MOVEMENTS OF POTTERY AND PEOPLE: PETROGRAPHIC THIN-SECTION ANALYSIS FROM THE ELK MOUNTAIN SITE (48CR301)

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ABSTRACT

The Elk Mountain site (48CR301), also called the Garrett Allen site, is located in south-central Wyoming in the Carbon Basin. Excavations commenced every year from 1969 until 1980 and were highly productive with many different types of artifacts recovered in large numbers. Despite its productivity, analyses were never completed on particular artifact classes. Recently, the University of Wyoming Archaeological Repository received grant funding to produce a petrographic thin-section study from three vessels recovered during the early excavations. The results indicate that a Woodland vessel was likely made from non-local materials similar to those found in the South Platte River basin of Colorado and Nebraska. However, two other smoothed surfaced vessels probably were made locally, but do not correspond well with established ceramic types in southern Wyoming. It is hypothesized these vessels may represent the movement of Plains groups into the area who carried pots or ceramic manufacturing traditions with them.

[1: TITLE SLIDE]

[SLIDE 2] The Elk Mountain site, also known as the Garrett Allen site, is located in south-central Wyoming in the Carbon Basin along Halleck Ridge. It is found at seventy-five hundred feet in a sheltered arroyo near Quealy Springs surrounded by sagebrush and grassland. **[SLIDE 3]** The site was excavated repeatedly by the Wyoming Archaeological Society and the University of Wyoming from 1969 until 1980 (Berger 1969, 1970; Hayter 1981; Junge 1973).

[SLIDE 4] The excavations were highly productive and many different types of artifacts were recovered including points from the Late Paleoindian to the Late Prehistoric, though the majority of points are small side-notched varieties. **[SLIDE 5]** A large number of faunal remains and bone tools, such as awls or antler flakers, bone beads, and one incised gaming piece were also cataloged.

[SLIDE 6] While originally interpreted as a kill and processing site, recently Eckles and Guinard (2015) argue the locale may be some type of trading and rendezvous location using data from the wide variety of lithic and obsidian sources found at Elk Mountain. More research is needed from the lithic tool assemblage composition, like the number of blanks, cores, or finished tools to provide another line of evidence for this interpretation, though.

In 2013, UWAR began an evaluation of the Elk Mountain ceramics in order to catalog this portion of the collection. **[SLIDE 7]** At first, we thought this endeavor would be fairly straightforward. There were only two pottery fragments listed in a 1970 article, and while the ceramics were not inventoried for the 1979 UW field school we assumed there simply couldn't be that many more. This is Wyoming after all. Also, the 1979 field school excavation paperwork recorded few ceramics, and what was detailed listed all the pottery as either Woodland, or coming from the Woodland level, or Upper Republican. So we assumed designating typology should be relatively easy as it had already been done for us.

[SLIDE 8] This proved to be wrong- all wrong. Once we pulled the ceramics we found larger amounts of ceramics from the site than previously known with the number of sherds totaled nine-hundred-three (N=903). Also, I brought the sherds to Donna Roper at the 2013 Plains conference in order to confirm the typology. She was adamant the sherds were not representative of the Upper Republican or any portion of the Central Plains tradition. We were

left with the questions of where might these ceramics come from or who might have made them and so turned to attribute analysis and petrography for answers. Twenty-one rim sherds represent at least six different vessels. I will discuss basic attributes for only the three vessels that were used for petrographic thin-sectioning.

[SLIDE 9] An undecorated, conoidal Woodland vessel has an average wall thickness of 6.28 mm. The cordmarked exterior surface is very slightly oblique and the flat lip has a smoothed-over-cordmarked surface. The paste is slightly laminated and moderately compact. The rim is inslanting. The smoothed interior surface is encrusted with residue and an AMS assay came back very late, at AD 1300-1410, which is significantly too late for the commonly accepted range of Woodland in Wyoming.

[SLIDE 10] A second vessel used for petrography is an undecorated vessel with an everted rim and rounded lip. I will refer to this pot as the Smoothed Undecorated vessel. As there is so little of the orifice, I am unsure whether the notch on the lip is intentional. Interior and exterior surfaces are both smoothed. The paste has a fine matrix, and it appears well compacted though no lamination is visible. The vessel is completely reduced in cross-section and the rim averages 4.56 mm in thickness.

[SLIDE 11] The third vessel will be referred to as the Trailed vessel because it has trailed decoration limited to the vessel shoulder starting just below the neck. They alternate in direction producing a zig-zag motif. The vessel has a smoothed surface, everted rim, and wall thickness averages 4.76 mm. The paste is well compacted. An AMS date taken from exterior residue returned a range of cal 2 sigma AD 1170-1280. **[SLIDE 12]** This vessel is found in association with many other body sherds displaying similar or slightly different rows of trailed decoration, so there is likely more than one trailed vessel at the site.

PETROGRAPHY METHODS

In 2014, the repository received a grant from the University of Wyoming Frison Institute to conduct petrographic thin-section analysis on these three vessels just described. Standard point counting, to identify basic volumetric composition and mineral composition, and grain frequency counting, to identify volume of size grades, were both performed on the slides (Page 2014).

[SLIDE 13] In an effort to identify manufacturing location, two sand samples were also collected and thin-sectioned for characterization in addition to the three vessel thin-sections. These sand samples were from the nearby Medicine Bow River, denoted as MB1 on the slide, and the North Platte River southwest of the site, denoted NPW3. **[SLIDE 14]** Two sand samples were necessary as the Elk Mountain site is situated on the divide between these two drainage basins. These samples were screened to remove gravel, silt, and clay, then the remaining sand was sieved in order to separate it into size grades from very-fine to very-coarse. A representative sample of each size class was mounted onto petrographic slides.

The petrofacies method of resource provenience determination was used in the petrographic analysis for the Elk Mountain ceramics (Page 2014). It is based on the tenet that sand is the weathered and eroded material from a parent rock which has entered a sedimentary transport system. Therefore, the sand sample composition should reflect the mineral composition of the parent rock, and can be used to differentiate sand material sources. In turn, if one can differentiate the sand material sources, the method can be used to define the locality of manufacture for ceramics which has sand included as temper or in the clay body. The difficulty is few modern sand petrofacies have been identified systematically despite the method's utility for archaeologists (Page 2014:3). The method has been successfully applied in the South Pacific

and the southwestern US, but many different local petrofacies may be needed to characterize adequately a site's ceramic assemblage.

PETROGRAPHIC RESULTS

[SLIDE 15] Results of the point counting analysis show all three vessels have roughly the same proportions of paste, temper, silt, and pore space. Also, all three samples have between 80-90% very-fine and fine grained sand which is sub-angular to rounded. This sand may have been present naturally in the clay and was probably not "temper" per se. **[SLIDE 16]** However, the Woodland vessel has larger sized grains that are sub-angular to rounded. These sands are monomineralic or minerals indicative of fluvial sediments (Page 2014:8). The Woodland vessel was therefore interpreted as sand-tempered.

[SLIDE 17] In contrast, the larger, very-coarse grains of the Trailed Vessel are angular to sub-rounded fragments of quartzite found in similar proportions to an unidentified metamorphic rock. The size, shape, and composition of these inclusions indicate crushed rock temper for this vessel. **[SLIDE 18]** Another interesting occurrence on the trailed vessel was the visibility of pseudo-slip or burnishing on the vessel exterior, probably created by repeatedly wetting and rubbing the surface so the finer particles are brought to the surface. **[SLIDE 19]** The Smoothed Undecorated vessel also had medium to very-coarse grained fragments of quartzite that appear to have been used as crushed-rock temper.

[SLIDE 20] Comparing the mineralogic proportional compositions between the three vessels and the two sand samples produces interesting distinctions. The Woodland vessel is very dissimilar to the other samples and does not compare well with the other vessels or with the sand samples. It has a very high proportion of potassium feldspar, a very low count of ferromagnesian minerals like muscovite, biotite, chlorite, pyroxene and amphibole, and no opaque minerals. It

is likely the vessel was not constructed with known sands from the area. However, Page (2009; 2014:13) noted "[s]imilar high proportions of potassium feldspar were noted in the sands of the South Platte River basin in Colorado and western Nebraska" in his previous petrofacies studies, and notes it could have been made with sands from even farther east.

The Trailed Vessel and Smoothed Undecorated vessel thin-sections were somewhat similar, but the Trailed vessel has a higher frequency of quartz and no chlorite was seen in the sample. Also, the Trailed vessel is comprised of about 7.0% ferromagnesian minerals, and this is about half of what was noted in the Smoothed Undecorated vessel where they accounted for 14.3%. The Smoothed Undecorated vessel had roughly equal proportions of plagioclase and potassium feldspar, and a high proportion of chlorite which were found in a phyllite lithic aggregate. Similar phyllites occur in the north Snowy Range regions of south-central Wyoming (Page 2014:15). The Medicine Bow River sand sample also contained a high proportion of chlorite.

Though there are some differences between the Trailed and Smoothed Undecorated vessels to the sand samples, the minerology of these two vessels generally compare well with the nearby rivers. The vessels were also both tempered with crushed quartzite, the most common rock identified in both sand samples. Though the data are limited and more petrofacies may be needed, it is likely these two vessels were produced using locally or regionally available materials.

DISCUSSION

The varying percentages of identified rocks and minerals present in the three petrographic samples suggest separate manufacturing locales for the different vessels with the Woodland vessel constructed outside the site area as it does not match the composition of the local sand

samples. Rather, the minerals present in the Woodland petrographic thin-section are more representative of sand samples taken from areas in western Nebraska and eastern Colorado.

[SLIDE 21] The Elk Mountain Woodland vessel attributes also are more typical of Plains Woodland vessels found on the front range of Colorado (Ann Johnson, personal communication, 2013). It has the fine, generally vertical cord-marked exteriors Ellwood (1995) illustrates for Eastern Colorado. The vessel has many similarities to Kivett's (1952) Ash Hollow Cord Roughened including its lack of decoration, oval vessel form, and sand tempering. It may be possible to associate the pot with the South Platte phase found in eastern Colorado and western Nebraska (Bozell and Winfrey 1994). However, the AMS date obtained from the Elk Mountain Woodland vessel is also about three hundred years too late for the Early Ceramic period as it is defined on the Front Range. It is very likely the date on the Elk Mountain vessel is simply incorrect.

What is a vessel with compositional and attribute similarities to Colorado and Nebraska doing in south-central Wyoming? Cobry and Roper (2002) document the movement of Upper Republican pots, and therefore the people who made them, into southeastern Wyoming, northeastern Colorado, and the Nebraska panhandle using INAA pottery evidence. They argued that the nature of movement does not seem to be incidental and sporadic, and while Nebraska pots are found on the High Plains, this situation is not reversed. They offer different exchange explanation including that pots made from Nebraska clays were more desirable and therefore preferentially transferred to the High Plains in exchange for lithic materials. In particular, they argue it is likely the Upper Republican groups on the High Plains were the ones to travel to the eastern populations because they were more nomadic. Alternatively, the transfer of pottery from Nebraska to the High Plains could have happened within a system of seasonal movement.

[SLIDE 22] At Elk Mountain, it appears as if we have evidence that these types of group movements or trade between locales stretching back farther into the Woodland Period so by the time Upper Republican groups participated in an east-west interaction it was an already within an established system. If Elk Mountain were a trading or rendezvous locale, it would make sense for groups to bring their desirable pots for lithic resources found further west. However, the Elk Mountain vessel is already fairly far west considering the placement of other Wyoming Woodland ceramics, so I find it equally likely that Wyoming groups already close to the Plains moved east to obtain the vessels during a series of cyclical rounds.

[SLIDE 23] The Trailed and Smoothed Undecorated vessels indicate a different type of movement in south-central Wyoming. Instead of moving finished pots, people moved into the area. The petrography for these vessels indicates they were made at or nearby to the site itself. Also, their suite of decoration and manufacturing attributes do not match other smoothed-surfaced types common to Wyoming like Crow, Dismal River, or Intermountain ware (see Frison 1967, 1971; Trabert 2015). However, many of their individual attributes seem more at home on the northern Plains, like the globular vessels forms, and the smoothed and burnished surface treatments. Yet none of the Elk Mountain vessel attributes are found in a combination which would offer an easy association with identified northern Plains types, or the vessels are missing critical attributes which would seal such an association.

[SLIDE 24] Johnson (1980:85, Table B-3; 2007) notes the trailed pattern can be found in some Extended Coalescent rims, ca. 1400-1650, especially the herringbone rimsherd marked K in the figure. This herringbone motif is also found sometimes in Post-contact Calescent (ca. 1650-1800). **[SLIDE 25]** Wood (1962) also documents a similar zig-zag shoulder pattern in the Lower Loup focus sites in east-central Nebraska, considered by him to represent the immediate

predecessors of the Pawnee. The motif is also found on sites in South Dakota relating to the La Roche foci which he argued to be the prehistoric antecedent of the Arikara. While it is likely the Elk Mountain trailed vessel is not Pawnee or Arikara, it is apparent the motif represents a long-standing Plains tradition.

[SLIDE 26] While the decoration and its placement on the vessel shoulder may fit Extended Coalescent, other attributes signal Extended or Initial Middle Missouri. The simple everted Elk Mountain rim forms in particular are more reminiscent of EMM or IMM vessels. Also, if the "bump" on the lip of the Smoothed Undecorated vessel is intentional, it may also be more at home in EMM (George Holley, personal communication, 2014). It is interesting to note that EMM rims are always smoothed and EMM dates to approximately AD1200-1400 so the AMS date from the Trailed vessel would fit well in this range (Johnson 2007). The Trailed and Smoothed Undecorated vessels at Elk Mountain also seem to fit well with Toom's (2004) Northeastern Plains Village complex. Most vessels he designates as part of this complex have smoothed or burnished upper vessel portions, but do not have braced or S-shaped rims, though everted rims are present.

What is missing at Elk Mountain is the simple or checked stamped body sherds which should be present to make a direct association to other Dakota or northern Plains sites, though I will note briefly it is not just pottery that signals an easterly association at Elk Mountain. **[SLIDE 27]** A shell was recently identified as Pleurocera- a genera found in large freshwater streams of the eastern US or the Mississippi drainages on the eastern edges of the Plains. **[SLIDE 28]** An opossum humerus was also found in situ. Their modern range does not extend into Wyoming, and their prehistoric range would have been much more confined to the southern

U.S. **[SLIDE 29]** Finally, a box turtle carapace is much more likely to have come from somewhere on the southern or central Plains or even farther eastward.

[SLIDE 30] Given the petrography results, the Woodland vessel represents the movement of pots themselves, but the Trailed and Smoothed Undecorated vessel probably better represent the movement of people. Wood (1980) discusses the large scale complexities of the Middle Missouri intertribal trade network and maps how it ranged from the Shoshone rendezvous in southwestern Wyoming to the Arikara and Mandan/Hidatsa trade centers in the central Dakotas before goods moved even farther afield. It resulted and was facilitated in part by ceremonial exchange and real or fictive kinship through intermarriage or adoption.

The ceramic petrofacies data could serve as evidence that Elk Mountain was some type of node on a similar trade network. Women from more easterly nations either moved west when groups met at Elk Mountain to trade, or they could have married into Wyoming groups. In either case, they brought their ceramic manufacturing traditions with them, and constructed the pottery on site thus resulting in the presence of ceramic attributes more at home within northern Plains groups.

[SLIDE 31] Maybe we will never find an exact type match for the Elk Mountain smooth surfaced vessels because Wyoming is simply not the Dakotas. As groups and people move, attributes change over time and space. Yet the potting tradition visible at Elk Mountain is more closely aligned the northern Plains around the Middle Missouri area even though the pots were made locally. The Woodland vessel also indicates some type of interaction with more central Plains groups as the petrofacies model suggest the vessel was made in Colorado or Nebraska. It is likely these types of movement have always occurred on the Plains as part of seasonal rounds or large scale population shifts. It is reasonable to suggest the ceramics at Elk Mountain are

another example of the movement of pottery and people across the Plains visible throughout prehistory.

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Movements of Pottery and People: Petrographic Analysis from the Elk Mountain Site (48CR301)

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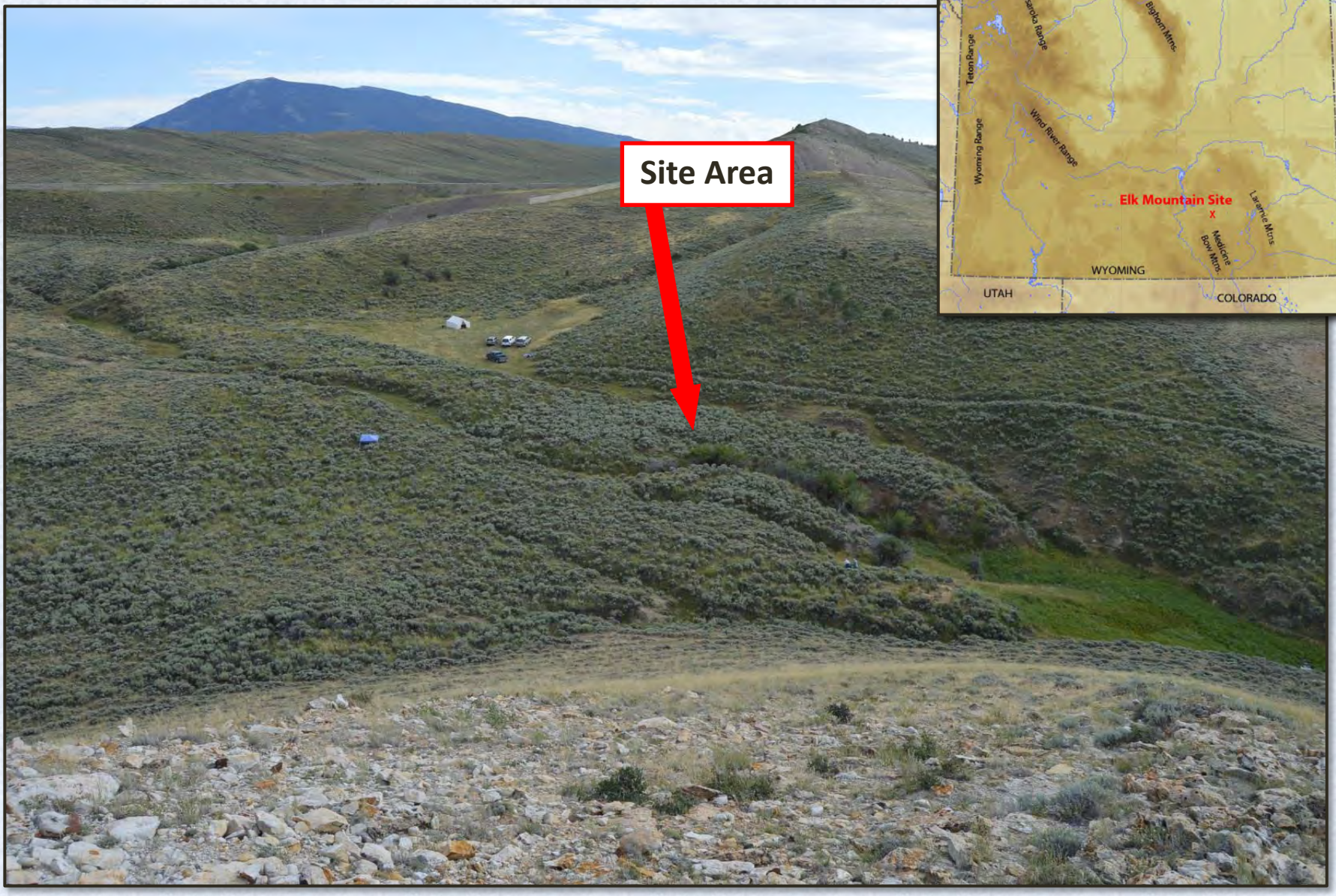

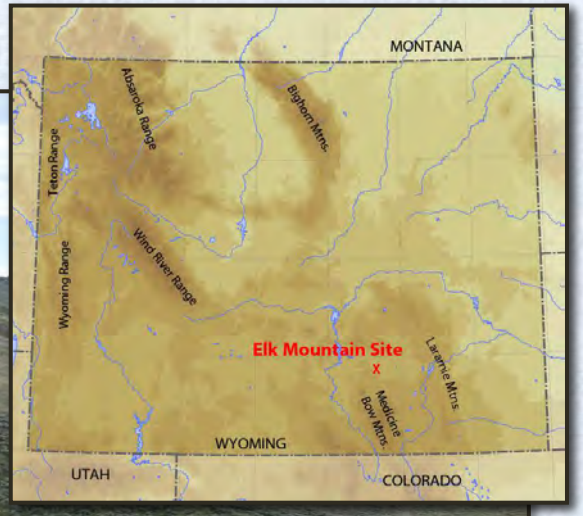

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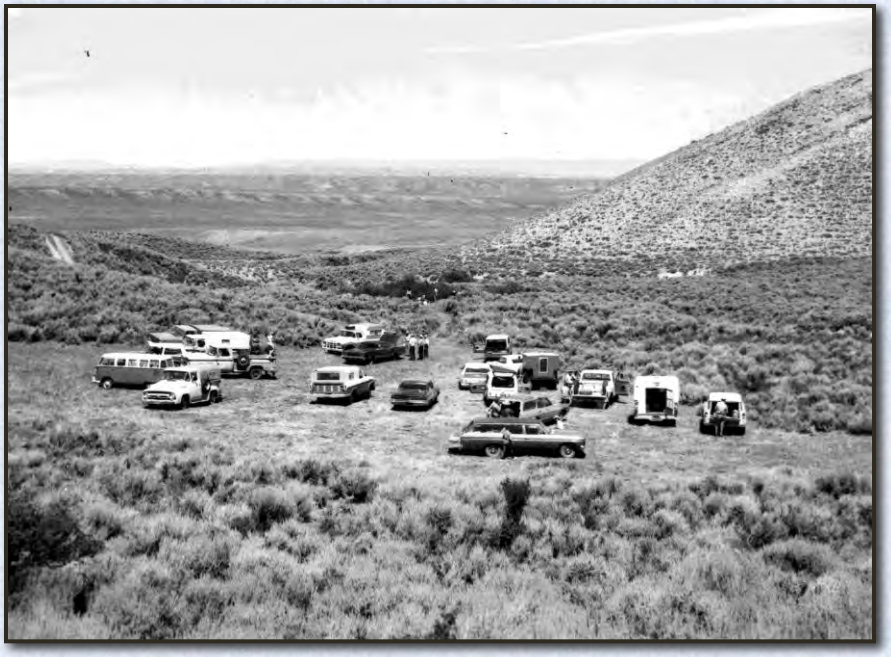

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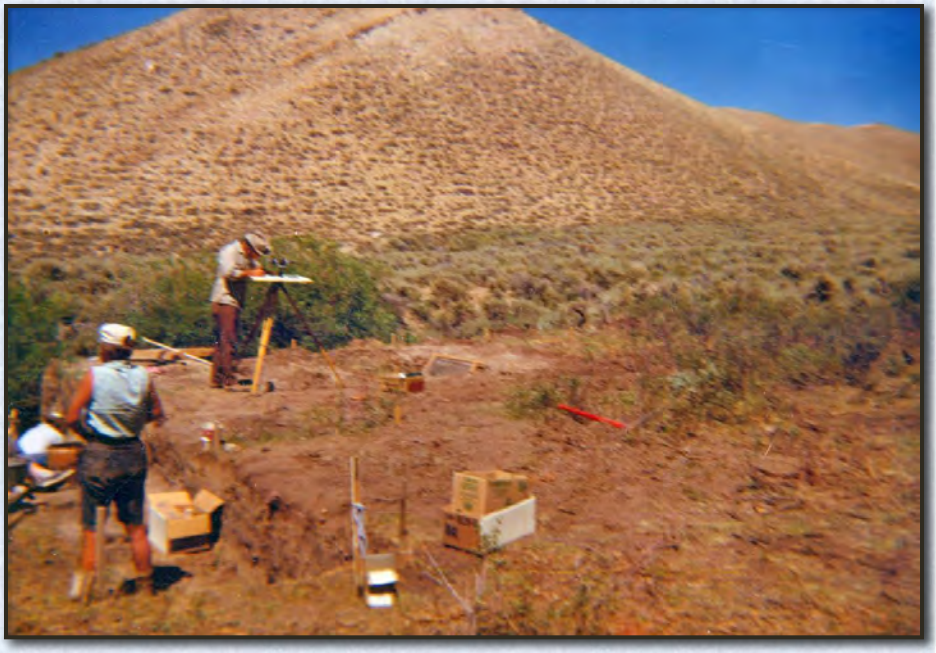

1970

1979

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Worked Bone

N	Type
64	Bone Tools (awls, antler or long bone flakers)
14	Bone beads
1	Incised gaming piece

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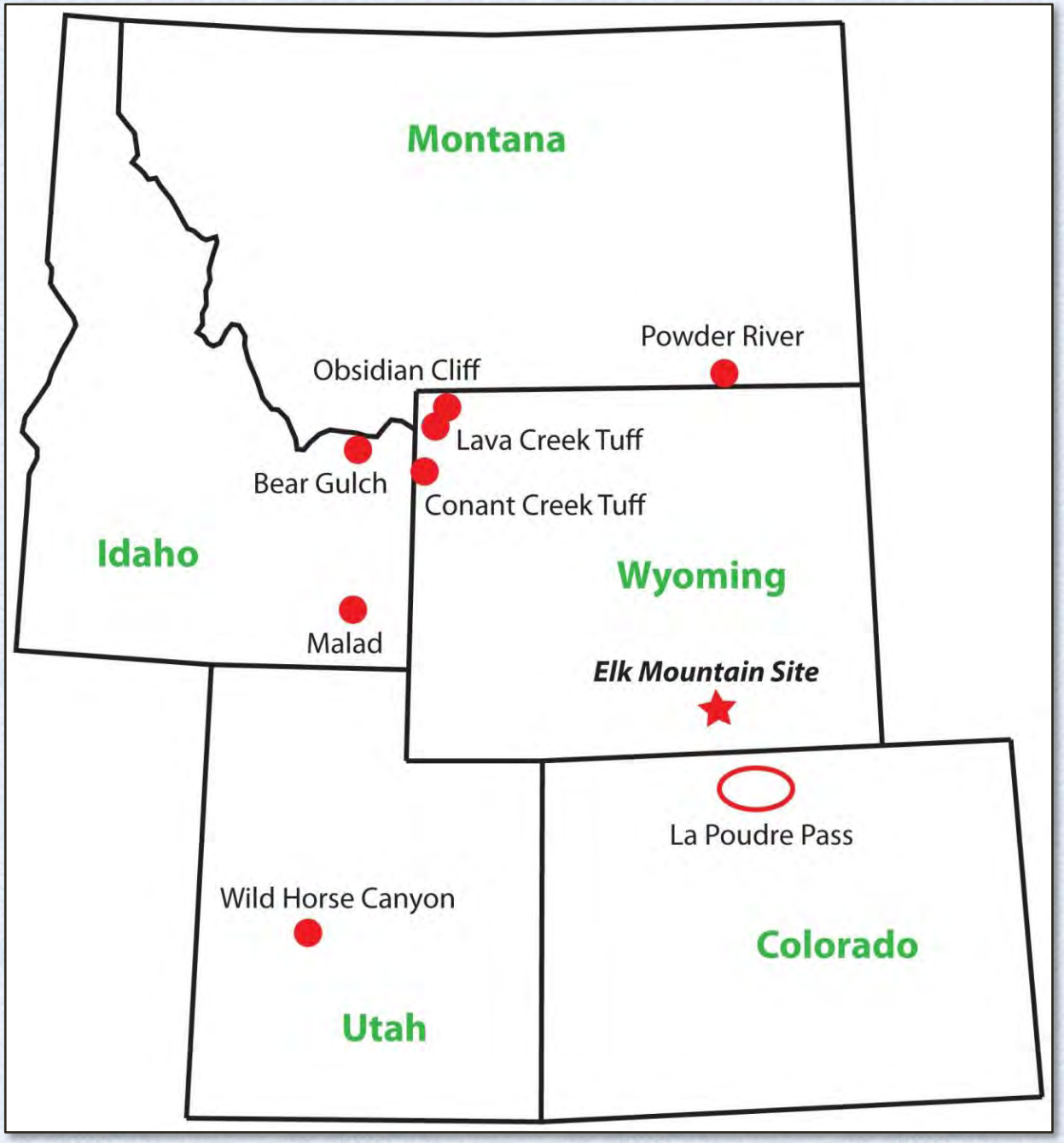
2013 Obsidian Sourcing

N	Source
7	Obsidian Cliff
6	Malad
5	Wild Horse Canyon
1	Bear Gulch
1	Powder River
1	La Poudre Pass
1	Conant Creek Tuff
1	Lava Creek Tuff



During the winter months, all material recovered was washed, numbered and cataloged on 3 x 5 file cards. The identification system used for identifying the various artifacts recovered, plus the number found and cataloged is as follows:

PP---Projectile point	8 found and cataloged
PPB--Projectile point base	37 found and cataloged
PPC--Projectile point center	5 found and cataloged
PPT--Projectile point tip	14 found and cataloged
S----Scraper	20 found and cataloged
SB---Scraper, broken	8 found and cataloged
CT---Cutting tool	9 found and cataloged
CTB--Cutting tool, broken	38 found and cataloged
MFT--Miscellaneous flaked tool	13 found and cataloged
F----Flakes	2,086 found and cataloged
MS---Miscellaneous stone	8 found and cataloged
BT--- Bone tool	7 found and cataloged
BB--- Bone bead	1 found and cataloged
B---- Bones	1,449 found and cataloged
PS--- Pottery sherd	2 found and cataloged

1970 Wyoming Archaeologist 13 (2):13

1979 Test Unit form

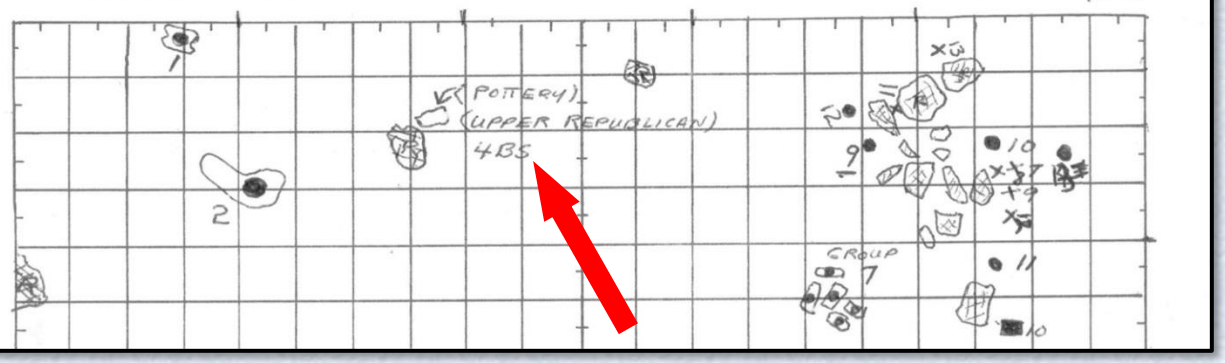
■ Tool
X Flake
● Bone frag.
▲ Point
✦ Datum
(R) Rock
Rock, fire hardened

Note:
Sketch complete bones, features and large artifacts to scale.
Obtain catalogue numbers for artifacts and features.
Fill out reverse side.

NOTE: BONE #(1 - 14)
TOOLS & FLAKES 1 - 15

N

SCALE 1 sq = 3"



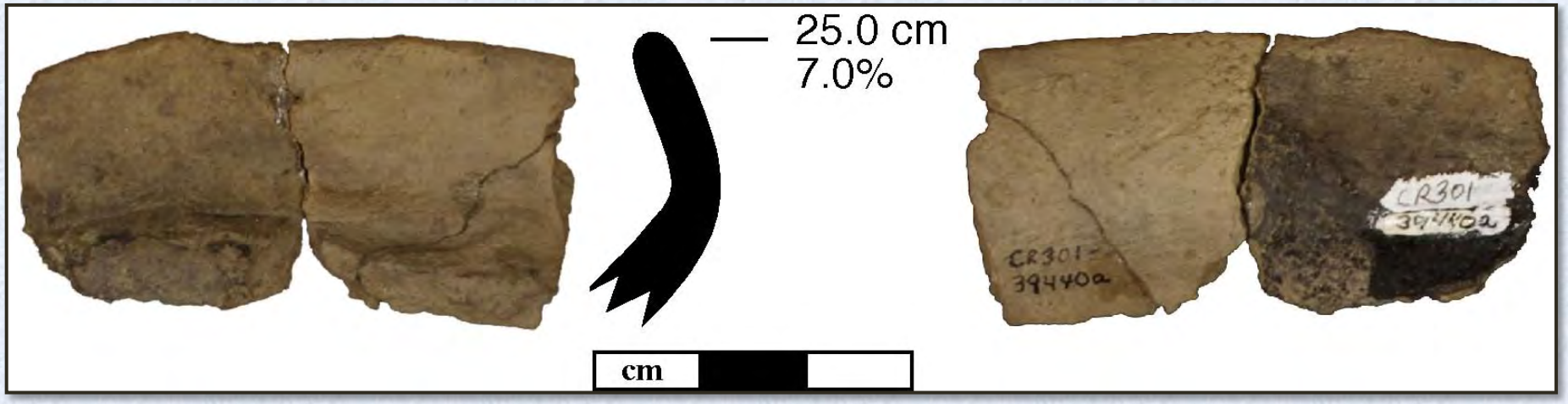
21 rimsherds represent 6 vessels

Total ceramic N = 903

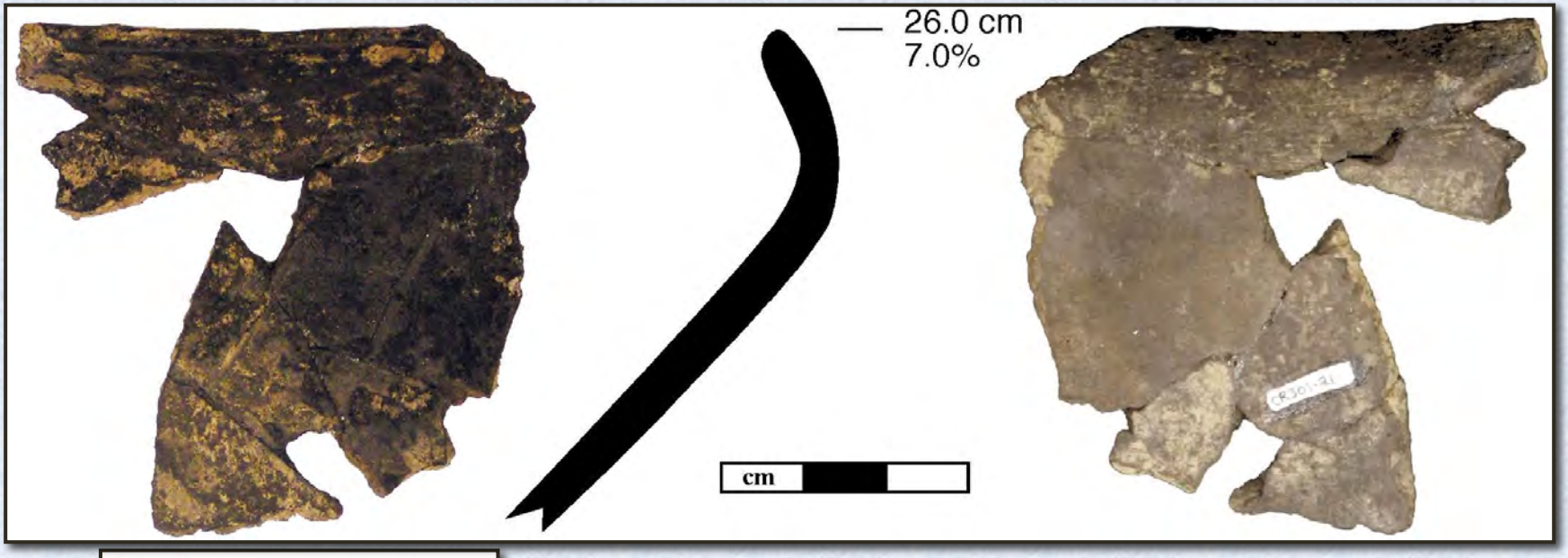
* Orange tags indicate groupings of individually bagged ceramics

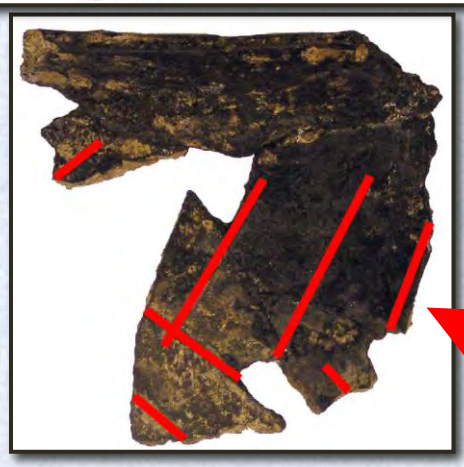
Woodland vessel

BP Age	Cal. 2 sigma	Provenience	Material	Associated Diagnostics	Time Period	Lab #
591 +/- 25	650-540 BP (AD 1300-1410)	1-8” bs	Interior vessel residue	Woodland pottery	Late Prehistoric	D-AMS 004548



Smoothed Undecorated vessel





Trailed decoration pattern

Trailed vessel

BP Age	Cal. 2 sigma	Provenience	Material	Associated Diagnostics	Time Period	Lab #
797 +/- 33	670-780 BP (AD 1170-1280)	N18-20, W78-80, 8” bs	Exterior vessel residue	Unknown pottery type	Late Prehistoric	D-AMS 004547

Trailed bodysherds

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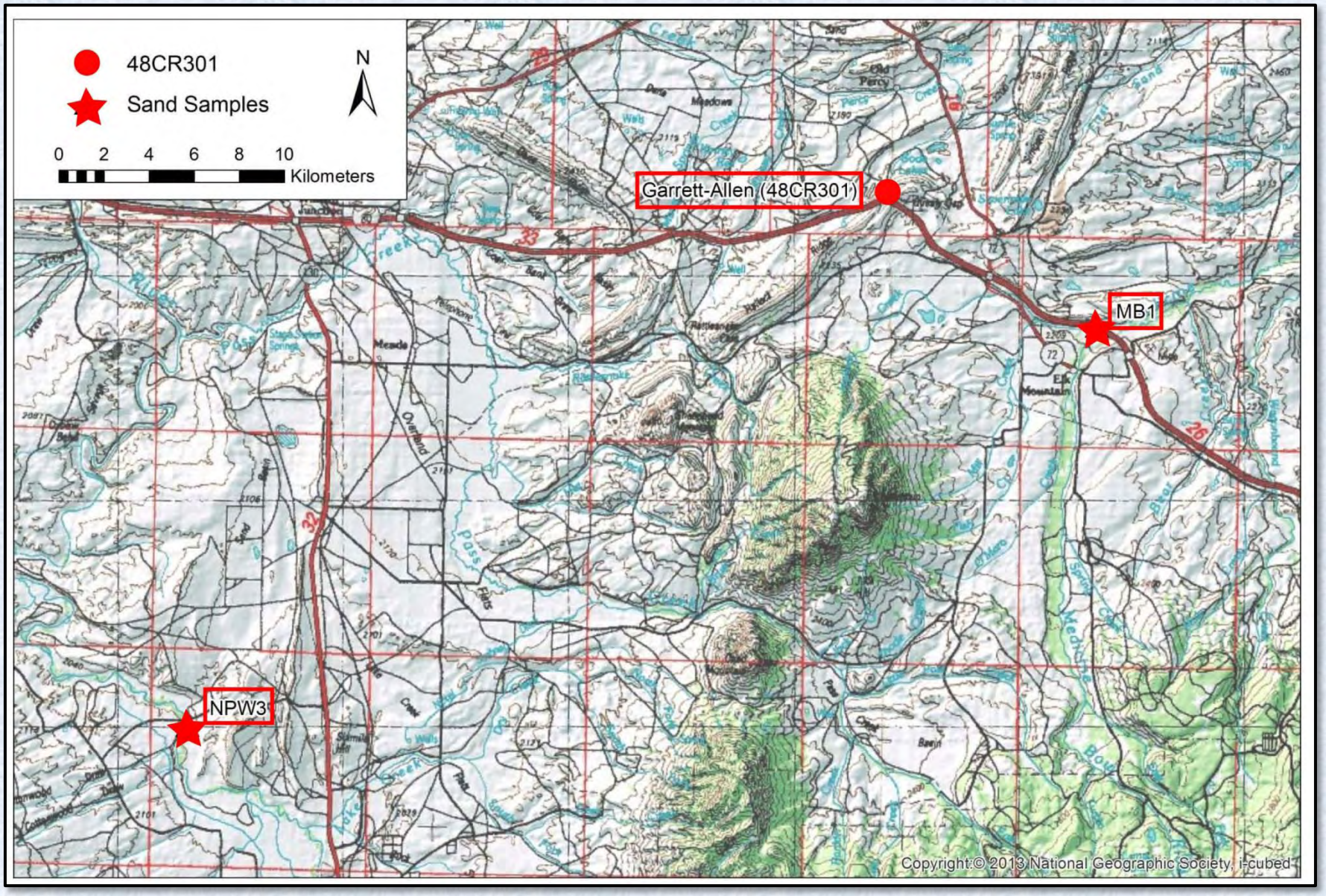

Location of sand samples

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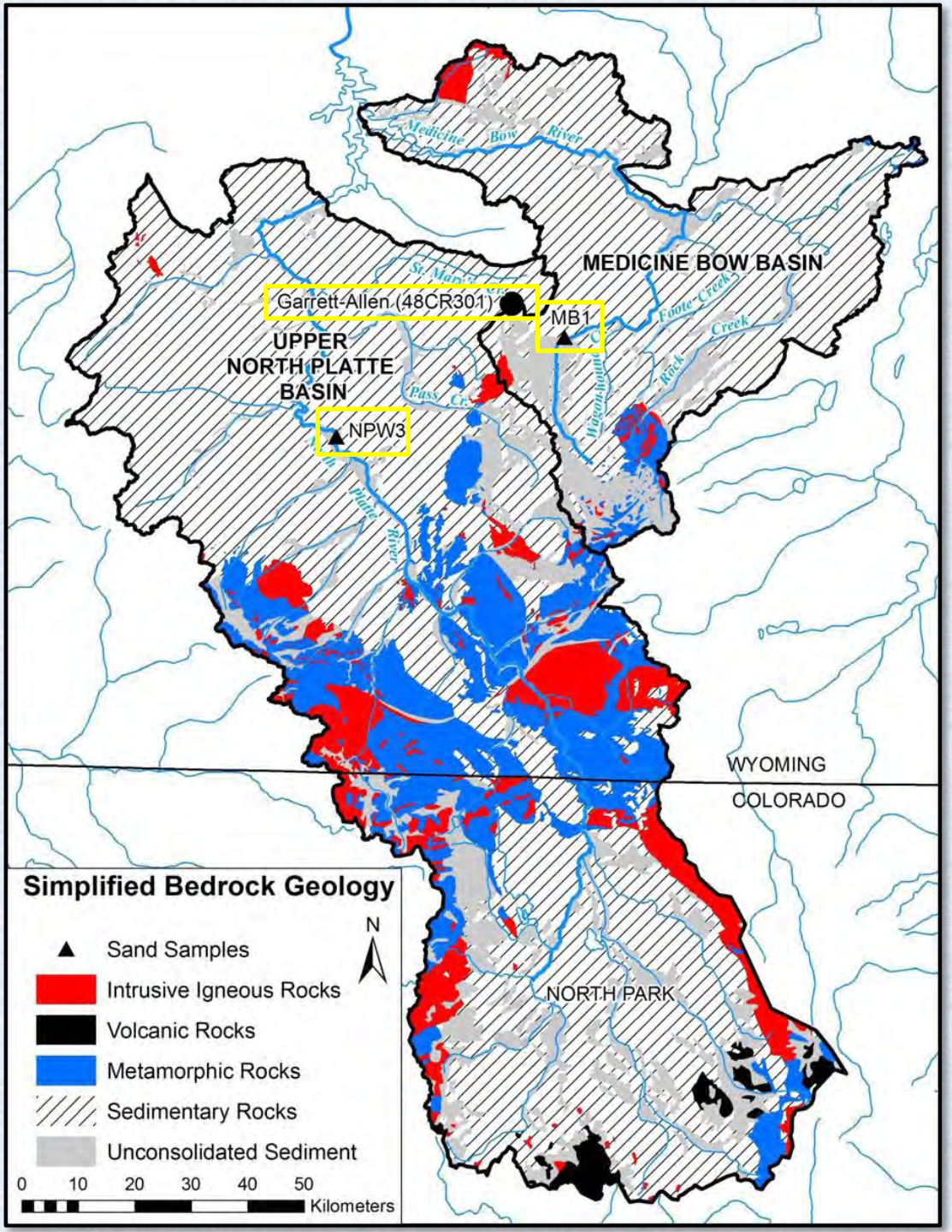

Drainages and sample locations

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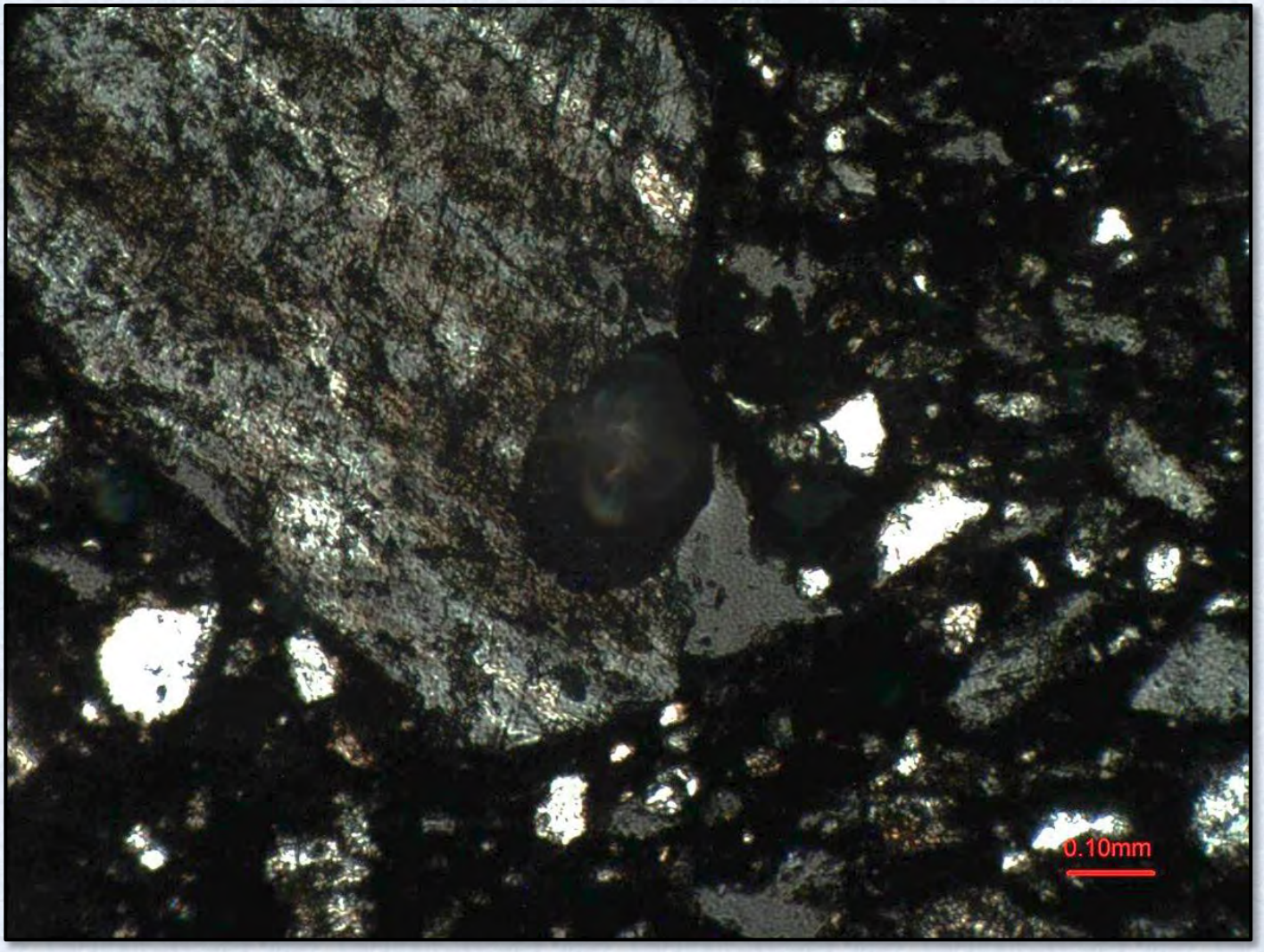
Basic Composition of Sampled Pottery

Vessel	Paste	Temper	Silt	Pore	Total Counts	Temper Type
Woodland	58.00%	23.50%	5.50%	13.00%	400	sand
Trailed	56.30%	18.40%	9.40%	15.90%	403	crushed rock
Smoothed Undecorated	56.80%	22.00%	12.40%	8.80%	400	crushed rock

Results of Grain Size Analysis

Vessel/Sand Sample	Very Fine	Fine	Medium	Coarse	Very Coarse
Woodland	44.4%	41.3%	12.7%	1.0%	0.5%
Trailed	66.9%	23.8%	7.7%	1.5%	0.0%
Smoothed Undecorated	58.7%	21.6%	17.0%	2.8%	0.0%
MB1	29.0%	39.8%	28.8%	2.3%	0.3%
NPW3	37.3%	33.8%	27.8%	1.0%	0.3%



Photomicrograph of Woodland vessel with large grain of potassium feldspar altering to perthite

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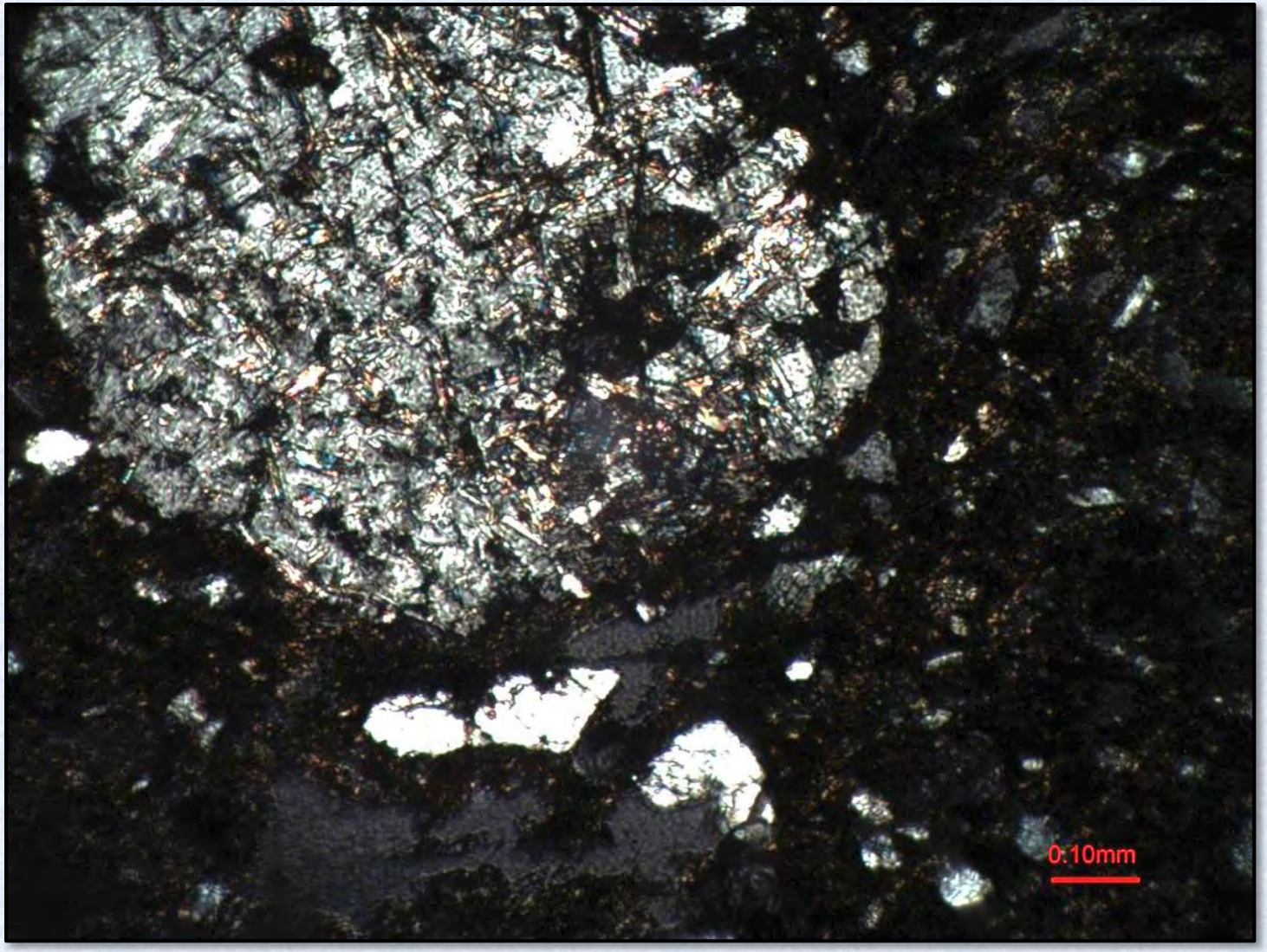

Photomicrograph of Trailed vessel with fragment of unknown metamorphic rock

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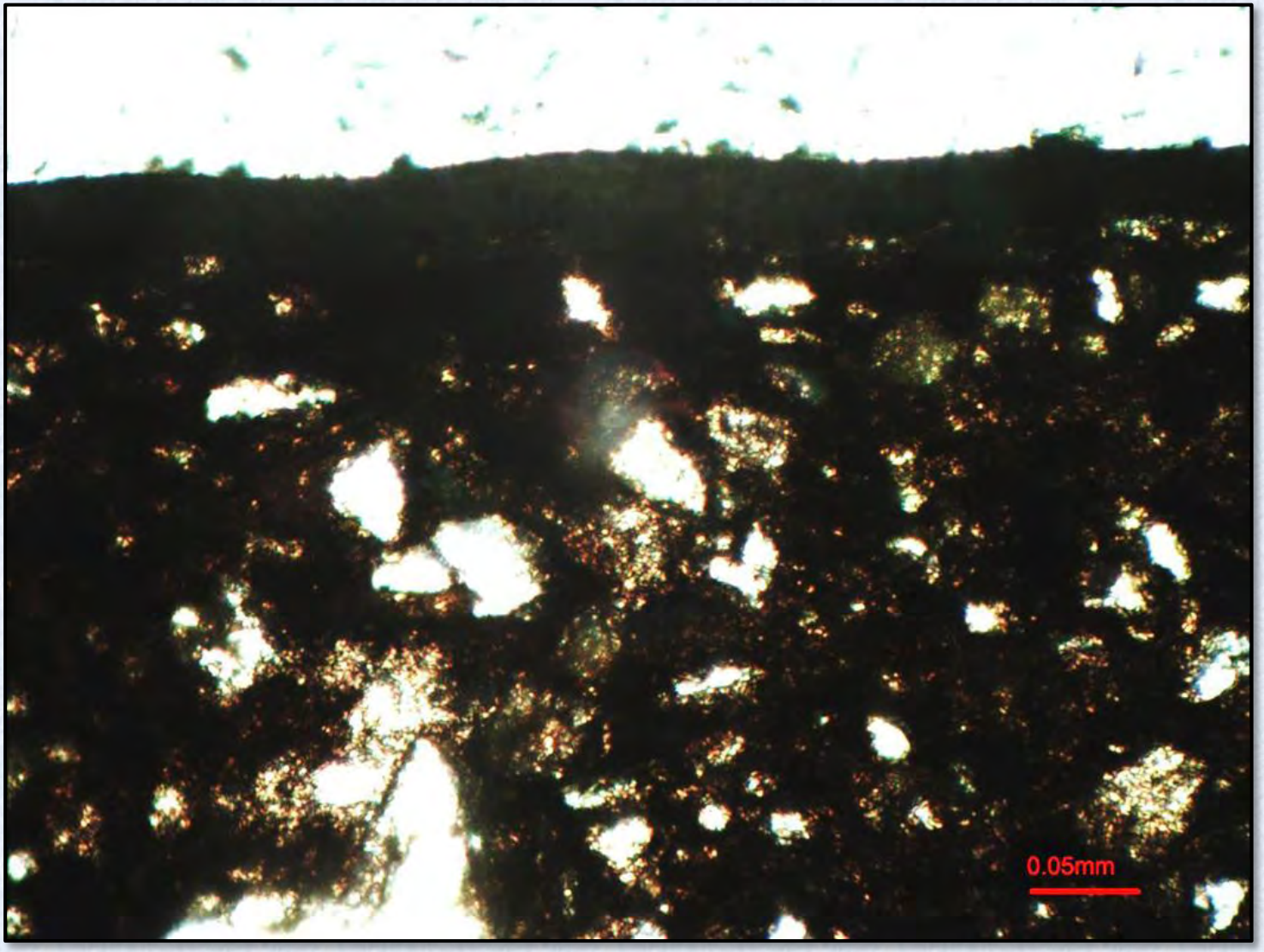

Photomicrograph of Trailed vessel with pseudo-slipped exterior surface

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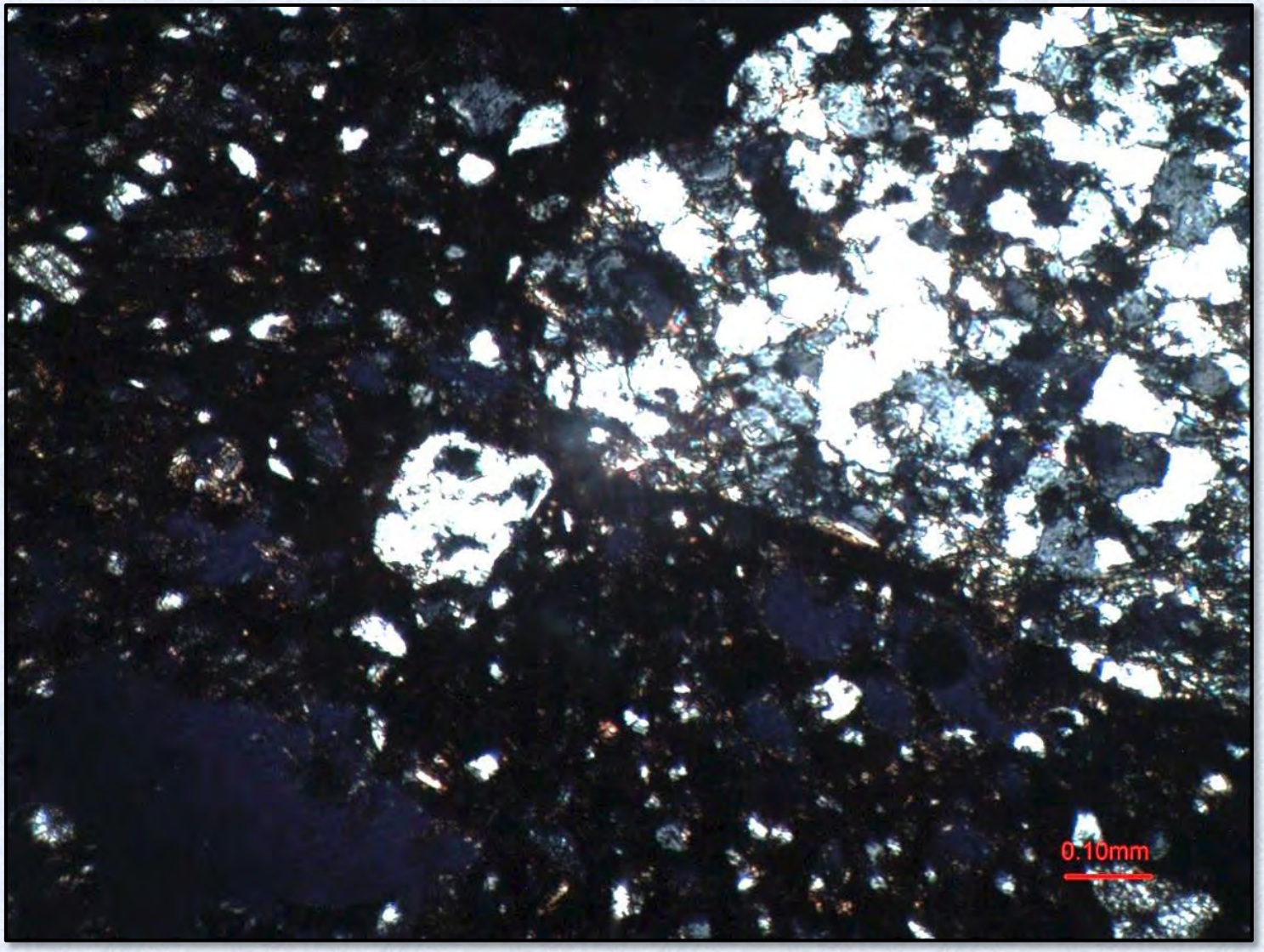


Photomicrograph of Smoothed Undecorated vessel with crushed quartzite temper

Percentage of Identified Minerals and Rocks by Sample and Vessel

Type	MB1	NPW3	Woodland	Trailed	Smooth Undecorated
Quartz	71.8 %	42.8 %	53.2 %	62.8 %	51.4 %
Alkali/Potassium feldspars	4.3 %	17.5 %	26.1 %	11.8 %	12.8 %
Plagioclase feldspar	8.8 %	23.3 %	10.1 %	12.7 %	10.6 %
Muscovite	0.5 %	0.3 %	1.0 %	4.6 %	6.9 %
Biotite	0.3 %	1.0 %	2.3 %	1.2 %	1.4 %
Chlorite minerals	8.3 %	4.0 %	0.0 %	0.0 %	5.5 %
Amphiboles	0.0 %	5.0 %	0.8 %	0.9 %	0.5 %
Pyroxenes	0.0 %	0.3 %	0.5 %	0.3 %	0.0 %
Isotropic minerals	0.3 %	0.8 %	0.0 %	0.0 %	0.5 %
Opaque minerals	1.3 %	1.8 %	0.0 %	0.9 %	0.9 %
Aphanitic metamorphic rocks	0.5 %	0.3 %	0.0 %	0.0 %	0.0 %
Chert	0.0 %	0.8 %	0.0 %	0.0 %	0.5 %
Siltstone/Sandstones	2.0 %	1.3 %	2.8 %	0.3 %	7.8 %
Felsic volcanics	1.8 %	1.3 %	1.3 %	3.1 %	1.4 %
Unidentified	5.0 %	0.0 %	1.8 %	1.2 %	0.0 %

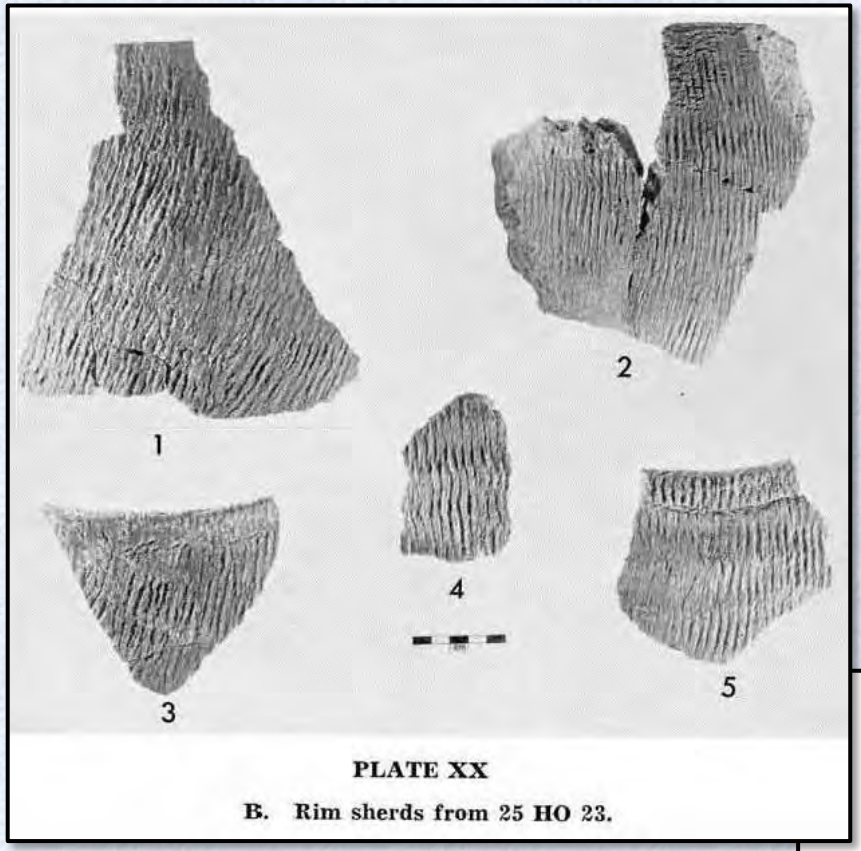
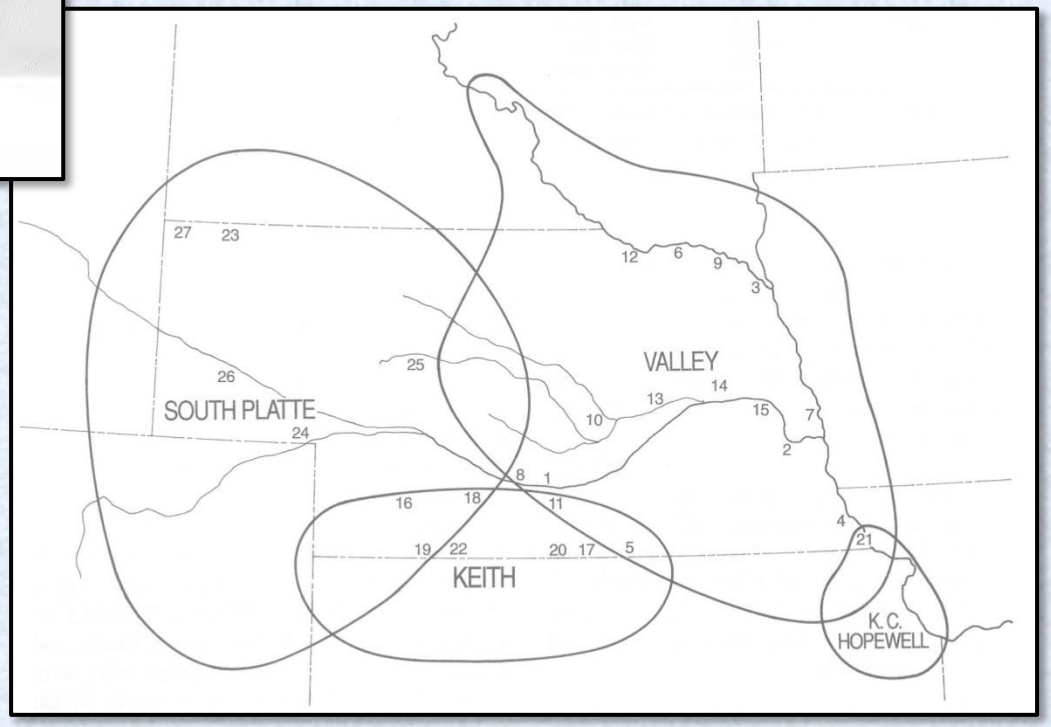


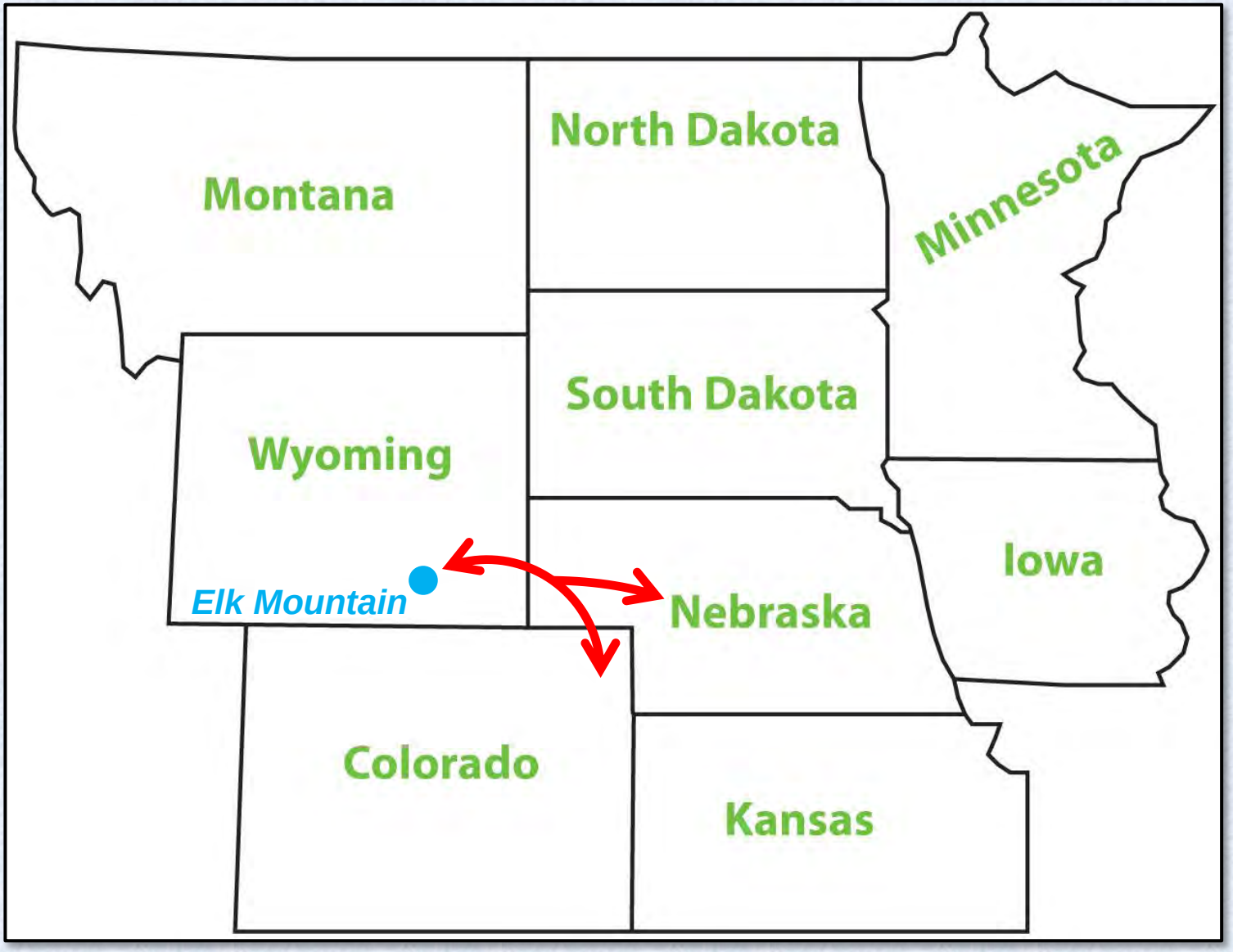
PLATE XX

B. Rim sherds from 25 HO 23.

Kivett (1952: 92, Plate XX)



Bozell and Winfrey (1994: 128, Figure 1)



Possible Movement of Woodland People and Pottery

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Crow

Dismal River

Intermountain

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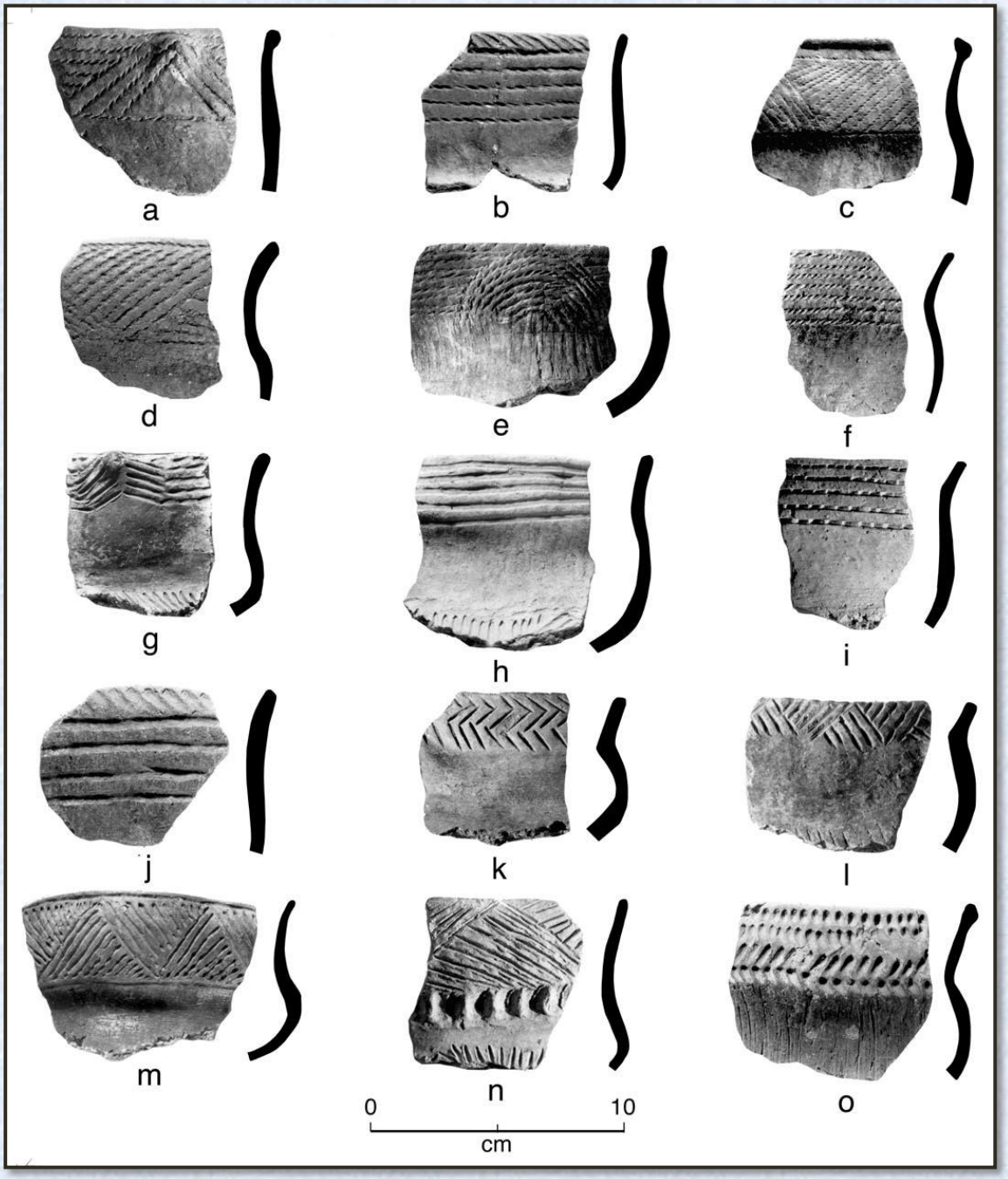
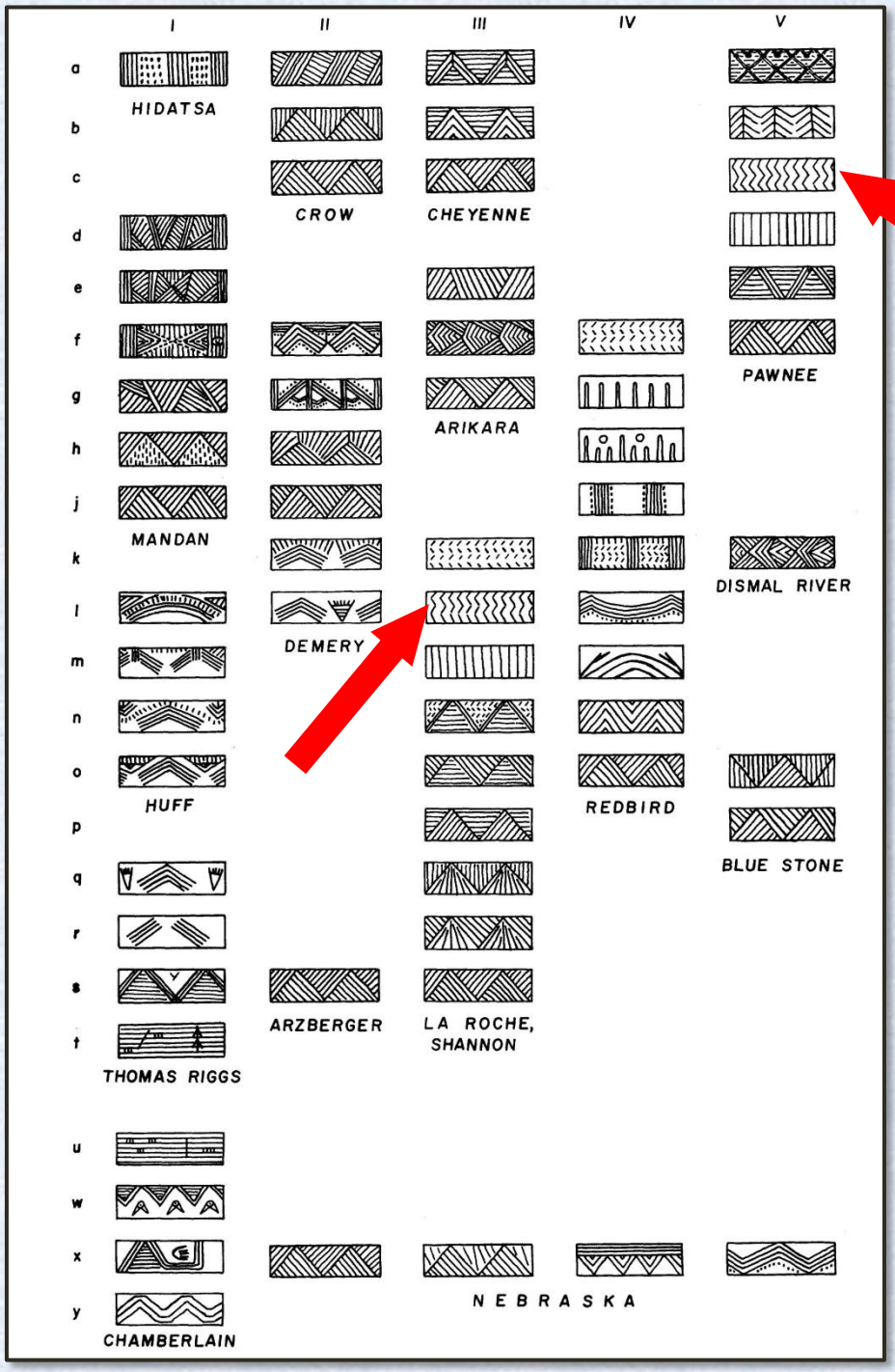
Designs on Extended Coalescent Rims



Johnson (2007: 265, Figure B.15)



Shoulder Patterns on Late Plains Indian Pottery

Wood (1962: Figure 3)

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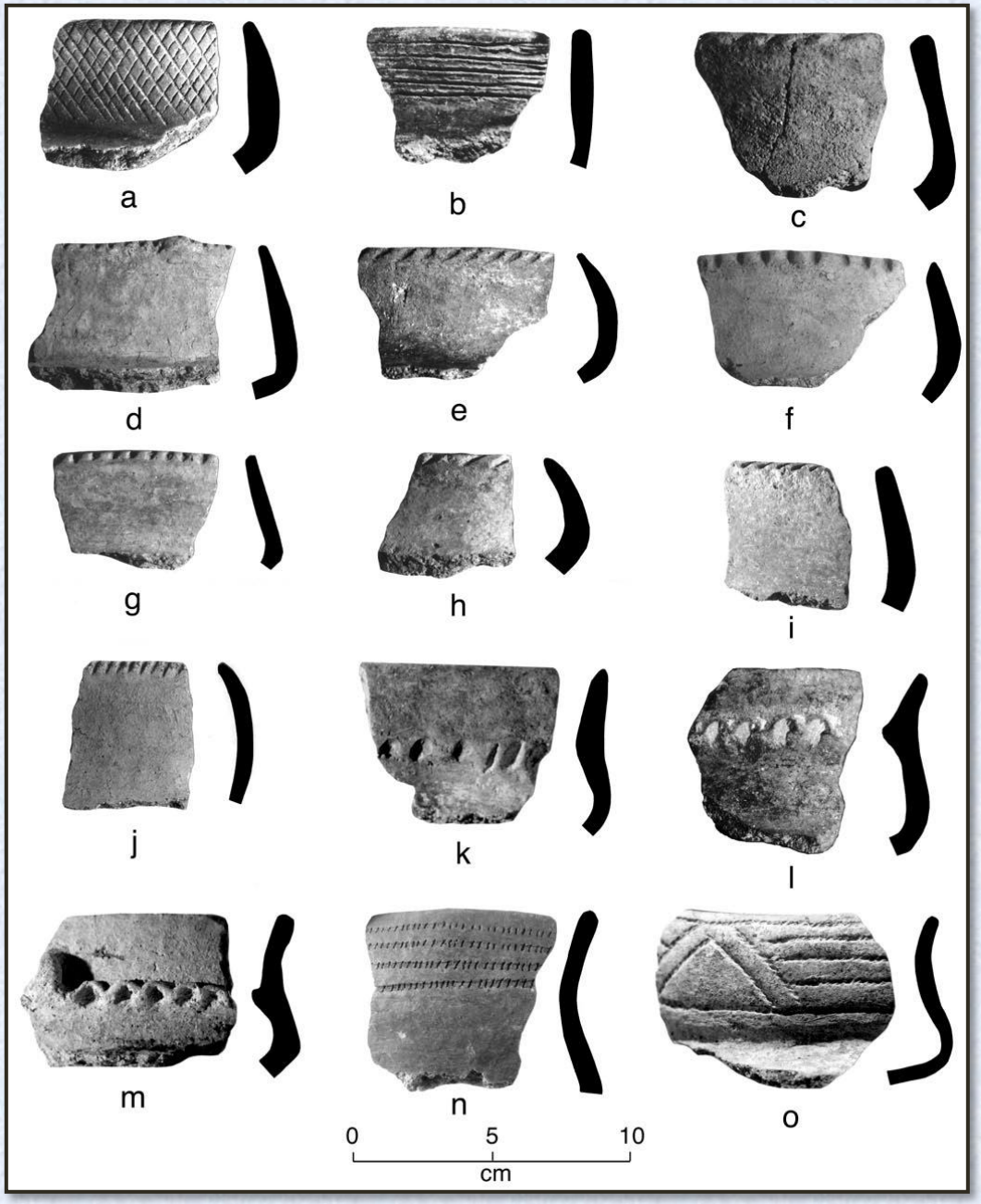

Extended/Terminal Middle Missouri Rim Forms

Johnson (2007: 261, Figure B.11)

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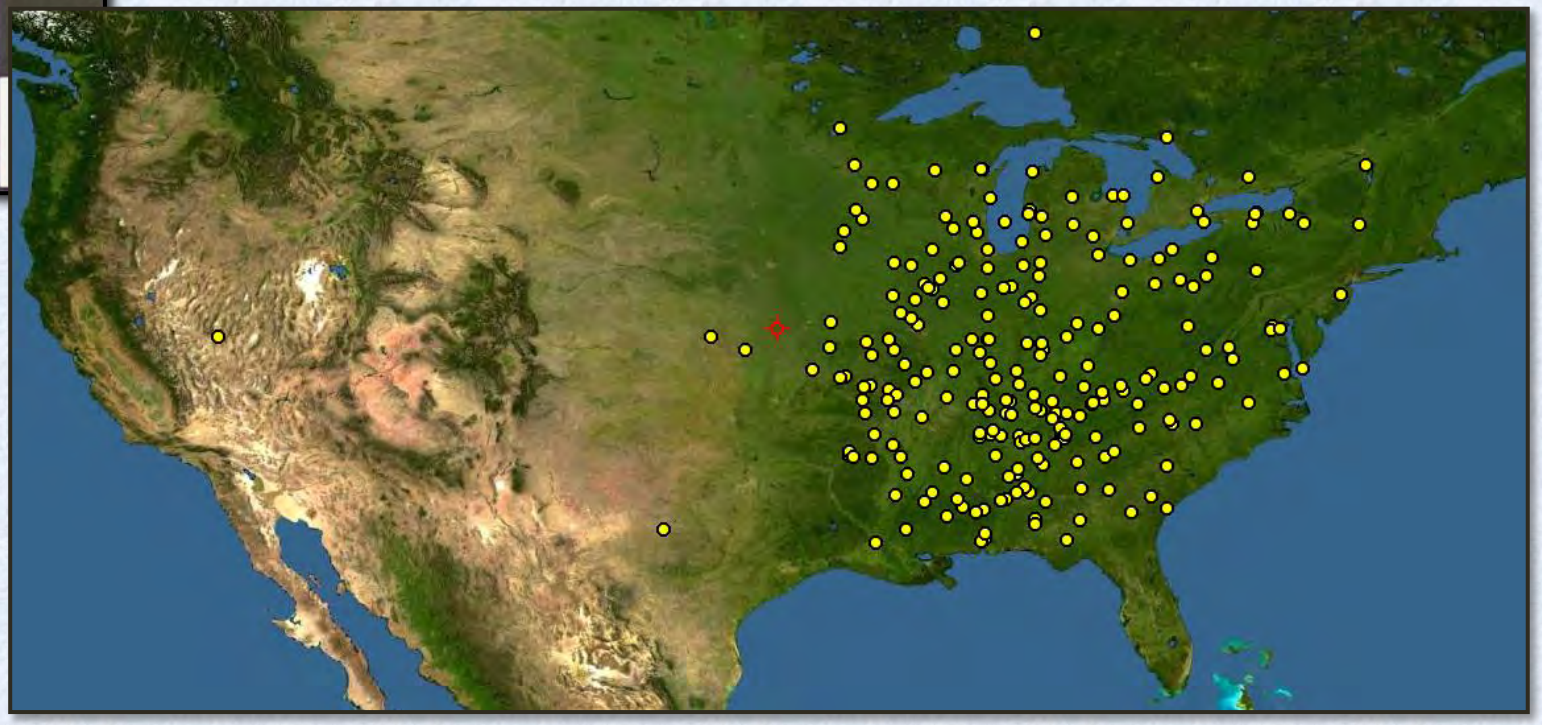
Pleurocera sp.

Modern Mapped Pleurocera Locations



http://www.discoverlife.org/mp/20m?act=make_map&kind=Pleurocera

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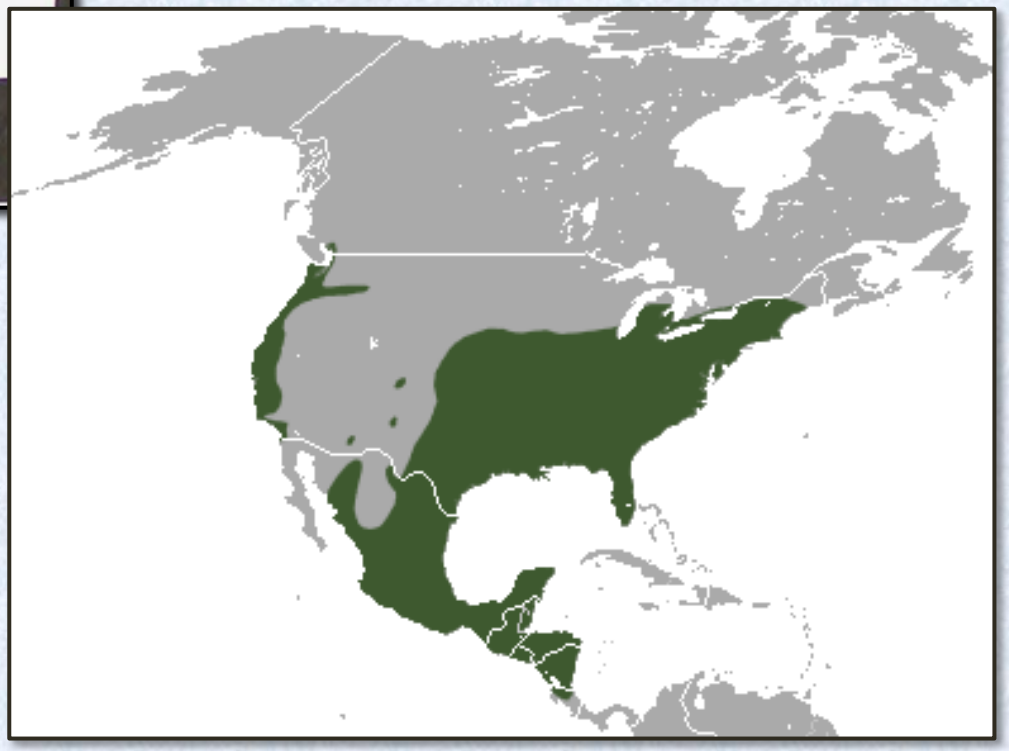
Opossum humerus



Modern Opossum Distribution

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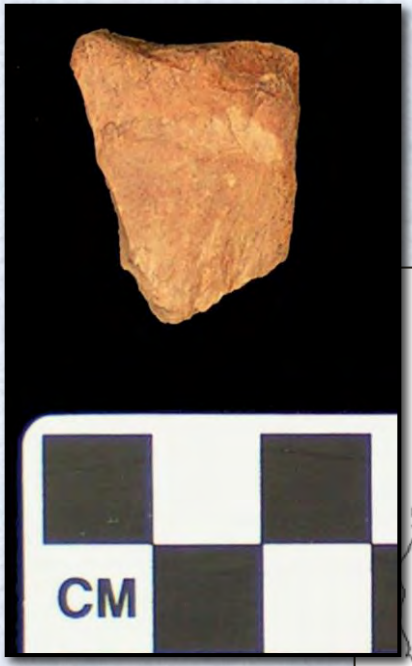
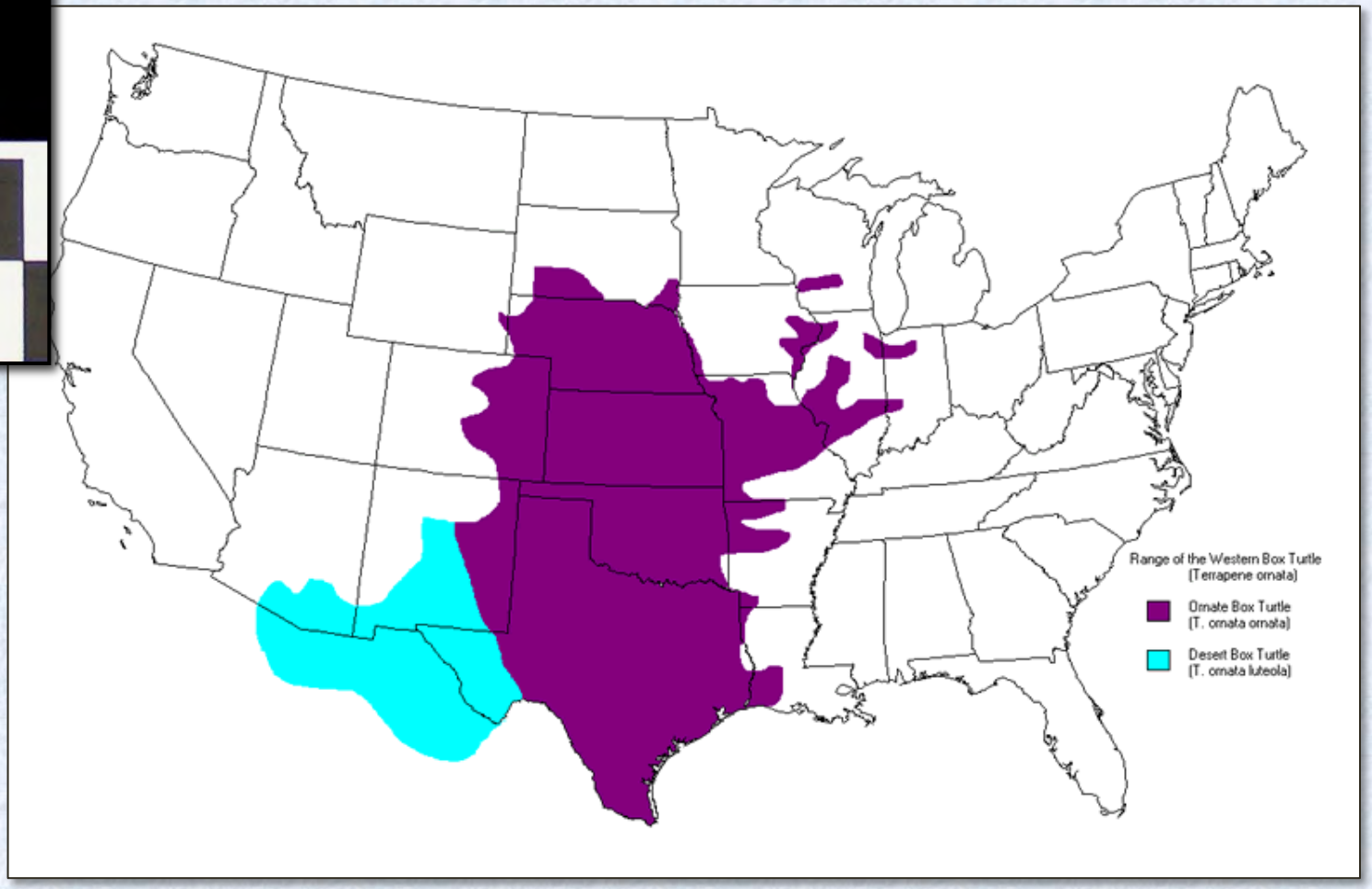
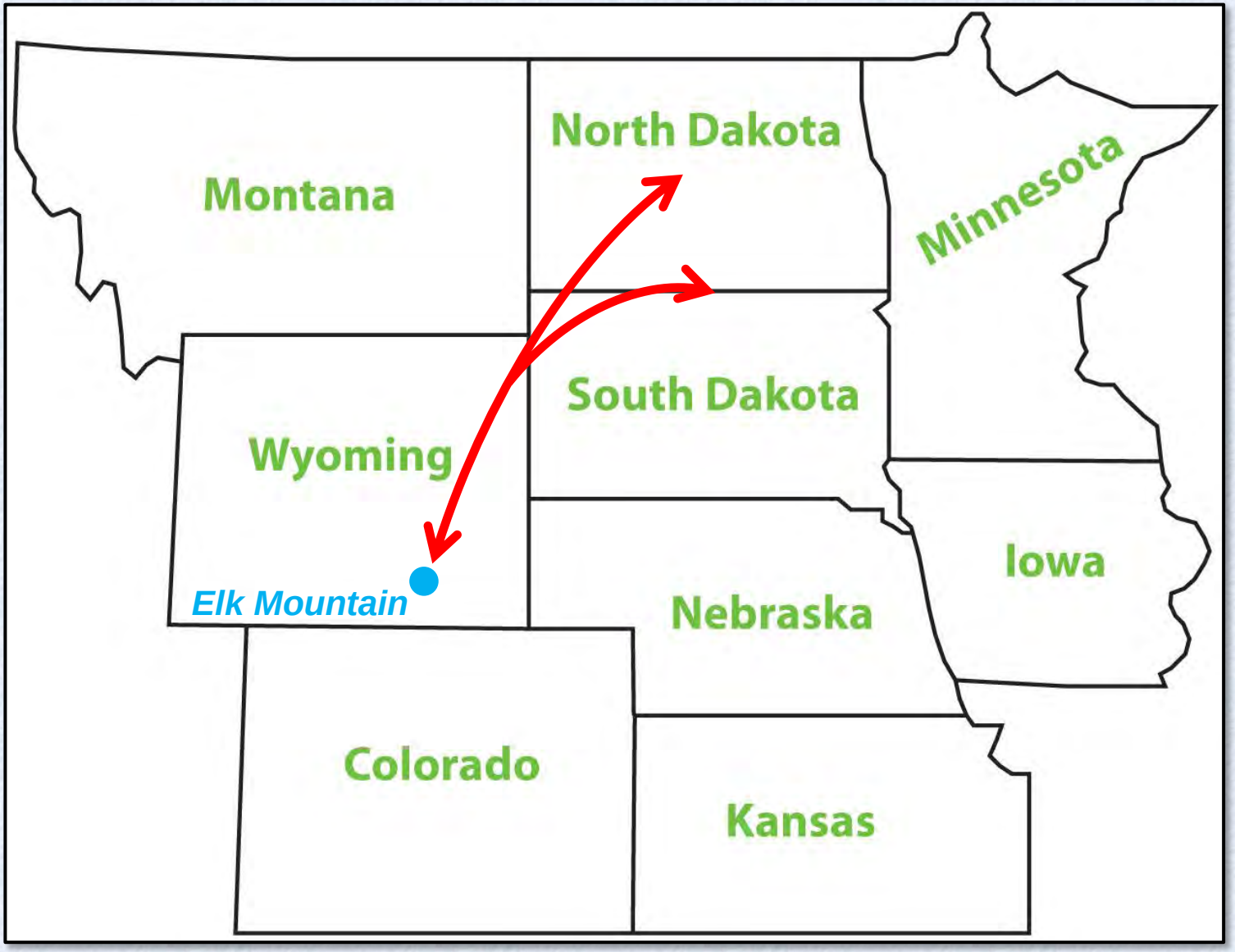


Box Turtle carapace fragment



Modern distribution of Ornate and Desert Box Turtle



Possible Movement of Northern Plains Peoples

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Thanks due to the Palm Family, Hooks Ranch LLC, Wyoming Archaeological Society , Wyoming Association of Professional Archaeologists, Wyoming State Historic Preservation Office, Office of the Wyoming State Archaeologist, University of Wyoming George C. Frison Institute