amount of information to the body of data contained in the table above; in particular, numerous dates have been obtained on Late Holocene (post 4500 B.P.) occupations in the shelter, all of which will be reported at a later date.

[g] At Deer Creek Cave, all that can be securely stated is that human occupation likely began by the latest Pleistocene. Several hundred projectile points were recovered from the cave, and six C-14 dates were obtained from separate hearths found within the main excavation block. Five of these six radiocarbon dates were in chronological order, but one date of ca. 4200 B.P. was obtained between two other hearths that dated to ca. 2650 and 2585 B.P. Based on the provenience of the projectile points and the C-14 dates, the evidence from Deer Creek Cave would suggest that Desert Side-notched points are 4,000 to 5,000 years old and Elko Corner-notched points are 10,000 years old and contemporaneous with Great Basin Stemmed points, neither of which is likely. Ziegler (1963:16) reports that marmot (*Marmota flaviventris*) remains were second to mountain sheep (*Ovis canadensis*) in abundance, and marmot bones were found up to 20 inches below the hearth dated to ca. 10,100 B.P. In all probability, marmots actively burrowed deep into the cave's sediments, rendering the stratigraphic integrity of the cave's deposits in serious question; as a result, we consider this site to be a poor case study of projectile point chronology.

vessels were locally manufactured. Fremont ceramics ceased to be manufactured anywhere in the Great Basin after about 600-500 B.P.

Beginning about 600-500 B.P. in the north-central Great Basin, the Eagle Rock Phase is characterized by Desert Side-notched (DSN) and Cottonwood Triangular projectile points, as well as Intermountain Brownware ceramics (Pippen 1986). DSN points may mark the initial spread of Numic-speaking groups (e.g., Shoshone, Paiute, Ute, Goshute) across the Great Basin from a homeland near modern Death Valley, California (see Rhode and Madsen 1994). Intermountain Brownware ceramics were manufactured throughout the Intermountain West at this time.

As mentioned above, there are two general types of ceramics that have been identified in the north-central Great Basin: "Intermountain Brownware" and "Fremont". Intermountain Brownware is a general term that refers to many Great Basin ceramics manufactured after about 600 B.P. It is a utilitarian ware that is generally brown in color, often exhibiting rough or uneven outer walls with straight to slightly convex rims (Figure 2). In northeastern Nevada, Intermountain Brownware vessels take various forms from large 'flowerpots' with rounded, cone-like bases to flat-bottomed pots that may exhibit basketry impressions on the underside of the base. Most Intermountain Brownware vessels are undecorated, although fingernail impressions are present on some. In almost all cases, Intermountain Brownwares from northeastern Nevada were made with the coil-and-scrape technique, and scraping marks are often visible on the interior and exterior walls, adding to the 'rough' texture of finished vessels.

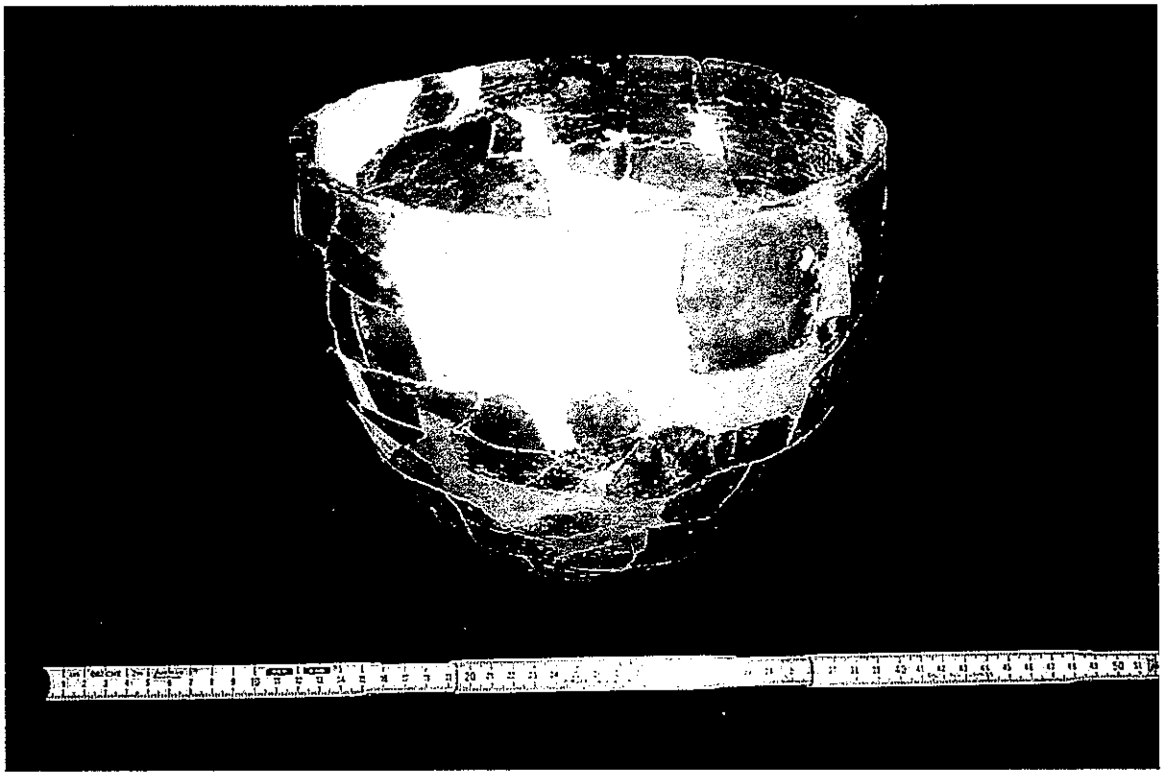


Figure 2. Typical Intermountain Brownware vessel that post-dates ca. 500 B.P. in northeastern Nevada. Note the irregular outer walls and relatively straight rim. This specimen was reconstructed from a site located in the Cherry Creek range west of the Goshute/Dolly Varden ranges.

Intermountain Brownwares stand in stark contrast to the relatively diverse suite of Fremont vessels manufactured before ca. 600 B.P. Fremont utilitarian wares take various forms from plain brown and gray wares to thick-walled corrugated vessels. However, even the plain wares manufactured before 600 B.P. in the Great Basin generally exhibit relatively even and smooth walls, although some of the so-called "Promontory" ware manufactured in the Great Salt Lake region around 500-700 B.P. is relatively crude (Madsen and Simms 1998). Many Fremont vessels also take the form of jars or jugs, often exhibiting 'flaring' or curved neck rims rather than the straight-walled rims of most Intermountain Brownwares. Fremont painted bowls and cups, reminiscent of some Anasazi wares, are common in many horticultural villages.

In the absence of artifacts such as projectile points and features such as datable hearths, it is becoming increasingly clear that temper and paste are poor mediums to classify and identify broken Great Basin plain wares (Dean 1987; Lyneis 1994; Madsen and Simms 1998). This is because early (pre-600 B.P.) and late (post-600 B.P.) vessels were often manufactured with the same or similar local materials within individual valley systems. As a result, vessel characteristics such as rim shape and wall preparation, as well as possible associations with other types of material items such as projectile points, probably are better mediums to classify Great Basin ceramics. In the absence of reliable C-14 dates, however, some vessels that are represented at individual sites by small samples and body sherds only remain difficult to classify with certainty (e.g., Fremont-like or Intermountain Brownware-like).

The Maggie Creek Phase in the north-central Great Basin chronologically overlaps the early phases of ceramic production and the establishment of Fremont horticultural villages throughout Utah and portions of east-central Nevada. Ceramic production may have begun as early as 1500 B.P. in the eastern Great Basin (Janetski et al. 1997; Madsen and Simms 1998), but Fremont horticultural villages with adobe architecture did not appear until 1000 to 1200 B.P. (Madsen and Simms 1998). Painted Fremont wares are not known to pre-date ca. 1000 B.P. in the eastern Great Basin, and appear to be associated with the fluorescence of villages in the central and northern portions of the Fremont complex, as well as with a period of upheaval and greater Anasazi influences stemming from the south (Madsen and Simms 1998). Corrugated ware is currently unknown from Fremont sites located around the Great Salt Lake (Madsen and Simms 1998:301), and could have been traded into the north-central Great Basin from elsewhere at about the same time as painted wares, perhaps from villages located in east-central Nevada or central/southern Utah.

In the north-central Great Basin the earliest securely dated Maggie Creek Phase occupations occur at James Creek Shelter (ca. 900-1250 B.P.; Madsen 1990) in the Upper Humboldt River drainage and at Oranjeboom Cave (ca. 1100-1200 B.P.; Buck et al. 2002) near the Nevada-Utah border (Table 1; Figure 1). These two sites also contain the only securely dated Fremont ceramics from the region. King (1994) found both painted and plain gray wares in Ruby Valley, and, based on the dating of nearby hearths, suggested that Fremont wares may have been manufactured there as early as 1400 B.P.; however, the palimpsest nature of these Ruby Valley sites render this interpretation unsubstantiated at this time. Other sites containing Fremont plain ware ceramics such as 'Great Salt Lake Gray' or 'Promontory Ware', have been found in undated surface contexts near the Nevada-Utah border (e.g., Seldomridge 1985; Murphy 1990; Moore 1994; Arkush 1999; Hockett et al. 1999), near the beginning of Loray Wash five miles northeast of Oasis (Seldomridge 1985), and along the eastern flank of the Cherry Creek Mountains. Portions of three Snake Valley Black-on-Gray painted bowls or cups have been recovered from three undated open-air sites. One is located near the Nevada-Utah border on the eastern flanks of the Goshute Mountains (analyzed as sample 12 below). Another site, 26EK2828 is the same site as the one mentioned above near Oasis that also produced

Fremont plain wares (Seldomridge 1985). The third site is located in Ruby Valley (Murphy 1983). Pieces of broken Fremont corrugated jars have been found at two locations in northeastern Nevada, including the Dolly Varden Range west of the Goshute Mountains at Deer Springs (Figure 1), and at site 26EK1846 near the town of Wells along the Humboldt River (Brown and Rusco 1987).

If all of the Maggie Creek Phase ceramics from northeastern Nevada were manufactured elsewhere and traded into the region, and if horticulture was never adopted there, then it would be unwise to argue that sites exhibiting pre-600 B.P. ceramics were left behind by groups that were part of the Fremont Behavioral Complex, except in a peripheral way as trading partners. On the other hand, if Fremont-style ceramics were locally manufactured in northeastern Nevada, and if they occur with Fremont-style projectile points, then this may indicate more complex cultural, behavioral, and/or biological affiliations with Fremont groups located near the center.

Unfortunately, it has not been determined whether the broken vessels found at Maggie Creek Phase sites such as James Creek Shelter (Elston and Budy 1990) and Oranjeboom Cave (Buck et al. 2002) were locally manufactured, or if they represent trade wares manufactured elsewhere and carried into the region. Resolving this issue is one of the goals of the analysis described here.

The Eagle Rock Phase has been viewed as the first definitive evidence for local ceramic production in the central and north-central Great Basin (reviewed in Rhode 1994). Tuohy (1973) suggested some time ago that plain wares diffused from south to north across the Great Basin. This idea, however, was challenged in the mid-1980s by the discovery of plain wares dating between 1000 and 1200 B.P. in northern regions such as southern Idaho (Holmer and Ringe 1986) and southwest Wyoming (reviewed in Smith 1992). Plain wares, in fact, may be youngest in those regions closest to the proposed origin of the Numic Spread near Death Valley because they are all Intermountain Brownware vessels. The ceramic tradition would have spread from those regions nearest the Fremont or Anasazi peoples. This influence simply may not have reached the western fringes of the Great Basin until between 1500 and 600 B.P. Rhode (1994), for example, reports that the oldest securely dated plain wares from Owens Valley in the western Great Basin may be no older than ca. 400 B.P., while the oldest plain wares from Yucca Mountain in southern Nevada date to ca. 900 B.P. at the Sever Tanks site. And, as mentioned, plain wares have been dated between 1000 and 1200 B.P. across a vast region of northern Utah, southern Idaho, and southwest Wyoming adjacent to the region exhibiting Fremont ceramics dating to at least ca. 1500 B.P.

The earliest securely dated Eagle Rock Phase occupation in northeastern Nevada occurs at the Carorra's Camp site northeast of Battle Mountain at ca. 600 B.P. No ceramics were recovered from this site. Of the 14 well-dated, single component Eagle Rock Phase occupations, 13 (93 percent) date to 500 B.P. or younger (see Table 1). The oldest securely dated Intermountain Brownware ceramics come from Little Boulder Basin at sites such as Round Mountain Camp, northeast of Battle Mountain, at ca. 500 B.P. (Table 1).

Regarding projectile points, Rose Spring and Eastgate styles are associated with the early Fremont ceramics in Utah, southwestern Wyoming, southern Idaho, western Colorado, and northeastern Nevada (see Madsen and Simms 1998:301 for a review), and they are also common in some Fremont horticultural villages. They are also commonly found at small, short-term foraging camps that lack ceramics throughout the Great Basin. Because these points are so common in both Fremont and non-Fremont contexts beginning about 1300 years ago in the north-central Great Basin, they are not considered a Fremont-style artifact here because they are not 'diagnostic' of groups participating in the Fremont Behavioral Complex. Fremont-style points that are diagnostic of this complex include side-notched (Uinta, Bear River, Nawthis), basally-notched (Parowan), and concave-base (Bull Creek) varieties (Holmer and Weder 1980; Holmer 1986). Prior to the excavations at Scorpion Ridge that recovered a Nawthis point, no other arrow point style previously recovered in Fremont villages had been identified in northeastern Nevada.

The chronological distribution of projectile points in this region is somewhat ambiguous, but patterns are evident. The data in Table 1 show that most of the dart and spear point styles pre-date the Late Archaic at ca. 1200-1300 B.P. These point styles include varieties of stemmed, large side-notched, and Pinto-like, as well as Humboldt, Gatecliff and Elko Series. Greater than 90 percent of all Elko dart points from well-dated contexts date between ca. 3500-1700 B.P., and they generally post-date Gatecliff points, although they occasionally are found in Late Archaic contexts in cave and rockshelter settings. Obsidian hydration dating generally corroborates these interpretations (Hockett 1995). Elko points are also commonly found in Fremont horticultural villages that post-date ca. 1200 B.P. in Utah and east-central Nevada (e.g., Talbot et al. 2000; Wilde and Soper 1999). Thus, the association of this dart point style with Late Archaic Eastgate or Rose Spring arrow points is to be expected at some locales, and their association does not necessarily imply a multi-component occupation.

THE SCORPION RIDGE SITE

The Scorpion Ridge site (26EK7123) is located approximately 3 km (2 mi) southeast of Elko, Nevada (Figure 1), between two small ridgetops at approximately 1760m (5800 ft) above sea level in the Elko Hills. The Elko Hills are draped with big sagebrush and Utah juniper trees, and they separate the Humboldt River drainage to the northwest from the western slopes of the Ruby Mountains to the southeast. The Elko Hills consist of extensive chert deposits, and in surface area are second only to the Tosawihi Quarries (Elston and Raven 1992) in the availability of concentrated, artifact-quality chert in northeastern Nevada. The Scorpion Ridge site is located in the Elko Hills Chert Source Area, although there are no bedrock outcroppings of artifact-quality material within the boundaries of the site.

Ridgetops in the region, including Scorpion Ridge typically consist of sediments that are shallow and Late Holocene in age. These sediments consist of very loose, powdery, tannish-brown silts that are usually no more than 10-20 cm thick. They are typically unstratified and overlie weathered rhyolitic bedrock.

A total of 88 square meters was excavated at the Scorpion Ridge site during the summer of 2001. All but one of the projectile points, all of the ceramics and faunal remains, and the two hearth features were found at Locus 1, where 53 contiguous square m surrounding the two hearth features were excavated.

The Scorpion Ridge site represents a single-component, Maggie Creek Phase assemblage. The two AMS dates retrieved from charcoal collected from two separate hearth features located within Locus 1 suggest that the site was occupied approximately 1200 B.P. (Beta 157186; 1290 ± 40 B.P. 660-790 cal A.D. and Beta 164705; 1200 ± 40 B.P. 710-910 cal A.D.). In addition, the 15 Eastgate points (Figure 3) surrounding the two hearths are consistent with a Maggie Creek Phase occupation. Other than an Elko-Eared point recovered from Locus 1, the remaining projectile point (see Figure 3) matches the form and description of Nawthis Side-notched points previously identified from Fremont village sites in central and southern Utah such as Bull Creek (Jennings and Sammons-Lohse 1981:66, Figure 35c,d), Round Spring (Metcalf and Overturf 1993:34, Plate 7g-l), Icicle Bench (Talbot et al. 1999:40, Figure 1.36c), Huntington Canyon (Montgomery and Montgomery 1993:311, Figure 8.2), Backhoe Village (Madsen and Lindsay 1977:39, Figure 22L), and Radford Roost (Talbot et al. 1999:104, Figure 2.23h-k), as well as in east-central Nevada at Baker Village (Fergusson and Eccles 1999:125, Figure 46h, l).

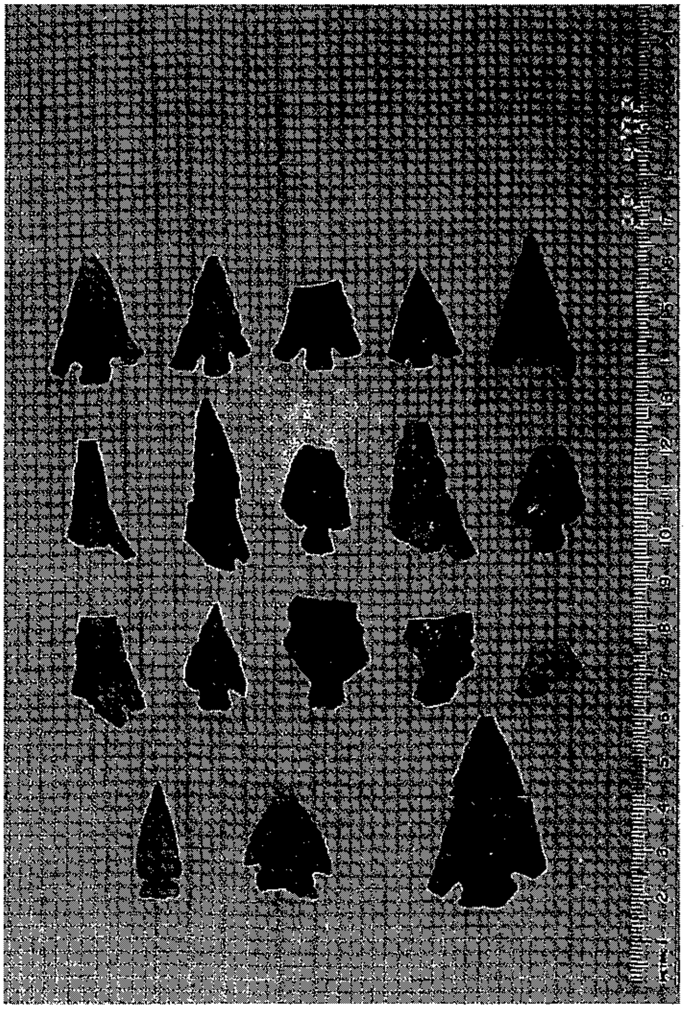


Figure 3. The projectile points recovered from the Scorpion Ridge site. The top three rows show the 15 Eastgate points plus the point tip refit (second row from the top, second point from the left). Bottom row shows the Nawthis Side-notched point (left) and the Elko-Eared point (center) from Locus 1, as well as the Elko Corner-notched point and point tip refit (right) found in another area of the general site boundaries.

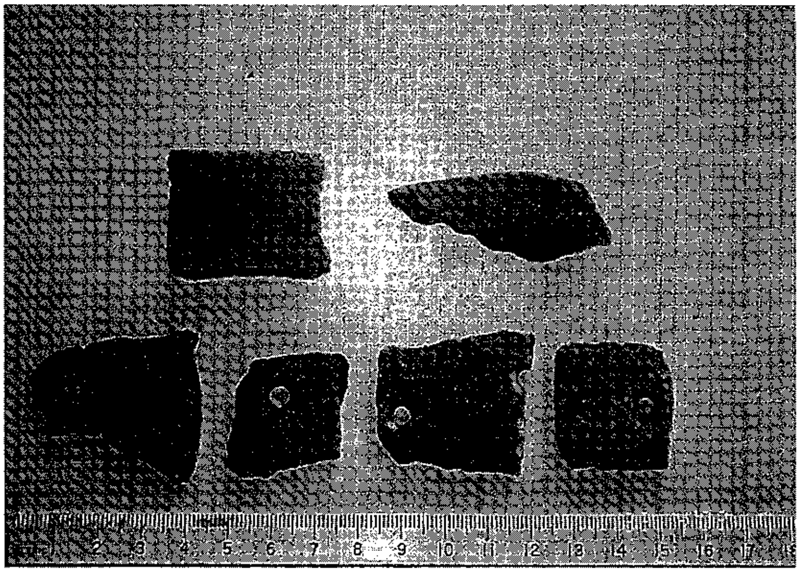


Figure 4. Two rim sherds (top row) and four body sherds exhibiting drill holes from the Scorpion Ridge site. Note the curved rim that belonged to a flaring neck jar typical of Great Salt Lake Gray vessels. The straighter rim is typical of those found on Fremont corrugated wares (Bill Fawcett, personal communication 2002).

As recently reviewed in Madsen and Simms (1998:302), Nawthis Side-notched points are generally thought to post-date 900 B.P., and they are primarily distributed in the southern Fremont region. The side-notched point from Scorpion Ridge matches the descriptions and illustrations of Nawthis Side-notched points too closely to warrant the creation of a new point style in the central Great Basin based on a single artifact. Thus, we prefer to argue that Nawthis Side-notched points are older and more widely distributed than previously acknowledged.

In addition to the 17 identifiable projectile points, 10 middle-to-late stage bifaces, seven cores, four pieces of groundstone, 858 pieces of debitage, 145 ceramic sherds, and 306 faunal specimens were recovered from the site. All of the lithic artifacts were made from local cherts available in the Elko Hills. The bifaces, cores and abundance of relatively large pieces of debitage suggest that lithic reduction focused on the production of tool blanks rather than tool repair and maintenance. The faunal remains consist of the extensively fractured remains of a single deer (*Odocoileus hemionus*) carcass, which was butchered, cooked, and eaten at the site. Many of the bones are burned, and the extensive fracturing suggests that the long bones were broken open for marrow. The grinding stones could have been used to process plant foods, aid in the processing of the deer carcass, or both.

Other than the Nawthis Side-notched point, a characteristic of the Scorpion Ridge site is the presence of nearly 150 plain ware sherds. They are relatively thin (mean thickness = 4mm), the outside surfaces are smooth and even, and two rim sherds do not resemble those typically found on Intermountain Brownware vessels, particularly the rim sherd from a flaring neck jar (Figure 4). The straight rim sherd (Figure 4) resembles those typically found on Fremont corrugated vessels (Bill Fawcett, personal communication 2003). In short, vessel shape and manufacturing technique suggest that the vessels from Scorpion Ridge most closely resemble "Great Salt Lake Gray" Fremont wares. As a result, chemical and petrographic analyses were conducted to investigate whether the Scorpion Ridge Fremont ceramics were locally manufactured or traded into the region from elsewhere. The results of these studies are reported below.

CERAMIC ANALYSIS: SCORPION RIDGE AND BEYOND

A total of 22 sherds and three temper samples was investigated by optical petrography, inductively coupled plasma (ICP), inductively coupled plasma-mass spectrometry (ICP-MS) and scanning electron microscopy (SEM). Petrographic microscope analysis focused on the identification of mineral and rock fragments in the ceramic sherds and potential temper source samples, while sample examination using the SEM focused on the mineral concentrations in the potential source sample fine silt and clay fractions and sherd paste. These optical methods combined with geochemical analysis by ICP and ICP-MS concentrated on the classification of shard components.

The primary goal was to determine whether the Scorpion Ridge vessels were manufactured locally or brought into the region from elsewhere by comparing chemical and petrographic analyses of a variety of plain and painted wares from within and outside of the north-central Great Basin with the geology of the local bedrock. This analysis determined the mineralogical and geochemical composition of the plain wares recovered from Scorpion Ridge and other nearby sites in the Upper Humboldt drainage, as well as Fremont plain and painted wares recovered near the Nevada-Utah border in east-central and north-eastern Nevada. The potential temper sources all came from the Elko Hills or the nearby Ruby Mountains within 50 km of the Scorpion Ridge Site. While we are aware that the temper analysis is not likely to yield the precise location of the temper used to make the Scorpion Ridge vessels if they were manufactured locally, these studies, when combined with knowledge about the geological composition of the parent bedrock in the Upper Humboldt drainage, will assist in our interpretations.

Ceramic samples 1-3 (see Table 2) were recovered from Scorpion Ridge. Although refitting of individual sherds proved to be unsuccessful, the two distinct rim sherds suggest that at least two vessels were broken and deposited within Locus 1. Samples 4, 5, and 7 were recovered from small, open-air lithic scatters along the Humboldt River within about 16 kilometers of the Scorpion Ridge site. Samples 6 and 8 were recovered from open-air lithic scatters on the eastern side of the Ruby Mountains in Ruby Valley, approximately 40 km east of Scorpion Ridge. Samples 9 and 10 were from plain wares recovered from the Baker Village Fremont site (Figure 1) in east-central Nevada (Wilde and Soper 1999). Samples 11 and 12 represent a Great Salt Lake Gray sherd and a Snake Valley Black-on-Gray sherd recovered along the Nevada-Utah border on the eastern flanks of the Goshute Mountains in Nevada, south of Wendover and directly east of Oranjeboom Cave (Figure 1). Samples 13 and 14 were plain wares found embedded in a 750 B.P. hearth at the Wells Dump site (Figure 1) and associated with Eastgate projectile points (Murphy 1988). Samples 15-22 were found at the Elko Dump site, which is located less than five km north of Scorpion Ridge (Vierra and Langheim 2002). One temper sample was collected from the Elko Hills near Scorpion Ridge, and two within Harrison Pass on the western flanks of the Ruby Mountains, approximately 50 km southeast of Scorpion Ridge.

Table 2. Location of ceramic sherds and potential temper sources studied.

Sample Number	Site/Location	Sample Type
		Ceramics
1	Scorpion Ridge	brown ware
2	Scorpion Ridge	brown ware
3	Scorpion Ridge	brown ware
4	CRNV-11-5248	brown ware
5	CRNV-11-3644	brown ware
6	CRNV-11-6937	brown ware
7	CRNV-01-3586	brown ware
8	CRNV-11-6911	brown ware
9	Baker Village	Fremont utilitarian ware
10	Baker Village	Fremont utilitarian ware
11	CRNV-11-8979	Great Salt Lake Gray ware
12	Goshute Mountains	Snake Valley Black-on-Gray
13	Wells Dump	brown ware
14	Wells Dump	brown ware
15	CRNV-12-9371 Unit 13	brown ware
16	CRNV-12-9371 Unit 13	brown ware
17	CRNV-12-9371 Unit 13	brown ware
18	CRNV-12-9371 Unit 13	brown ware
19	CRNV-12-9371 Unit 3	brown ware
20	CRNV-12-9371 Unit 3	brown ware
21	CRNV-12-9371 Unit 3	brown ware
22	CRNV-12-9371 Unit 2	brown ware
		Temper Sources
T1	Elko Hills	temper source
T2	Harrison Pass/Ruby Mtns.	temper source
T3	Harrison Pass/Ruby Mtns.	temper source

Optical petrography was accomplished on an Olympus Vanox-Pol petrographic microscope with DC290 digital camera interface into a Macintosh computer. Smear slides were made from the potential temper source samples and a point count modal analysis was made to study the mineralogical population. The modal analysis methodology was similar to what we used for petrographic thinsections. Modal data collection from petrographic thinsections utilized .255 mm traverse horizontal and vertical grid spacing between data points. In all of our petrographic modal analyses we collected grain shape for only quartz, and mineralogical identification for all other minerals for each data point on the grid. The total modal point count varied among the different samples from 230 points to 1729 points.

ICP and ICP-MS were run at XRAL Laboratories in Toronto, Canada. ICP-MS analysis was chosen because of our interest in obtaining a large list of elements with low detection levels. It would also have been acceptable to use neutron activation and/or XRF analysis to obtain similar results. Thirty-six elements proved to be in sufficient concentrations above the detection limits in both the sherd and potential source temper samples to be useful in preliminary provenance analysis (Table 3). All of the thirty-six elements in the sherd and potential temper samples were subject to a hierarchical cluster analysis employing the use of SPSS-10 statistical software. This analysis produced a dendrogram (Figure 5) of the sherds and the potential source tempers showing the linkage between groups. There are a total of four clusters loaded in two major cluster groups (A and B).

Cluster Group A is composed of plain wares from the upper Humboldt River drainage system. Cluster 1 in Cluster Group A is composed of seven sherds consisting of the Scorpion Ridge site, Wells Dump site, site 9371 and site 3581. Cluster 2 in Cluster Group A is composed of eight sherds consisting of sites 9371 and 5248.

Cluster Group B is composed of Fremont painted and plain ware ceramics found near the Nevada and Utah border, along with plain ware from Ruby Valley and one plain ware sample (sample 5) from site 3644 located in the upper Humboldt River drainage. Cluster 3 in Cluster Group B is composed of a Ruby Valley plain ware and a Fremont painted bowl from the Goshute Mountains. Cluster 4 contains Fremont plain ware pottery from Baker Village, a Fremont plain ware sherd from site 8979, a Ruby Valley plain ware and the one sample of plain ware that does not cluster with its neighbors from the Humboldt River drainage.

Geochemical analysis of the tempers did not provide compelling correlations between the pottery sherds and the potential temper samples. However, it is apparent that the temper used to manufacture the sherds from Scorpion Ridge likely derives from a source area close to the two temper samples analyzed from the Ruby Mountains.

Petrographic analyses of the temper source samples were made by slide examinations (Table 4). Modal point counts were made on all samples. Optical petrographic data for the sherds are presented in Tables 5 and 6, and Figures 6 through 9. Scanning electron microscope micrographs of Fremont plain ware pottery, as well as plain ware from Scorpion Ridge and Wells Dump, are provided in Figure 10.

The three temper samples studied (Table 4 and Figure 6) divided into three different rock types: T1 is dominated by a conglomeratic and hematite cemented novaculitic chert; T2 is a classic diorite gruss; and T3 is a granodiorite gruss. Biotite mica is not a major component of any of these rock types even though it is a major component in the Brownware ceramic sherds.

The ceramic sherds can be relatively easily classified with respect to tempering components in the coarse fraction. The coarse fraction is classified here as a grain size equal to and greater than coarse silt (31 microns in diameter). However, the presence or absence of temper in the fine fraction (less than 31 microns in diameter) clay component is quite difficult to assess petrographically, as it is unclear which inclusions occur naturally in the clay and which were added as temper. In general, the optical petrography

Table 3. Ceramic sherd and potential temper source sample geochemistry by ICP and ICP-MS analysis.

Sample	Mg	Al	P	K	Ca	Sc	Ti	Cr	Mn	Fe	Ba	Ce
Method	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	MS*	MS*
Units	%	%	%	%	%	ppm	%	ppm	ppm	%	ppm	ppm
D.L.**	0.01	0.01	0.01	0.01	0.01	5	0.01	10	10	0.01	0.5	0.1
1	1.00	8.73	0.04	3.87	0.76	15	0.46	95	492	4.04	1352.1	102.9
2	1.06	8.91	0.01	3.88	0.69	15	0.46	92	441	4.05	1450.8	119.3
3	1.01	8.84	0.02	3.81	0.63	15	0.46	94	512	4.09	1300.4	120.2
4	0.88	10.07	0.10	2.84	1.16	11	0.43	28	589	4.08	1038.5	114.1
5	0.64	8.68	0.11	2.91	1.43	10	0.28	51	587	2.94	727.9	88.9
6	0.85	8.17	0.05	2.79	3.37	9	0.30	39	556	2.53	773.9	59.9
7	1.03	10.18	0.05	2.48	1.04	16	0.49	90	559	4.96	732.3	141.2
8	0.66	9.05	0.08	2.87	1.52	9	0.23	27	333	2.71	882.6	51.1
9	1.36	11.49	0.12	2.07	2.66	13	0.58	32	375	4.25	1765.7	73.3
10	1.72	7.69	0.90	3.40	5.76	9	0.37	35	516	2.83	725.5	87.5
11	0.77	7.65	0.05	1.61	1.68	14	0.43	72	209	2.73	1113.5	69.8
12	0.85	13.70	0.05	2.55	0.69	7	0.33	17	203	3.10	1257.7	194.9
13	1.03	9.30	0.03	2.71	1.14	15	0.46	76	537	4.25	1166.0	155.9
14	1.08	9.49	0.03	2.68	1.17	15	0.48	78	602	4.40	1001.8	106.0
15	0.92	9.44	0.12	2.80	1.82	11	0.43	24	427	4.04	1990.0	145.0
16	0.96	9.36	0.06	2.57	1.96	11	0.47	27	452	4.11	1880.0	161.0
17	0.90	9.97	0.11	2.90	1.93	11	0.46	27	471	4.31	1970.0	150.0
18	0.91	9.40	0.12	2.64	1.83	12	0.42	26	460	4.05	1800.0	131.0
19	0.87	9.11	0.08	2.22	1.62	13	0.37	37	520	3.53	1020.0	104.0
20	0.91	9.50	0.14	2.45	1.73	12	0.36	40	553	3.70	1330.0	118.0
21	0.84	9.82	0.09	2.66	1.71	12	0.42	31	544	3.78	1220.0	96.4
22	1.03	9.69	0.23	2.84	1.63	14	0.42	46	608	3.83	978.0	184.0
T1	0.04	0.83	0.01	0.24	0.02	<5	0.05	25	36	0.13	933.0	15.1
T2	0.27	7.77	0.03	4.52	0.68	<5	0.14	<10	415	1.29	2130.0	48.8
T3	0.10	6.63	0.02	3.93	0.76	<5	0.08	<10	108	0.56	1091.9	33.0
dup-T1	0.03	0.83	<0.01	0.23	0.01	<5	0.05	26	34	0.13	927.7	15.0

Sample	Co	Cs	Cu	Dy	Er	Eu	Gd	Ho	La	Lu	Nd	Ni
Method	MS*	MS*	MS*	MS*	MS*	MS*	MS*	MS*	MS*	MS*	MS*	MS*
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
D.L.**	0.5	0.1	5	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.1	5
1	13.2	16.0	20	7.10	4.45	1.76	8.63	1.52	56.6	0.70	50.7	38
2	13.8	17.7	25	7.78	4.48	1.96	9.83	1.60	63.3	0.75	55.4	38
3	14.3	17.6	19	7.95	4.72	2.06	10.10	1.70	64.0	0.75	57.5	40
4	9.3	10.3	30	5.81	2.92	1.60	7.26	1.14	54.7	0.44	43.6	22
5	9.6	5.2	24	4.14	2.35	1.14	6.33	0.84	45.0	0.37	35.9	32
6	8.1	6.5	19	3.83	2.09	0.89	4.46	0.76	30.0	0.31	24.1	20
7	15.2	4.7	35	7.47	3.81	1.72	10.90	1.46	73.3	0.51	62.6	34
8	5.7	4.7	16	4.15	2.07	0.92	4.55	0.81	27.3	0.29	22.3	19
9	11.7	28.9	23	2.93	1.65	1.13	4.20	0.59	29.8	0.24	27.0	34
10	8.6	12.5	28	3.61	2.11	1.35	5.56	0.73	45.8	0.34	36.8	21
11	13.7	9.0	20	5.50	3.18	1.54	6.40	1.17	34.5	0.48	33.3	34
12	4.4	61.7	11	2.47	0.79	2.08	6.81	0.37	83.9	0.12	66.8	25
13	14.5	4.4	34	8.39	3.98	1.87	12.70	1.64	79.3	0.54	69.3	41

Sample Method Units D.L.**	Co MS* ppm 0.5	Cs MS* ppm 0.1	Cu MS* ppm 5	Dy MS* ppm 0.05	Er MS* ppm 0.05	Eu MS* ppm 0.05	Gd MS* ppm 0.05	Ho MS* ppm 0.05	La MS* ppm 0.1	Lu MS* ppm 0.05	Nd MS* ppm 0.1	Ni MS* ppm 5
14	14.3	4.1	31	6.69	3.49	1.47	8.98	1.32	55.8	0.52	48.3	36
15	<10	8.6	20	5.70	2.70	1.84	7.40	0.98	69.0	0.33	58.6	21
16	21.0	10.9	46	7.30	3.50	2.24	9.00	1.31	81.0	0.41	66.6	31
17	16.0	8.5	21	5.60	2.70	1.87	7.50	1.05	76.0	0.34	59.7	17
18	24.0	11.4	31	5.20	2.60	1.76	7.10	0.96	63.0	0.32	51.9	24
19	17.0	7.3	29	5.70	2.90	1.50	6.60	1.03	49.0	0.39	42.5	25
20	11.0	7.1	28	5.60	2.90	1.52	6.80	1.04	60.0	0.41	47.9	29
21	20.0	7.3	21	5.90	3.20	1.54	7.10	1.14	41.0	0.47	42.5	17
22	11.0	8.6	22	6.20	3.20	1.73	7.50	1.16	105.0	0.41	60.8	21
T1	<0.5	0.5	9	0.96	0.59	0.34	1.16	0.17	8.5	0.11	7.8	6
T2	2.8	3.8	<5	1.69	0.85	1.05	2.12	0.30	25.8	0.17	17.9	<5
T3	1.2	2.3	9	1.74	0.91	0.83	2.18	0.30	19.5	0.14	14.5	<5
dup-T1	0.5	0.5	8	1.07	0.53	0.35	1.24	0.19	8.6	0.11	7.2	6

Sample Method Units D.L.**	Pb MS* ppm 5	Pr MS* ppm 0.05	Sm MS* ppm 0.1	Sr MS* ppm 0.1	Tb MS* ppm 0.05	Th MS* ppm 0.1	Tm MS* ppm 0.05	U MS* ppm 0.05	V MS* ppm 5	Y MS* ppm 0.5	Yb MS* ppm 0.1	Zn MS* ppm 5
1	16	13.83	9.3	127.3	1.29	19.8	0.64	4.22	71	43.0	4.4	77
2	23	15.56	10.4	122.5	1.44	21.9	0.69	4.44	74	46.7	4.6	75
3	16	15.71	10.7	109.8	1.52	23.5	0.70	4.58	71	47.1	4.8	76
4	35	12.32	8.4	243.0	1.11	27.1	0.46	9.56	72	31.9	2.9	149
5	36	10.28	7.0	261.6	0.93	24.6	0.35	6.02	57	21.9	2.1	100
6	34	6.84	4.7	478.8	0.69	13.0	0.32	5.69	48	22.4	2.1	99
7	26	17.62	12.1	165.7	1.52	29.2	0.53	8.38	88	38.7	3.4	156
8	33	6.35	5.0	224.9	0.77	11.7	0.28	2.80	33	22.6	1.9	93
9	31	7.63	4.7	243.0	0.60	27.2	0.25	4.50	63	16.6	1.6	116
10	38	10.43	6.3	409.4	0.77	27.2	0.31	8.68	64	22.1	2.1	129
11	20	8.67	6.7	237.8	0.94	12.2	0.50	2.84	79	32.4	3.2	67
12	27	20.21	10.7	231.1	0.77	44.6	0.10	1.50	23	8.1	0.8	101
13	31	19.04	13.2	210.0	1.77	37.5	0.56	7.76	82	42.9	3.7	108
14	31	13.26	9.4	184.3	1.34	23.6	0.50	5.90	75	37.3	3.3	110
15	<20	16.10	10.5	387.0	1.00	29.3	0.40	5.60	78	29.0	2.4	100
16	<20	18.60	12.4	368.0	1.30	33.9	0.50	5.70	79	36.0	3.0	110
17	26	17.10	10.2	412.0	1.00	32.0	0.40	5.70	77	28.0	2.5	103
18	23	14.40	9.5	373.0	1.00	27.3	0.40	5.60	77	26.0	2.3	106
19	28	11.60	7.9	229.0	1.00	20.3	0.40	3.90	86	27.0	2.6	94
20	29	12.80	8.5	255.0	1.00	22.8	0.40	4.00	84	28.0	2.7	96
21	22	10.90	8.8	259.0	1.00	21.1	0.50	4.30	80	30.0	3.0	79
22	22	18.50	9.6	222.0	1.00	27.9	0.50	4.50	99	30.0	3.0	108
T1	<5	2.02	1.5	223.9	0.17	1.7	0.08	1.09	31	4.6	0.5	28
T2	26	5.39	3.1	459.3	0.33	14.3	0.13	1.70	12	8.0	1.0	55
T3	14	4.23	2.9	299.5	0.34	9.4	0.11	1.46	9	7.9	0.8	38
dup-T1	<5	2.13	1.6	228.0	0.18	1.9	0.09	1.12	30	4.9	0.6	23

Notes: * MS = ICP-MS **D.L.= detection limit

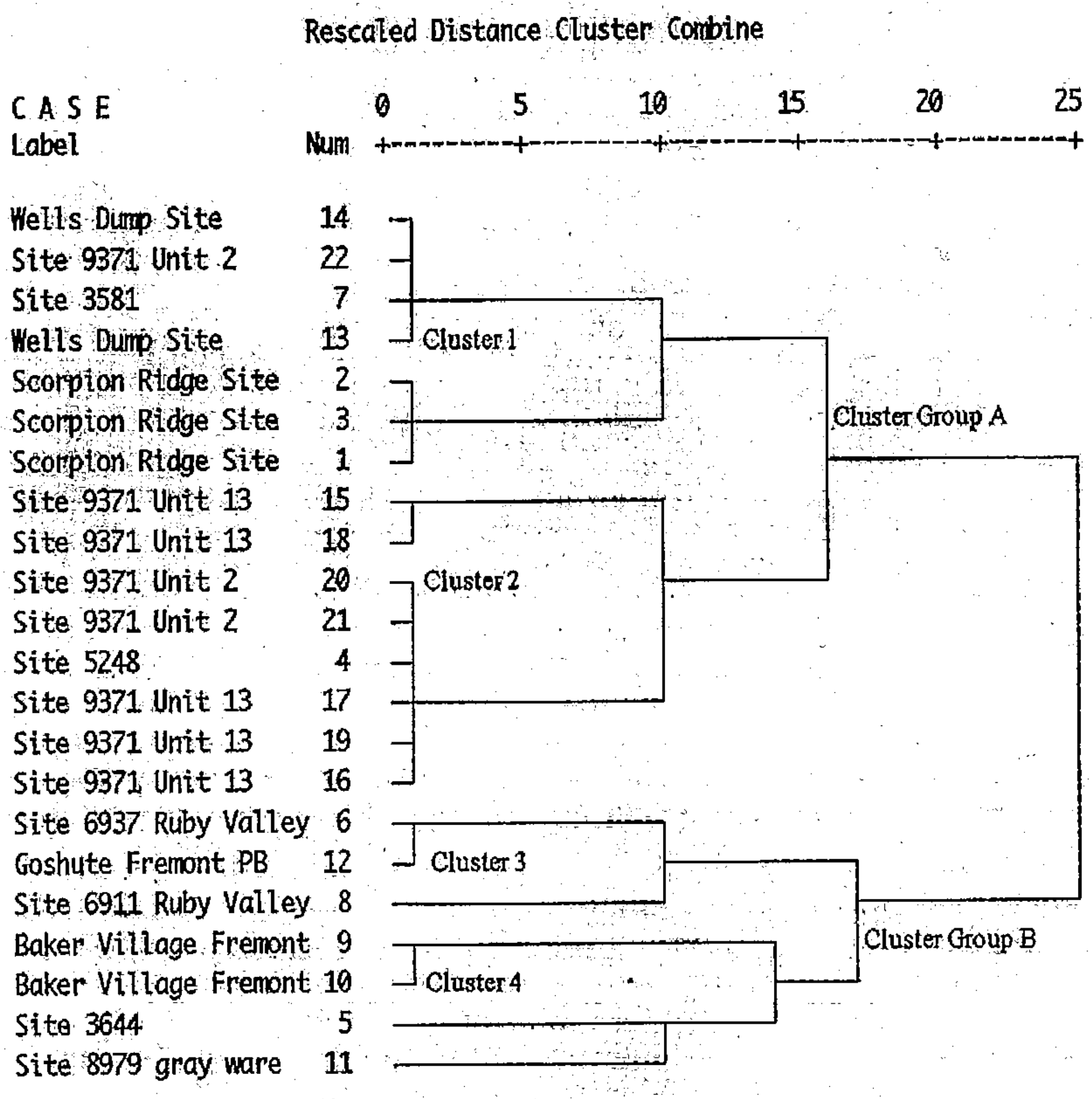


Figure 5. Hierarchical cluster analysis dendrogram using average linkage (between groups) for the following 36 elements: Mg, Al, P, K, Ca, Sc, Ti, Cr, Mn, Fe, Ba, Ce, Co, Cs, Cu, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Ni, Pb, Pr, Sm, Sr, Tb, Th, Tm, U, V, Y, Yb, and Zn. Chemical data were obtained by ICP and ICP-MS analysis. Cluster Group A contains upper Humboldt drainage brown wares from site 9371, the Wells Dump site, the Scorpion Ridge site, and sites 3581 and 5248. Cluster Group B contains Ruby Valley brown wares, gray ware, and Fremont pottery.

Table 4. Modal petrography of the non-clay mineral components in the potential source tempers studied.

Sample	% Quartz Monzonite	Granodiorite (No Biotite) %	Diorite %	% Biotite-Granodiorite	% Quartz IRF Consertal Texture
Temper 1	0.00	0.00	0.00	0.00	0.00
Temper 2	0.00	0.00	71.15	0.00	0.00
Temper 3	0.00	33.83	0.00	0.00	15.41

Sample	Perthite %	Plagioclase %	K-Feldspar %	% Quartz Sub-Rounded to Rounded	% Quartz Sub-Angular to Angular
Temper 1	0.00	0.35	0.17	9.86	2.60
Temper 2	0.00	24.11	0.00	0.00	1.19
Temper 3	0.38	24.81	17.67	0.00	6.02

Sample	Biotite %	Volcanic Glass %	Accessory Minerals %	Calcite %	% Clay Balls	% SRF Novaculites
Temper 1	0.00	0.00	1.21	0.00	0.00	83.91
Temper 2	0.40	0.00	3.16	0.00	0.00	0.00
Temper 3	0.00	0.00	1.88	0.00	0.00	0.00

The total number of grains counted for each sample was: Temper 1 = 578, Temper 2 = 253, and Temper 3 = 266.

supports the geochemical observations made in the dendrogram in Figure 5.

All of the plain wares studied from the upper Humboldt River drainage system are tempered with a schistose biotite-granodiorite. This includes sample number 5 from site 3644 (Figure 9). The only significant difference between sherd number 5 and the other Humboldt River drainage plain ware is the quantity of biotite in the fine fraction (less than coarse silt grain size) as shown in Table 6. Scorpion Ridge, Wells Dump, site 9371, site 5248, and site 3586 plain wares have fine fraction silt sized biotite concentrations ranging from about 30 to 70 percent, whereas the sherd (#5) from site 3644 has a fine-grained biotite content of only about 1 percent. This is actually a very significant difference in the overall petrography of these samples, and as such, sherd (#5) from site 3644 does not fit the normal pattern of tempering in the Humboldt River drainage system.

The schistose biotite granodiorite temper has several distinguishing attributes (Figures 6, 7 and 10). It is characterized by a very large concentration of biotite flakes and books with various igneous rock fragments (IRF) having the overall general composition of a granodiorite (20-30 percent quartz + 10-35 percent [plagioclase + alkali feldspar] + biotite). The IRFs consist of one or more of the following:

1. Foliated biotite plus quartz clumps with consertal texture (intergrown grain boundaries).

Table 5. Modal count, percent temper and paste and percent biotite in the fine-grained (less than coarse silt sized fraction) paste of the pottery sherds studied.

Sample	Modal Count	% Temper > Coarse Silt	% Paste < Coarse Silt	% Biotite in Paste
1 Scorpion Ridge	906	65	35	71
2 Scorpion Ridge	1025	68	32	68
3 Scorpion Ridge	933	66	34	67
4 Site 5248	874	60	40	41
5 Site 3644	361	39	61	1
6 Site 6937, Ruby Valley	423	44	56	2
7 Site 3586	850	61	39	63
8 Site 6911, Ruby Valley	396	42	58	3
9 Baker Village, Fremont	280	37	63	0
10 Baker Village, Fremont	308	35	65	0
11 Site 8979, gray ware	230	29	71	0
12 Goshute Mtns., Fremont	612	45	55	2
13 Wells Dump	846	67	33	52
14 Wells Dump	655	65	35	58
15 Site 9371 Unit 13	250	68	32	65
16 Site 9371 Unit 13	250	67	33	66
17 Site 9371 Unit 13	250	70	30	63
18 Site 9371 Unit 13	250	74	26	70
19 Site 9371 Unit 2	250	65	35	30
20 Site 9371 Unit 2	250	65	35	33
21 Site 9371 Unit 2	250	55	45	30
22 Site 9371 Unit 3	250	60	40	30

2. Quartz clumps with consertal texture.
3. Quartz plus feldspar with consertal textures.
4. Biotite plus feldspar.
5. Feldspar and quartz included with micro-biotite crystallites (poikilitic texture).
6. Perthitic feldspar with quartz and sometimes poikilitic biotite.
7. Foliated biotite plus feldspar plus quartz with feldspar and quartz aggregates having classic consertal textures.

The actual source rock is plutonic, possibly modified by contact metamorphism. Although we are unable to type the exact source locality from the Upper Humboldt ceramic samples, it is almost certain that the original rock is local, given the dominance of biotite granodiorites in Elko County (Coats 1987) and the spatial distribution of these wares in the local sites. These local rock outcrops even include metamorphic rocks such as a biotite schist in the East Humboldt Range and a biotite granodiorite gneiss in the Ruby Mountains (Coats 1978:78-79).

In contrast, plain wares from Ruby Valley (samples 6 and 8, Figure 9, Tables 5 and 6) are tempered with monzonite IRFs (alkali feldspar equals plagioclase feldspar and quartz is less than 5 percent,

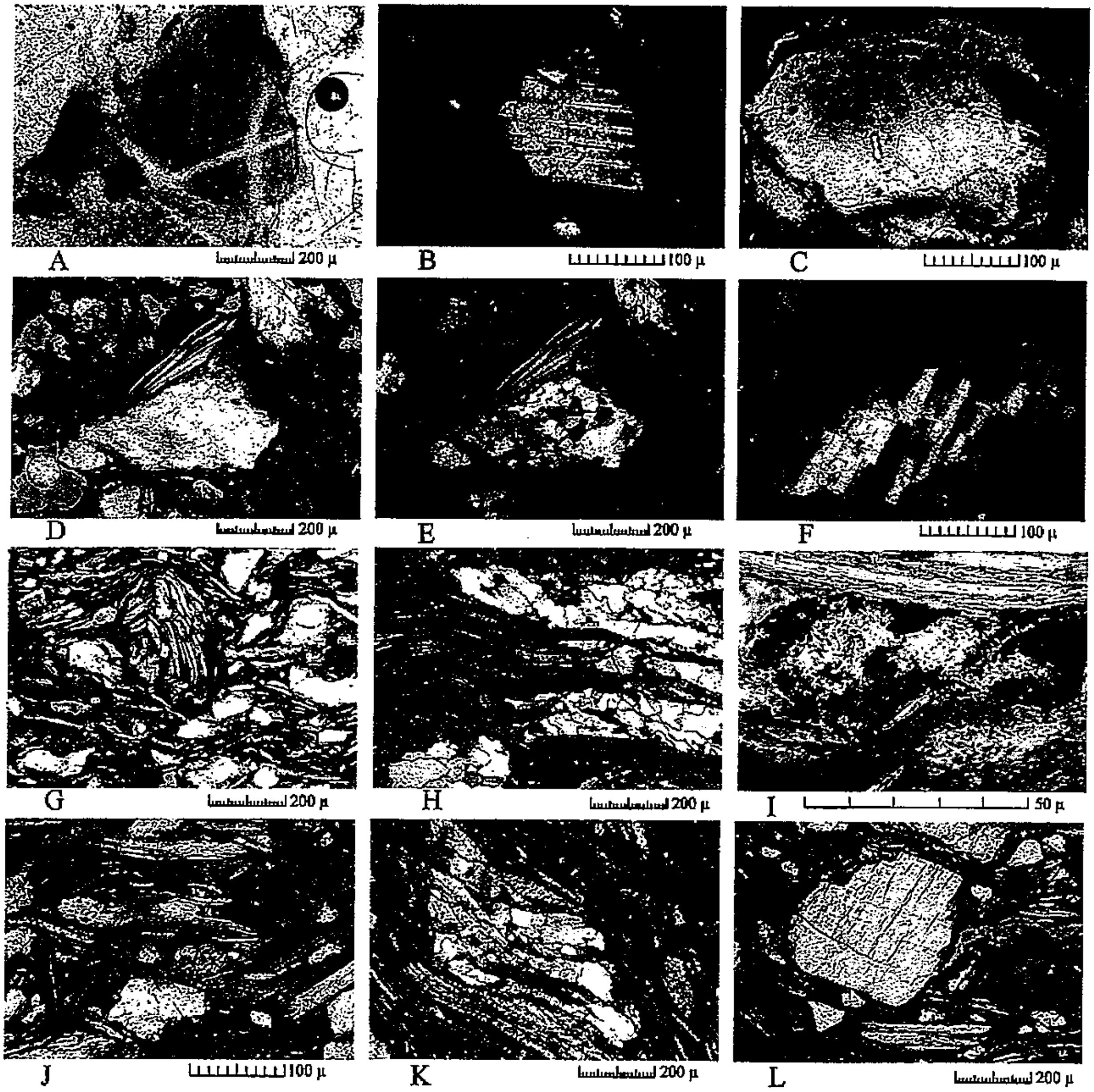


Figure 6. Digital photomicrographs of the temper samples (T1-T3), and three brown ware ceramic samples from the Scorpion Ridge site in the Humboldt River drainage system.

A: Temper T1 from Elko Hills is dominated by novaculitic chert as mudstones through conglomerates. Some appear as hematite cemented while others are fairly free of iron oxyhydroxides but are fracture filled with mega-quartz (K, plain polarized light, scale as shown).

B: Temper T2 from Harrison Pass in the Ruby Mountains is dominated by a plagioclase diorite with minor quartz, biotite and other accessory minerals. The plagioclase grains appear to be partially weathered (L, cross polarized light, scale as shown).

C: Temper T3 from Harrison Pass in the Ruby Mountains is dominated by a granodiorite that contains interlocking quartz grains and quartz-feldspar clumps in a consertal texture. Individual subangular quartz grains also occur (M, cross polarized light, scale as shown).

D-F: Sample 1 is tempered with a schistose biotite-granodiorite that consists of both plagioclase feldspar (F, cross polarized light, scale as shown) and microcline in about equal amounts. The feldspars are associated with quartz in a classic consertal texture (grain boundaries are intergrown). The IRFs (A and B) show foliation, but the quartz and feldspar grains are not elongated (D, plain polarized light; E, cross polarized light, scale as shown). Biotite (D and E) is dominant in both the fine grain size fraction (less than coarse silt) as well as in the IRFs and coarse to very fine sand sized mineral temper.

G-I: Sample 2 is tempered with a schistose biotite-granodiorite that is composed of plagioclase, microcline and biotite with minor accessory minerals such as magnetite, pyroxenes and amphiboles. Biotite is dominant as a mineralogical constituent (G, plain polarized light, scale as shown) and in part dictates the shape and orientation of the ceramic pores. Biotite forms as individual sheets and as stacks or books of mica (G) in addition to being a major constituent of the foliated IRF's (H, cross polarized light, scale as shown). The paste fraction contains fairly common carbonaceous organics (I, plain polarized light, scale as shown), sometimes observed in the pores (as one might observe with an organic tempered ceramic), while other organic material is just in the paste.

J-L: Sample 3 is tempered with a schistose biotite-granodiorite that is composed of plagioclase, microcline and biotite. Occasionally the feldspars are perthitic (L, plain polarized light, scale as shown). Again the biotite dominates the temper and fine fraction of the ceramic (J, plain polarized light, scale as shown) and is present in the IRFs (K, cross polarized light, scale as shown). The quartz and feldspar are mostly observed as individual mineral temper grains, but can also be located as two or more minerals in small IRFs.

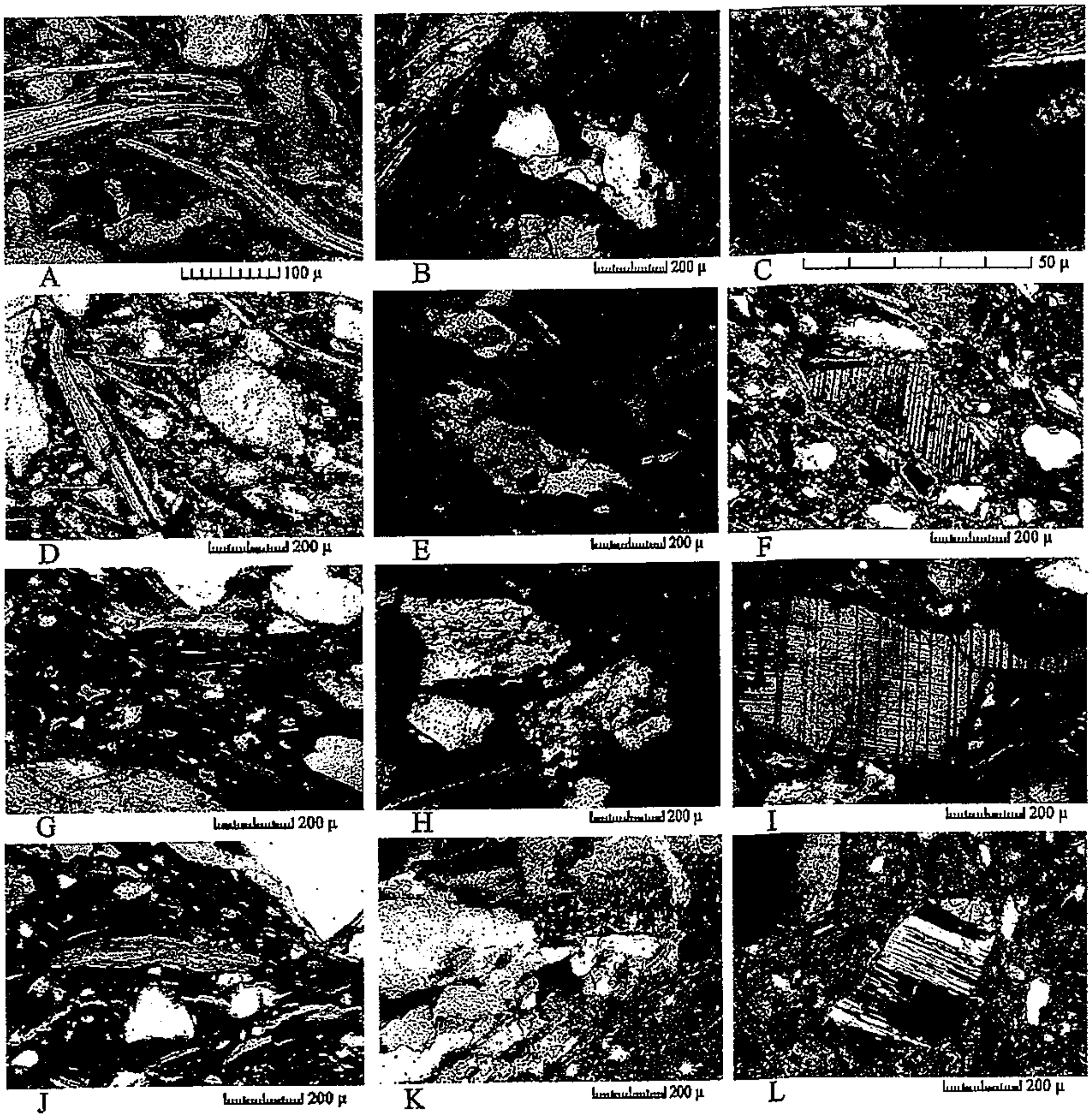


Figure 7. Digital photomicrographs of four brown ware ceramic samples from the Humboldt River drainage system.

A-C: Sample 13, from the Wells Dump site, is tempered with a schistose biotite-granodiorite consisting of microcline and plagioclase feldspars, quartz and biotite with minor accessory minerals such as magnetite, amphiboles and pyroxenes. Biotite is ubiquitous as individual sheets and as mica books (A, plain polarized light, scale as shown). The quartz and quartz feldspar portion of the granodiorite has a distinctive consertal texture (B, cross polarized light, scale as shown). Organics are common in the paste as well as in the pores of the ceramic (C, plain polarized light, scale as shown). Sample 13 is very similar to the sherds studied from the Scorpion Ridge site, with just slightly less biotite in the temper and the fine fraction.

D-F: Sample 14, from the Wells Dumps site, is tempered with a schistose biotite-granodiorite consisting of microcline and plagioclase feldspars (F, cross polarized light, scale as shown), quartz and biotite with minor accessory minerals. The IRFs (E, cross polarized light, scale as shown) vary in size from very fine sand to very coarse sand, and are dominant in the fine to medium sand size range. The quartz and feldspars show classic consertal textures in the IRFs. Biotite dominates the temper and fine fractions of the ceramic (D, plain polarized light, scale as shown). This sample is very similar to sample 13 above.

G-I: Sample 7, from site CRNV-01-3586, is tempered with a schistose biotite-granodiorite that contains plagioclase (I, cross polarized light, scale as shown), microcline (G, larger temper grains are microcline, plain polarized light, scale as shown), quartz and biotite. Most of the IRFs in this section are dominated by quartz and quartz-feldspar fragments exhibiting consertal textures (H, cross polarized light, scale as shown). Biotite sheets and books are dominant in the temper and fine fraction paste of the ceramic. This sample is very similar to sherds from the Scorpion Ridge site.

J-L: Sample 4, from site CRNV-11-5248, is tempered with a schistose biotite-granodiorite. The larger very coarse-grained sand sized IRFs contain perthitic feldspars that are included with biotite clumps (K, cross polarized light, scale as shown). These IRFs also contain quartz-feldspar (microcline and plagioclase) zones that have classic consertal textures. This sherd contains medium sand size feldspars as single temper grains (J, microcline feldspar in the upper right corner of the photograph, plain polarized light, scale as shown). Most of the feldspars, however, are fine to very fine sand sized (L, plagioclase feldspar, cross polarized light, scale as shown). Biotite dominates the temper (J) and the fine-grained portion of the ceramic. This sample is similar to ceramics from the Wells Dump site.

Table 6. Modal petrography of the ceramic pottery samples studied.

Sample Number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
% Rock or Mineral Component														
IRF: Schistose Biotite-Granodiorite*	4.19	4.10	3.32	3.09	4.99	0.00	3.06	0.00	0.00	0.00	0.00	0.00	3.66	6.56
Monzonite**	0.00	0.00	0.00	0.00	0.00	5.44	0.00	7.83	0.00	0.00	0.00	3.10	0.00	0.00
VRF: Basalt;	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.03	0.00	0.00	0.00	0.00
Sideromelane-lava flow glass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.07	0.00	0.00	0.00	0.00	0.00
SRF: Hematite Cemented Siltstone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00
Silica Cemented Sandstone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.26	0.00	0.00	0.00
Chert Novaculite	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00
Feldspars: Perthite	0.55	0.88	1.61	2.40	1.11	0.71	1.64	1.01	0.00	0.00	0.87	4.58w	2.72	2.75
Plagioclase	19.21	20.29	20.69	18.76	32.41	29.78	19.18	34.85	38.57	24.35	10.87	35.95w	21.75	19.24
Microcline	20.53	21.76	22.40	20.02	20.22	30.97	21.53	32.07	0.36	0.00	6.96	38.56w	25.65	20.61
Quartz: Rounded with Overgrowth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.48	0.00	0.00	0.00
Angular to Subangular Quartz	18.10	16.78	17.04	18.65	9.42	14.42	17.88	9.85	4.29	2.91	6.09	6.86	19.27	21.07
Other: Biotite	35.10	33.56	32.90	33.52	27.98	9.93	33.65	9.34	0.00	0.00	0.00	5.07	24.82	27.94
Accessory Minerals	2.32	2.63	2.04	3.55	3.88	7.80	3.06	4.29	23.21	23.70	3.48	5.88	2.13	1.83

Notes: IRF = igneous rock fragment VRF = volcanic rock fragment SRF = sedimentary rock fragment
* IRFs with distinctive consertal textures ** IRFs with anhedral textures w = weathered mineral grains (pitted feldspars)

Samples from Site 9371 were treated differently than the samples in the above table. The percent of biotite was determined and the other minerals and rock components were treated as being present or absent. The results of these analyses are similar to the Scorpion Ridge (sample numbers 1,2 and 3) and the Wells Dump Sites (samples 13 and 14). The percentage of biotite for Site 9371 samples ranged from 15 to 37 percent and averaged 26 percent by volume.

minerals ranging from 10 to 25 percent). The mafic accessory minerals are biotite, magnetite, hornblende and minor pyroxenes. The biotite content for this rock is significantly lower than that for the schistose biotite fabrics. This is very conspicuous in the fine-fraction where only two to three percent biotite is observed. The IRF textures range from anhedral to subhedral granular and are distinctively different than the consertal textures observed in the granodiorites from the upper Humboldt drainage. In addition to the IRF temper, the Ruby Valley plain wares have minor concentrations of sedimentary rock fragment (SRF) cherts.

The Fremont painted ware from the Goshute Mountains (Tables 5 and 6, Figure 8) was tempered with monzonite with very highly weathered (pitted) feldspars, a low biotite content in the fine fraction (about two percent) and a higher content (about five percent) in the coarse fraction temper. Most of the accessory minerals are amphiboles. The quartz content was under seven percent. This temper would be difficult to distinguish from that of the Ruby Valley plain wares from just petrographic observations, except that the feldspars are highly weathered.

The Baker Village sherds (Tables 5 and 6, Figures 8 and 10), however, are very distinctive from a petrographic viewpoint as they are tempered with basaltic volcanic rock fragments (VRFs). Sherd number 9 is tempered with sideromelane (basaltic glass) with abundant magnetite and well-formed calcic-plagioclase phenocrysts. The VRF grains are dominantly subrounded in shape and appear to be weathered from the glassy portions of a basalt flow. Sherd number 10 is tempered with fine-grained glassy basalt that contains calcic-plagioclase and pigeonite (pyroxene). Quartz is present in both sherds studied from Baker Village.

The Fremont plain ware from site 8979 has by far the most distinctive temper of all of the sherds studied here (Tables 5 and 6, Figures 8 and 10). The temper is a simple quartz sand, where almost every fine to medium sand sized, subrounded, sedimentary grain contains a very well rounded quartz sand grain interior surrounded by a quartz overgrowth cement. The overgrowth cement is not chalcedony or chert (not from a novaculitic sandstone) and has the classic optical attributes of a mega-quartz cement. It is very likely that this temper is sourced from a lithified dune sandstone, similar in appearance to the Navajo Sandstone of central Utah, although at present there are not enough data to be able to type this sherd to a specific source temper location.

Together, petrographic and geochemical data provide compelling evidence that the upper Humboldt River drainage plain wares from the Scorpion Ridge site, Wells Dump site, and sites 5248, 3586, and 9371 are all similar. Furthermore, it appears that all of these plain wares are locally produced from clay and temper sources that have not yet been pinpointed in the field. Butler (1986), Pippin (1986), and Tuohy and Strawn (1986), among others, have not reported any similar tempering of plain wares from other surrounding locations. The dominant temper for the plain wares studied here is an easily characterized schistose biotite-granodiorite that has a classic consertal texture and is partially foliated. Temper grain sizes range from coarse silt to very coarse sand and average in the fine to medium sand size range. This material is greatly different than the Fremont utilitarian plain wares and one painted ware studied.

Carbonaceous material is prevalent in the fine fraction of most of the plain ware ceramics studied. The presence of this organic material indicates that the sedimentary source of the clay component is most likely a soil/lake bed or near surface sedimentary horizon. It is unlikely that the clays were derived from an outcrop of hydrothermally altered feldspathic igneous rock. Differences in clay sources may be responsible for the variations observed between the geochemistry of sample 5 (site 3644) and that of its neighboring upper Humboldt River drainage plain wares, even though the tempering agents appear to be similar. It is also important to note that if petrography were the only tool used for the ceramic analysis, sample

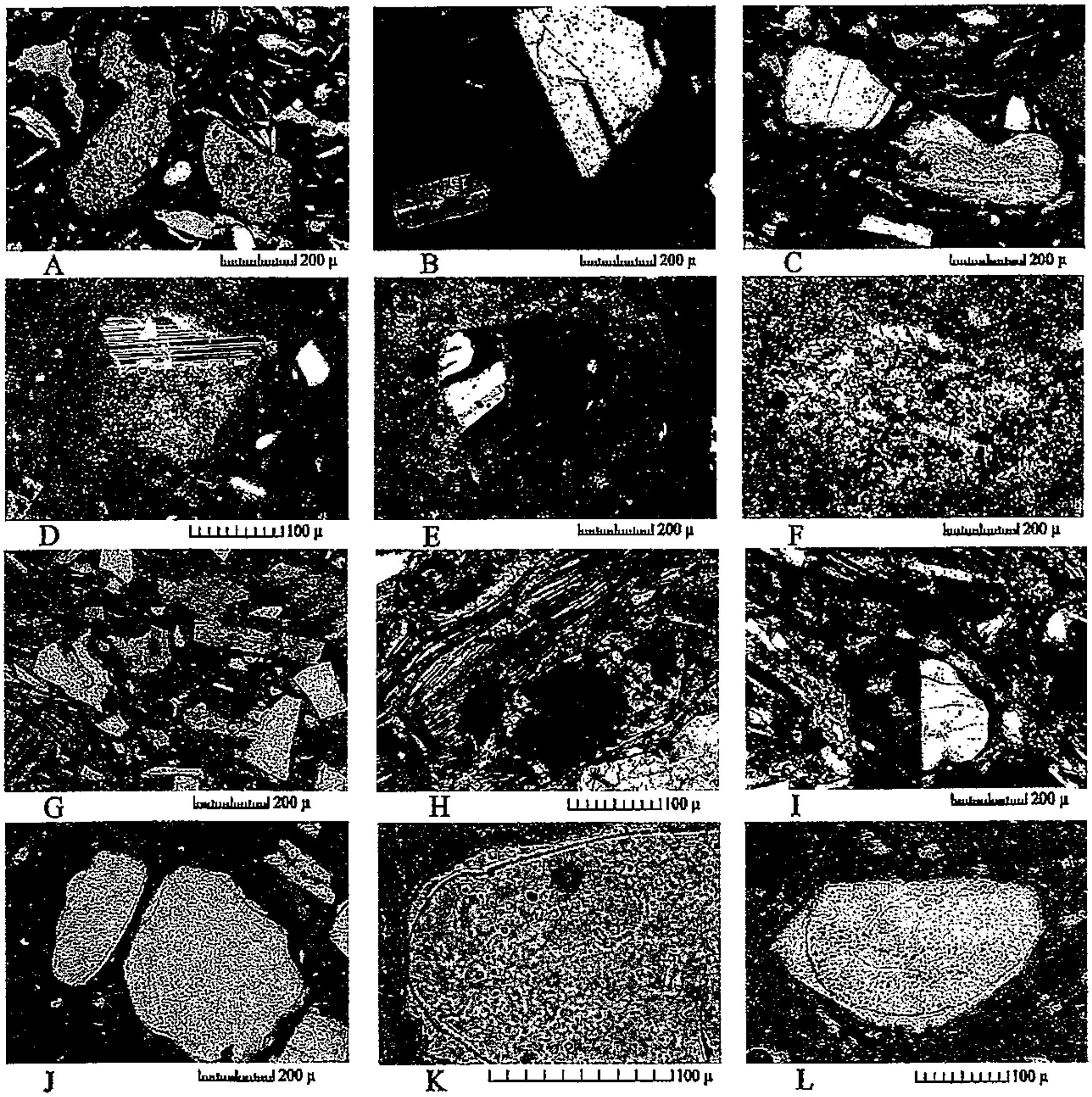
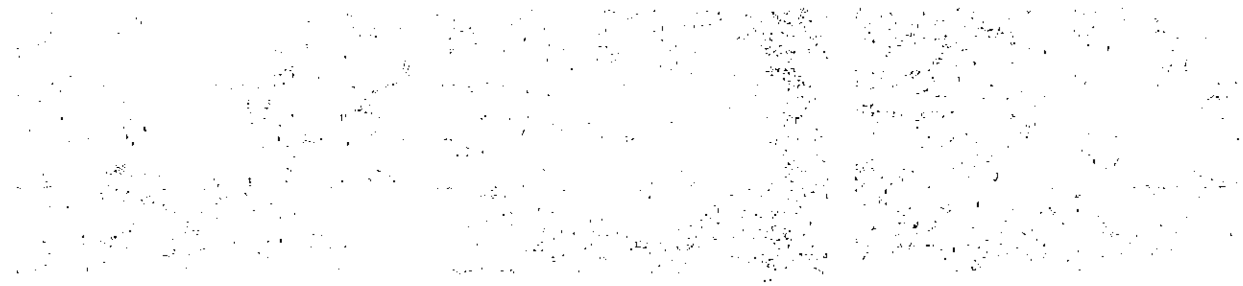


Figure 8. Digital photomicrographs of Fremont brown wares from Baker Village (samples 9 and 10), the painted ware from the Goshute Mountains (sample 12), and gray ware from site CRNV-11-8979.



A-C: Baker Village sample 9 is tempered with sideromelane (basaltic glass) that is slightly hydrated but not palagonitic. The VRFs are mostly subrounded and do not appear to be crushed (A, plain polarized light, scale as shown). They contain both fine-grained magnetite (A) and large plagioclase (B, cross polarized light; scale as shown) phenocrysts. Individual mineral grains in the temper are dominated by plagioclase (A). An additional temper constituent is bedded chert (C, novaculitic mudstone, plain polarized light, scale as shown). Most of the fine-sand sized chert appears as subrounded to subangular grains; however, smaller grains appear to be quite angular. Magnetite is not common as an individual temper grain, but is present as very fine sand. Quartz is present as very fine sand to silt (A, C).

D-F: Baker Village sample 10 is tempered with fine-grained basalt that contains fairly large plagioclase phenocrysts (D, cross polarized light, scale as shown). Most of the plagioclase feldspar, however, is present as small acicular laths in a matrix that is quite glassy. Magnetite is prevalent as small crystallites, and pyroxenes (pigeonite) are somewhat rare. Only a few VRF grains of volcanic glass were observed (E, cross polarized light, scale as shown); these are similar to sample 9. Most of the VRF temper grains ranged from rounded (F, cross polarized light) to subangular in shape. Individual temper mineral grains are dominated by plagioclase. Quartz is present as very fine sand to silt (D, E, and F).

G-I: Goshute Mountains sample 12 is tempered with monzonite IRFs and weathered feldspars and biotite (H, cross polarized light, scale as shown). The feldspars are mostly very angular (G, plain polarized light, scale as shown), but occasional more rounded grains (I, plagioclase feldspar, cross polarized light, scale as shown) occur. Most of the feldspar is pitted and weathered. Quartz is present as very fine sand sized grains and does not appear to be sourced with the feldspars. IRFs present are all clusters or feldspar grains.

J-L: Gray ware sample 11 is tempered with subrounded quartz sand that has overgrowths and is from a dune sandstone source. The original sand below the overgrowth is very well rounded (K, plain polarized light, scale as shown). The sand ranges from fine to medium sand size and, for the most part, appear to be naturally weathered (J and L, plain polarized light, scale as shown) as there are no angular breaks. Occasionally, the grain is broken (L) due to an internal fracture in the original quartz sand, but most of the time the grains are weathered at the quartz cement. The overgrowth cement is quartz and not chalcedony or opal-CT. As a consequence, it appears that the original source for this material is a sedimentary sand weathered from a lithified dune sand outcrop and not a novaculitic chert sandstone.

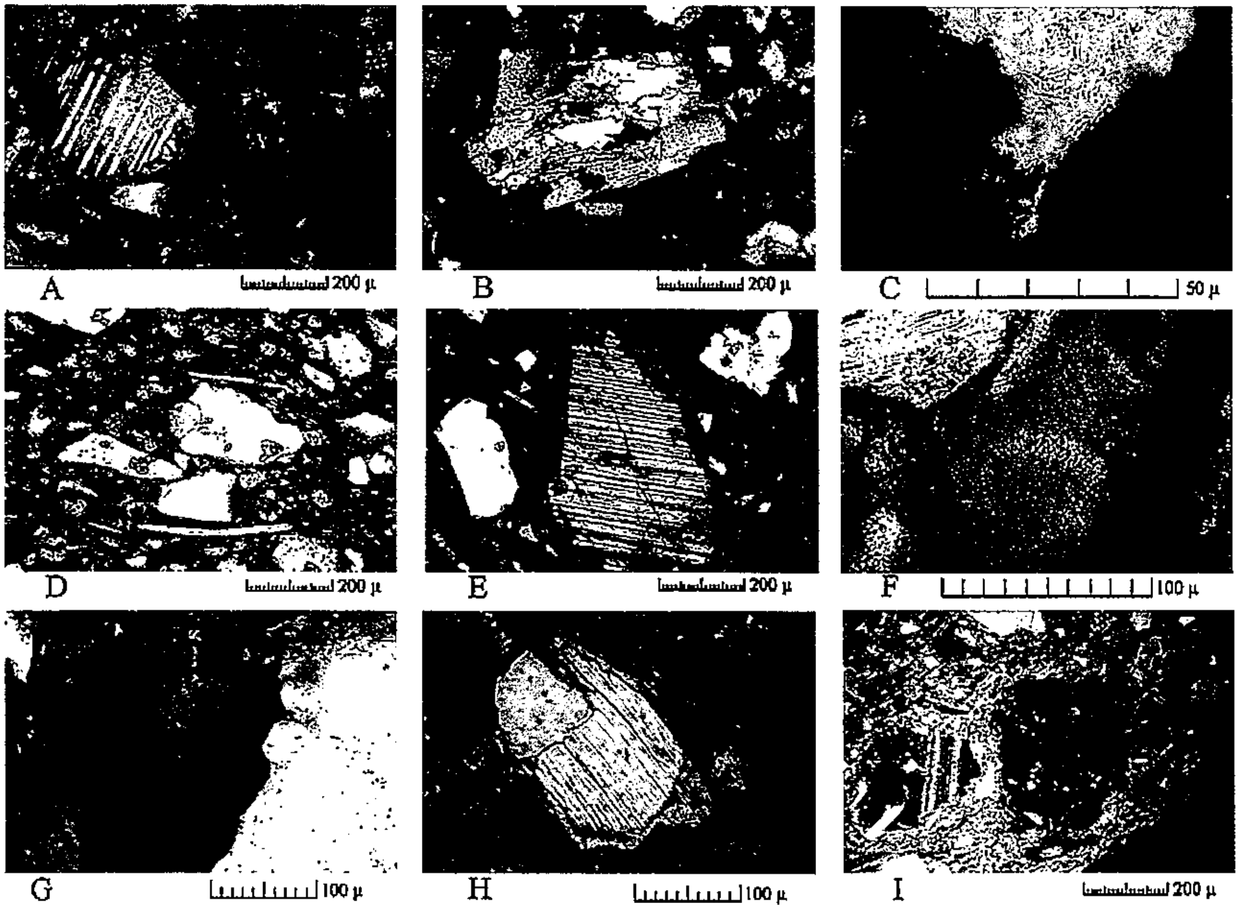


Figure 9. Digital photomicrographs of three brown ware ceramic pottery samples: A-C: sample 5, site CRNV-11-3644 from the Humboldt River drainage system; D-F: sample 6, site CRNV-11-6937 from Ruby Valley; and G-I: sample 8, site CRNV-11-6911 from Ruby Valley.

A-C: This sample is tempered with a schistose biotite-granodiorite that consists of both plagioclase feldspar (A, cross polarized light, scale as shown) and microcline in about equal amounts associated with quartz in a consertal texture (B, cross polarized light, scale as shown). The paste fraction contains an abundance of carbonaceous organic material (C, plain polarized light, scale as shown) in voids and in the vitrified clay component.

D-F: This sample is tempered with a monzonite with minor amounts of novaculitic chert (F, plain polarized light, scale as shown). These monzonite IRF (igneous rock fragments) are dominated by microcline with very minor quartz (D, plain polarized light, scale as shown) and plagioclase (E, cross polarized light, scale as shown). The biotite occurs mostly as larger temper grains and is not dominant in the fine silt sized fraction.

G-I: This sample is also tempered with monzonite (G, anhedral feldspars, cross polarized light, scale as shown) with very minor amounts of fine sand sized SRFs that are dominated by hematite cemented angular quartz siltstones (I, cross polarized light, scale as shown). Some of the IRFs are composed of both biotite and microcline (H, cross polarized light, scale as shown).

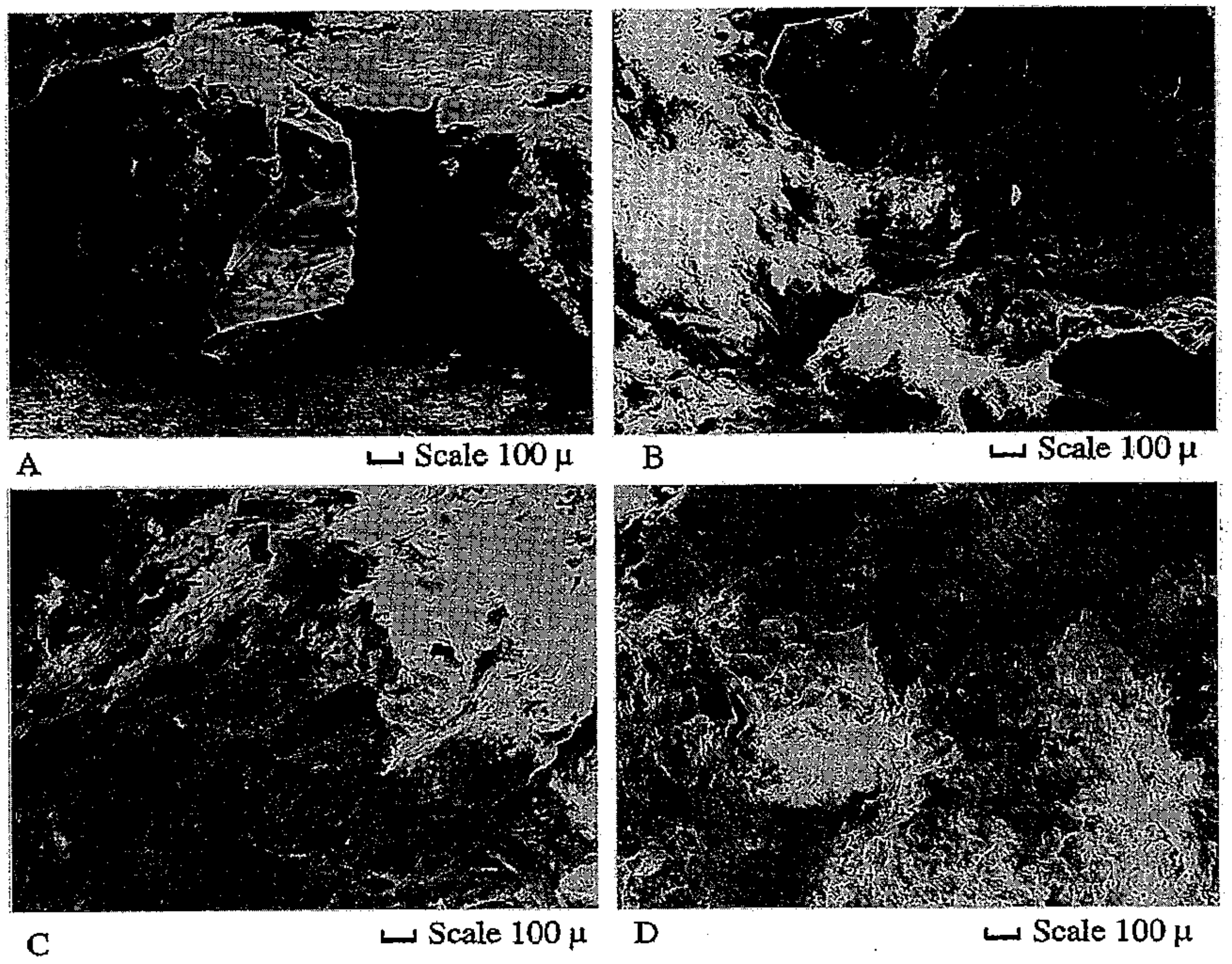


Figure 10. Scanning electron microscope (SEM) images of freshly broken surfaces of Fremont gray and brown ware, and brown ware from Scorpion Ridge and Wells Dump, all taken at the same magnifications.

A. SEM backscatter image from a freshly broken edge of sherd #11, gray ware, from site 8979, showing a well rounded, very coarse sand sized sedimentary quartz grain in a fine paste matrix with only minor void space; scale as shown.

B. SEM backscatter image from a freshly broken edge of sherd #9, Fremont, from the Baker Village site, showing plagioclase feldspar and VRF temper grains with common elongated pore space; scale as shown.

C. SEM backscatter image from a freshly broken edge of sherd #2, brown ware, from Scorpion Ridge site showing, biotite and IRF (quartz-dominated biotite granodiorite) temper grains in a fine paste matrix with very common elongated pores.

D. SEM backscatter image of a freshly broken edge of sherd #13, from Wells Dump site, showing large biotite grains and IRF (quartz-feldspar-biotite granodiorite) temper grains in a fine paste matrix with some elongated and irregular shaped pores.

plain ware samples from the upper Humboldt drainage. This would have had misleading implications.

The dune sandstone sand tempered Fremont plain ware from site 8979 is likely not a locally produced ceramic, but may have its origins in central or south central Utah (Navajo Sandstone or Carmel Formation). At present we cannot define any similar sources in Nevada.

For the most part it appears that the plain wares investigated here were manufactured from local materials. In this study, two local tempering materials have been identified for plain ware manufacture. These are a schistose biotite-granodiorite from the upper Humboldt River Drainage, and a monzonite with biotite from Ruby Valley. Both rock types have similar nonplastic mineralogical characteristics from a stylistic viewpoint as well as with respect to shrink-swell characteristics during ceramic firing. Temper variability in plain ware is emphasized by the limited petrographic and geochemical information in the open literature (Pippin 1986; Tuohy and Strawn 1986), which seems to suggest that the plain wares with specific tempers are confined to limited geographic districts. Within that local ceramic manufacture universe or lithologic district there is also some degree of mineralogical variation observed. For the upper Humboldt River drainage system the quantity of biotite in the ceramic temper varies among different features within a single site and from site to site, suggesting that there is variability in the temper source and the idiosyncratic behavior of potters. This variability may prove to be a temporal and spatial tool in the interpretation of cultural attributes with respect to pottery use and manufacture and with respect to overall exchange.

DISCUSSION AND CONCLUSION

As Madsen and Simms (1998) recently summarized, one of the material characteristics commonly employed to identify Fremont sites is plain gray ware ceramic vessels with flaring neck jars. One of these vessels was found at Scorpion Ridge together with a Nawthis Side-notched point in a context radiocarbon dated to about 1200 B.P. Petrographic and geochemical data provide compelling evidence that the Upper Humboldt River drainage plain wares were manufactured from local materials, regardless of vessel shape, manufacturing technique, or age. Butler (1986), Pippin (1986), and Tuohy and Strawn (1986), among others, have not reported any similar tempering of plain wares from other surrounding locations. This material is also greatly different than the Fremont wares studied from outside of the Upper Humboldt drainage along the western margins of the Bonneville Basin. It is almost certain that the Scorpion Ridge site documents that Fremont ceramics were locally manufactured in the central Great Basin as early as 1200 B.P.

This extends the known age of locally manufactured ceramics in the north-central Great Basin by seven centuries. In contrast, other sites such as 8979 suggest that Fremont wares were also traded into the region from elsewhere, perhaps from as far away as central Utah. The chemical and petrographic analyses reported here suggest that these methods may assist in distinguishing locally-made plain wares from those traded into the region.

At a regional scale, the Scorpion Ridge site is representative of a relatively early period of Fremont foraging cultures, perhaps before the establishment of adobe villages in the northwestern Fremont region. By at least 1200 B.P., Fremont ceramics may have been locally manufactured across a vast region that extended from the central Great Basin to western Wyoming and Colorado, and from southern Idaho to southern Utah. It seems unlikely that all of these early Fremont ceramic-manufacturing groups adopted the village lifestyle, although in some cases it is probably impossible to distinguish between base camps created by full-time Fremont foragers and temporary, task-specific camps created by hunting and gathering parties sent out from sedentary villages (see also Simms 1986). Importantly, this study suggests that the presence of

Importantly, this study suggests that the presence of ceramics is not a clear indicator to distinguish between the two subsistence/settlement strategies.

By all indications, the inhabitants of the Scorpion Ridge site were participating in the Fremont Behavioral Complex. Unfortunately, whether the cultural links in material remains between the Scorpion Ridge inhabitants and those Fremont groups at the center extended to close biological affiliations created by direct migration into regions west of the Bonneville Basin, or by the exchange of marriage partners, remains elusive.

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