TEXTILES AND ETHNIC GROUPINGS ON THE COLUMBIA PLATEAU

By

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A thesis submitted in partial fulfillment of
the requirements for the degree of

MASTER OF ARTS IN ANTHROPOLOGY

WASHINGTON STATE UNIVERSITY
Department of Anthropology

DECEMBER 2006

To the Faculty of Washington State University:

The members of the Committee appointed to examine the thesis of RHIANNON KATHRYN HELD find it satisfactory and recommend that it be accepted.

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Chair

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ACKNOWLEDGMENTS

I would like to thank my committee—my chair Dr. Tim Kohler, Dr. Andrew Duff, Dr. Mary Collins for helping me with studying the collections stored at the museum, and allowing me to radiocarbon date them, Dr. Dale Croes for expertise dealing with textiles, and everyone for ideas and support.

I would like to thank the Burke Museum and Dr. Laura Phillips for allowing me access to the Vantage collections; and Joy Mastroguiseppe, who helped me enormously in identifying the plant materials in the collections I studied. I would also like to thank Dr. George Burr and the all the students at the University of Arizona NSF AMS lab for helping me process my radiocarbon dates though the student internship program. I would like to thank Peter Jordan for his willingness to examine my data and his ideas for new approaches to try.

Finally, I thank my family and friends for their unfailing support and patience with this whole process.

TEXTILES AND ETHNIC GROUPINGS ON

THE COLUMBIA PLATEAU

Abstract

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December 2006

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Textiles have been proven to be useful for distinguishing ethnic groups, and archaeological textiles are an understudied resource on the Columbia Plateau. Basketry, mats, and cordage from sites across the southern Plateau were studied for patterns indicative of ethnic groups through time, and subjected to phylogenetic analysis. Phylogenetic methods are borrowed from biology, and look for branching relationships of cultures through similarities and differences in cultural traits.

Most of the Plateau sites have fairly even mixtures of the cordage twists, and many showed a link between cordage twist and cordage diameter. Multivariate analyses such as hierarchical clustering and correspondence analysis did not seem to group the sites in a meaningful manner.

Changes in cordage twist in sites around Vantage, Washington, suggest a change in the ethnic group using the area around 2000 BP. New radiocarbon dates put the oldest directly dated textile on the Plateau, a twined tule mat or basket fragment, at 3101 BP and suggest a change in textile types around 1200 BP, which may be linked to subsistence changes or changes in housing related to the switch to the Winter Village pattern.

Phylogenetic analyses showed a lack of phylogenetic signal, possibly due to the fragmentary nature of the data, and possibly to the importance of horizontal transmission on the Plateau.

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CHAPTER 1

INTRODUCTION

Tracking the interactions, relationships, and movements of ethnic and social groups in prehistory has always been a goal in archaeology. It is often complicated by the fact that some aspects of material culture can be similar across many socially distinct groups. One way to address this problem is to study textiles, which research has suggested (e.g., Jordan and Shennan 2003; Tehrani and Collard 2002) are more closely linked to distinct ethnic groups.

This study investigates the utility of Columbia Plateau archaeological textile collections for addressing this problem using phylogenetic theory. Phylogenetic theory uses a set of methods borrowed from biology to track the branching relationships of groups through similarities in their culture. In the case of textiles, it offers an explanation for why textiles seem to differentiate ethnic groups more effectively than other types of artifacts, and also allows an exploration of the past relationships between the groups who made the textile sets. Since phylogenetic theory is more often applied to ethnographic collections of artifacts rather than archaeological ones, this study was also designed to investigate whether archaeological data sets were suitable for those analyses.

This study used published data and collections in the Museum of Anthropology at Washington State University from a number of different areas along the mid and upper Columbia River and Snake River (Figure 1, Table 1). With one exception, the sites were all rockshelters. A number of specimens were directly radiocarbon dated to create more precise temporal information. I also investigated simple and multivariate patterns of

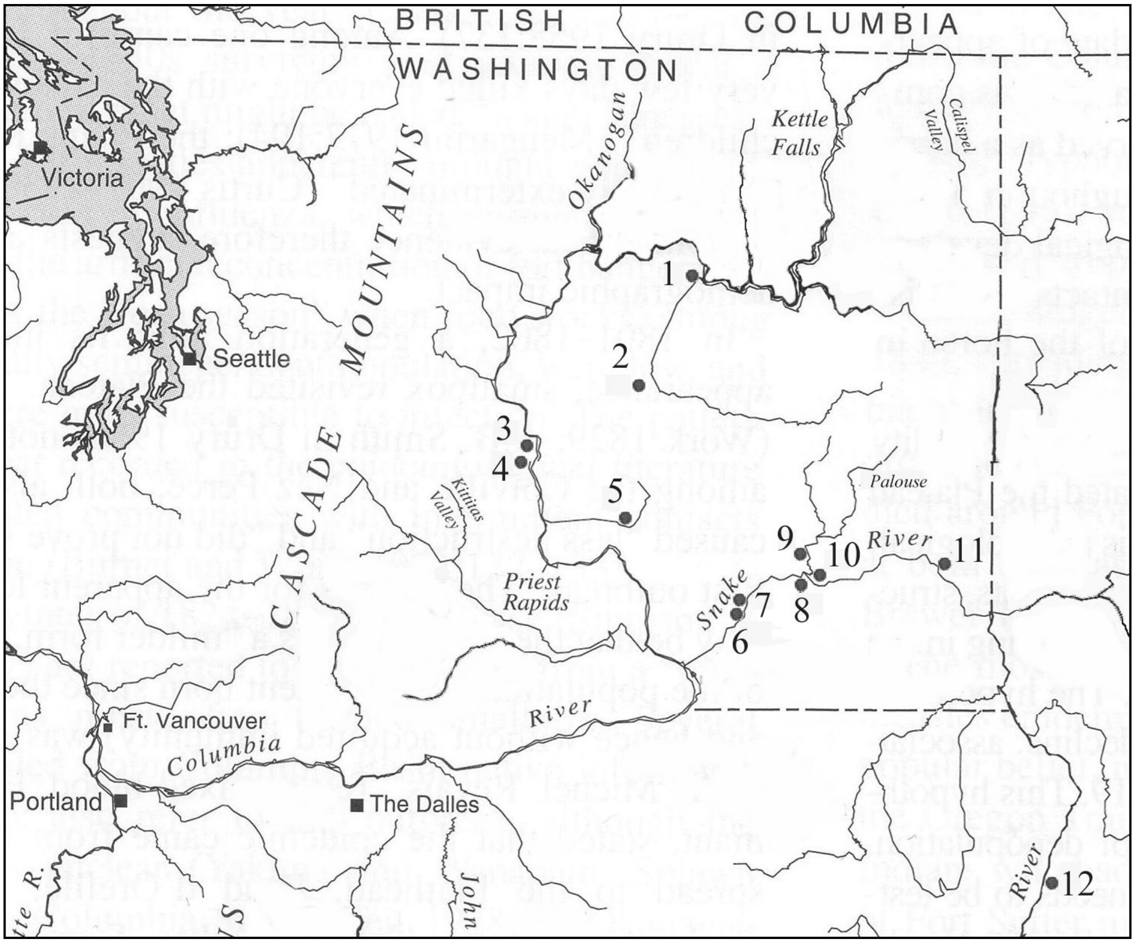

Figure 1. Site locations (adapted from Walker 1998:471).

Upper Columbia
1. 45GR2
2. 45GR78, 79, 80, 84, 94, 101, 102, 104, 111, 119, 121

Mid-Columbia
3. Quilomene Bar Rockshelters 1-7
4. Cedar Cave, Hole in the Wall, Duck, Cox, Trinidad, Crabtree
5. Unnamed rockshelter

Snake River
6. Windust
7. 45FR272
8. Squirt Cave
9. McGregor Cave, Porcupine Cave, 45FR53, 54, 276
10. Marmes
11. Wexpusnime
12. Allison Creek Shelter

Table 1. Collections Analyzed.

Site	Reference	Region	Sample size Cordage	Mats	Baskets	Nets
45GR2	Mills and Osborne 1952	Upper Columbia	56	9		1
45GR78	Osborne 1967	Upper Columbia	1		1	
45GR79	Mallory 1962	Upper Columbia	16	26	1	
45GR80	Osborne 1967	Upper Columbia	6	2	3	
45GR84	Clinehens 1961	Upper Columbia	35	6	2	
45GR94	Clinehens 1961	Upper Columbia	16	1	4	
45GR101	Clinehens 1961	Upper Columbia	31	8	2	
45GR102	Mallory 1962	Upper Columbia	2	2		
45GR104	Mallory 1962	Upper Columbia	2	1	1	
45GR111	Mallory 1962	Upper Columbia			1	
45GR119	Mallory 1963	Upper Columbia		2		
45GR121	Mallory 1964	Upper Columbia			1	
Quilomene 1	Osbourne 1969	Mid-Columbia	2			
Quilomene 2	Osbourne 1969	Mid-Columbia	10	20		
Quilomene 3	Osbourne 1969	Mid-Columbia	4	1		
Quilomene 4	Osbourne 1969	Mid-Columbia	18	7	1	
Quilomene 5	Osbourne 1969	Mid-Columbia		2		
Quilomene 6	Osbourne 1969	Mid-Columbia	7	5		
Quilomene 7	Osbourne 1969	Mid-Columbia	5	3		
Cedar cave FSI	Swanson 1962	Mid-Columbia	26	6		
Cedar Cave FSII	Swanson 1962	Mid-Columbia	16	1		
Cedar Cave FSIII	Swanson 1962	Mid-Columbia	107	31	1	
Cedar Cave CII	Swanson 1962	Mid-Columbia	23	1		
Duck Cave FSI	Swanson 1962	Mid-Columbia	20			
Duck Cave Loam I	Swanson 1962	Mid-Columbia	8			
Hole in the Wall FSII	Swanson 1962	Mid-Columbia	10		1	
Hole in the Wall FSIII	Swanson 1962	Mid-Columbia	16	3	2	
Hole in the Wall CI	Swanson 1962	Mid-Columbia	13		1	
Shelter 7A	Swanson 1962	Mid-Columbia	24	1		1
Shelter 8B	Swanson 1962	Mid-Columbia	21	3	12	
Shelter 8C	Swanson 1962	Mid-Columbia	10	3		
Cox Cave	Swanson and Bryan 1954	Mid-Columbia	14	1		
Crabtree Cave	Swanson 1962	Mid-Columbia	138	19		
Trinidad Cave	Swanson and Bryan 1954	Mid-Columbia	52	6		
Unnamed rockshelter	Swanson and Lee 1959	Mid-Columbia	8	1		
Windust	Rice 1965	Snake	8			
Burr Cave (45FR272)	Gilbow 1978	Snake			1	
Squirt Cave	Endacott 1992	Snake	243	41	5	
McGregor Cave	Mallory 1966, Hicks and Morgenstein 1994	Snake	651	189	4	
Porcupine Cave	Mallory 1966, Hicks 1995	Snake	259	57	2	
45FR53	Draper and Morgenstein 1993	Snake	12	3		
45FR54	Draper and Morgenstein 1993	Snake	16	11		
45FR276	Draper and Morgenstein 1993	Snake	1			
Marmes	Mastroguiseppe 2004	Snake	1	1		
Wexpusnime (45GA61)	Nakonechny 1998	Snake			1	
Allison Creek Shelter	Caldwell and Mallory 1967	Snake		1		

changes in textile attributes through time that would suggest population movement or changes in manufacturing techniques.

This study also aimed to use the patterns discovered to shed new light on continuing debates in the Plateau such as the causes of the ethnographic distribution of language families and the switch to more semi-sedentary life ways around 2000 to 2500 BP (Ames et al. 1998).

Plateau Culture

The Columbia Plateau culture area is defined as the area bounded on the east by the Rocky Mountains and the Plains culture area and on the West by the Cascades and the Northwest Coast culture area. To the north and south, the definition of the boundaries varies, usually including the Fraser Plateau in Canada and sometimes the Klamath and Modoc tribes in Oregon (Walker 1998).

There are two major language groups found ethnographically in the Plateau. Interior Salishan, located in the north, is a subgroup of the Salishan family also spoken on the Northwest Coast. The Sahaptian language family is located to the south. Other languages on the Plateau include a dialect of Chinookan spoken by the Wasco and Wishram, Nicola, in the Athapaskan family, and four language isolates—Kootenai, Molala, Cayuse, and Klamath (Figure 2; Kinkade et al. 1986).

Ethnographically, Plateau subsistence was built primarily around salmon, roots such as camas and bitterroot, and berries. Settlement was semi-sedentary with movement from winter villages with semi-subterranean pit houses or mat lodges near the rivers to

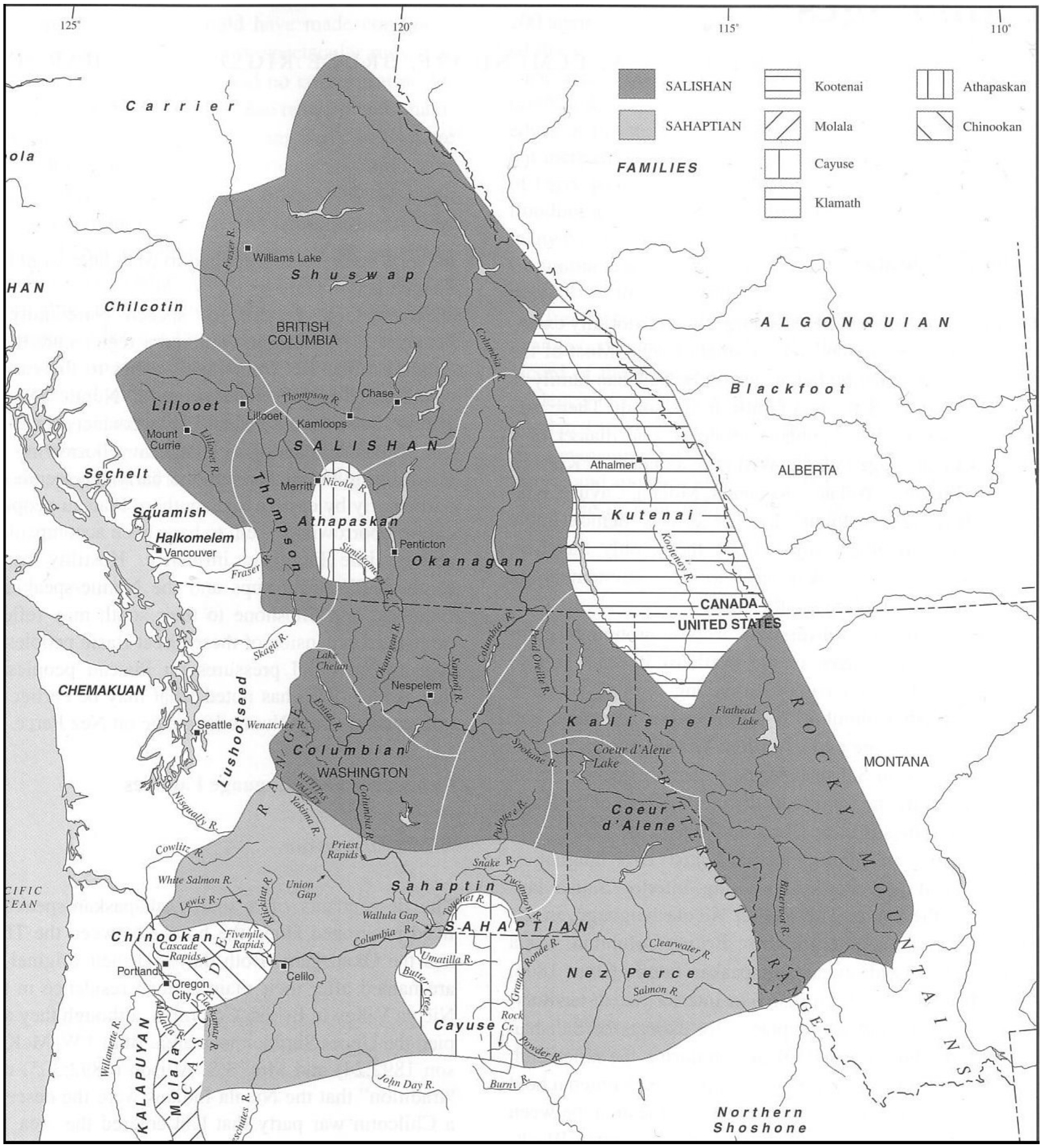

Figure 2. Language families on the Columbia Plateau (from Kinkade et al. 1986:50).

temporary villages at higher elevations near food sources during the summer (Walker 1998).

Prehistorically, this settlement pattern is equated with the Winter Village pattern, which is commonly suggested to have begun around 2,000 or 2,500 BP (Ames et al. 1998). The Winter Village pattern is essentially the ethnographic one, except for the addition of the horse, and the appearance of mat lodges. In some sources, the earliest mat lodges are put at 1600 to 1300 BP (Ames 1991) and in sources the first lodges are put later at around 1060 BP (Ames et al. 1998).

The reasons for the switch from the isolated pithouses that existed on the Plateau before 2000 BP to the larger pithouse villages and semi-sedentism that mark the Winter Village pattern are highly contested; many invoke some combination of population growth or changes in population dispersion (Ames and Marshall 1980) leading to resource stress and intensifying use of salmon or plant resources, and storage. For a summary, see Ames (1991:112) or Chatters (2004:67). Other possible reasons for the switch to pithouse villages include the introduction of the bow and an increase in warfare that made it more beneficial to band together in larger and more defensible groups (Chatters 2004).

There is also the theory that the change was caused by Salish groups from the Coast bringing in superior fishing technology, and so competing with and then intermarrying with native groups until only the language groups seen today remained (Figure 2), but without a real direct migration of people (Nelson 1973). Nelson's theory was also based on construction of pithouses being equated with semi-sedentism rather than the idea that the aggregation into villages is the important marker on the Plateau, which underlies the theories above. This theory has been discounted in later publications (Ames and Marshall 1980); the earliest pithouse dates at the time Nelson wrote supported a movement into and down from the northern Plateau, but early pithouse dates obtained more recently have been scattered across the Plateau.

Others working in the Northern Plateau have suggested population replacement to account for phase changes and the ethnographic distribution of Salishan and Sahaptin languages on the Plateau (Prentiss and Kuijt 2004; Rousseau 2004). The timing of the proposed replacement differs greatly, however—Rousseau (2004) puts the replacement at around 5000 BP, when Coast Salish groups foraged upriver and exchanged technology, knowledge, language and genetics with the interior groups. Large-scale conflict was avoided due to the fact that the Salish groups targeted primarily salmon and the interior groups targeted mostly large ungulates. Prentiss and Kuijt (2004) suggest that the Canadian Plateau was abandoned for several hundred years after 4000 BP due to a temperature downturn, and was recolonized by Salishan groups with a collector system from the Coast.

Basketry and fiber artifacts were extremely important in ethnographic Plateau life. Baskets and bags were used for containers for gathering a wide range of resources, carrying water, cooking, and storage and transportation of belongings. Mats were used as the coverings on lodges, food trays, and were also important in storage. Other fiber artifacts included fishing nets and wrappings of all kinds. They also were important items of trade including ritual trades associated with marriage, birth and death (Miller 1990; Schlick 1994).

Phylogenetic Theory

Phylogenetic methods are adapted from biology, and based on evolutionary principles, in which cultures grow, split, and give rise to new ones. Possible phylogenetic trees showing relationships between cultures are calculated using similarities and differences in cultural traits between the groups in question. These trees attempt to illustrate how the cultures arose from ancestral groups by tracking the number of changes necessary to create the collections of cultural traits seen in current groups.

Terms often used in the context of phylogenetic analyses are phylogenesis and ethnogenesis, terms first defined by Moore (1994). Phylogenesis is the process by which cultures are created by branching from an ancestral group, and ethnogenesis is the process by which "each language, culture, or population is considered to be derived from or rooted in several different antecedent groups" (1994:925). Whereas in phylogenesis cultural assemblages divide as populations grow and split, in ethnogenesis, cultural evolution takes place by the "borrowing and blending of ideas and practices, and the trade and exchange of objects" between contemporaneous groups (Tehrani and Collard 2002:443). In this study, the term diffusion is also used to refer to this process of blending and exchange of information about artifact manufacture.

The process that goes along with this idea is that of horizontal and vertical transmission. In the strictest definition, horizontal transmission is the transmission of cultural information between members of the same generation, and vertical transmission is from an older generation to a younger one (Cavalli-Sforza and Feldman 1981). Horizontal transmission is often seen as the process of transmission behind ethnogenesis, causing blending between groups, and vertical transmission causes phylogenesis, cultural information passed down so it branches with cultures (Jordan and Shennan 2003).

Phylogenetic methods have often been used to link cultural transmission and genetic or linguistic data (e.g., Cavalli-Sforza and Feldman 1981; Collard and Shennan 2000) but are much more contentious when they are applied to culture as measured by artifacts in the archaeological record. With the recent interest in phylogenetic methods in archaeology (O'Brien and Lyman 2003), many authors have also been trying to trace the formation and links of ethnographic groups using archaeological artifacts.

Some have applied phylogenetic analyses to projectile points (O'Brien et al. 2001). Others argue, however, that phylogenetic relationships are most visible in textiles (Jordan and Shennan 2003). Textiles are thought to be more indicative of ethnic divisions because their manufacturing information is transmitted vertically. Other types of artifacts are more likely to have information about their manufacture be transmitted horizontally, and be adopted by most within a particular environment for technological reasons (Jordan and Shennan 2003; Tehrani and Collard 2001).

Textiles may also carry ethnic markers and so would be subject to cultural practices designed to guard the integrity of the basketry or textile traditions, such as restrictions on teaching basketry techniques to those outside the tribe, and requirements for women to learn the basketry traditions of their husband's group (Adovasio 1980; Croes 1997; Croes et al. 2005). "Of all artefact categories, basketry has proven to be the most stylistically sensitive and complex for comparative studies through time and across space along the entire Northwest Coast and in many other parts of the world" (Croes 1997:596).

Croes has demonstrated this property of textiles in a number of studies in which he not only showed that baskets can differentiate between the different ethnographic regions of the Northwest Coast, but also showed that other artifacts such as wooden fishhooks (1997) and artifacts made of stone, bone, antler or shell cannot (Croes et al. 2005). Specifically, in his study of the Puget Sound site of $Q^{w}u?g^{w}es$ and others in the region, Croes et al. (2005) found that while the basketry phylogenetic tree linked the sites approximately by region within the Northwest Coast, the tree of the other artifact types linked the sites approximately by period (e.g., Marpole, Locarno Beach, etc.) cross-cutting apparent regions. Thus, it appears the technology of non-textile artifacts of each period diffused throughout the entire culture area.

Croes uses these results to suggest that artifacts fall into two categories: "economically important" and "ethnically significant" (Croes et al. 2005:150), terms I borrow for this study to avoid the loaded words of functional and stylistic. Basketry and textiles often fall into the ethnically significant category, and as such are probably subject to cultural practices designed to guard the basketry traditions within a group to preserve those ethnic markers.

Adovasio (e.g., 1980) is another proponent of the use of textiles for distinguishing ethnic groups. In his work with textiles in the Southwest and Great Basin, he regarded it as "an established fact that basketry is the single most sensitive indicator of prehistoric or ethnographic cultural integrity in the artifactual record, and further…no two prehistoric or ethnographic cultures ever produced exactly or even nearly the same kinds of basketry with the same range of construction attributes" (Adovasio 1980:40).

Jordan and Shennan (2003) used ethnographic rather than archaeological basketry to explore the differences between linguistic groups in California. Their conclusions were more tentative, but they found that the similarities and differences between the basketry weaving attributes of the region could not be explained by ethnogenesis, or horizontal diffusion, alone, so there was some phylogenesis operating. Finally, another example of using textiles to look at the differences between ethnic groups was carried out by Tehrani and Collard (2002) on decorative characters from Turkmen woven textiles. They concluded that phylogenesis was the dominant process at work.

Besides likely having manufacturing information transferred by vertical transmission, basketry is excellent for study because it is different from most other regularly studied types of artifacts in that it preserves all the choices that are made throughout the process of manufacture. With reductive techniques, such as lithic manufacture, early stages of shaping are lost as later stages remove more material. In a textile, early choices of shaping or technique remain part of the finished product. Textiles are also valuable for study because most of the attributes that go into a basket consist of discrete choices, not continua. An element can be twisted to the right, or to the left, but it cannot be twisted somewhere in between (Adovasio and Pedler 1994).

Archaeological baskets are most often fragmentary, which might suggest that they would not be good subjects for the kind of research mentioned above, which was done with ethnographic museum collections. However, many stress in their research that fragments still carry information sufficient to study social boundaries (Petersen et al. 2001). “Even the smallest fragment of a mat, bag or basket may possess a great number of diagnostic attributes” (Adovasio 1974:102). This is partly due to the idea that overlooked, not consciously controlled, attributes left over from the process of manufacture that are built into the finished object, are often the most useful for such studies.

Terminology

There exists a wide variety of possible basketry and matting techniques (Adovasio 1977), but only a subset of these possibilities were used on the Plateau. The study of textiles requires a specialized vocabulary, so it is worth providing at least a few brief definitions before I continue.

Cordage can be twisted in two directions—S or Z twist, so named because the twists follow the curve of an S or a Z (Figure 3). Because of the mechanics of twisting, cordage stays together better and is stronger when the strands, or plies, are twisted together in the direction opposite that in which the individual plies were twisted. Croes (1980) differentiates this with a terminological distinction—one strand is S or Z twist, and two or more strands are S or Z lay, but other authors don't make this distinction. Functionally, both twists are identical. It is often a matter how the twister was taught, and in some areas of the world, one or the other is sometimes regarded as the 'right' way to twist (Minar 2001).

Older studies sometimes differentiate between different types of cordage using diameter categories based on assumed functional differences. Mallory (1966) uses categories of "thread," "string," and "rope," which are very clearly connected to function: "thread used for sewing grades into and overlaps with string used for light tying, which in turn grades into small rope used for heavy lashing and binding" (1966:19). This

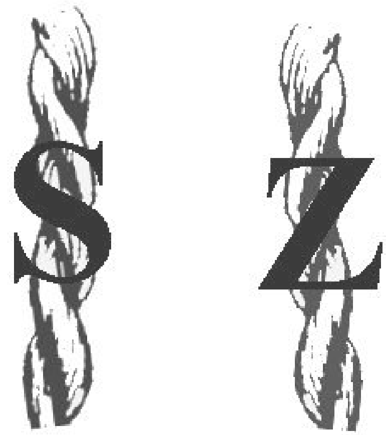

Figure 3. Twist directions.

assumption has been challenged, however. Beyond the problems of making such an assumption of function without much evidence to support it, rockshelters such as McGregor cave have a wide variety of diameters of cordage, but evidence of only a limited range of activities connected to storage occurring at the site, fewer than one might expect if each diameter of cordage was functionally connected to a different task. Other considerations, unrelated to the size of cordage, must be considered to get at function, including material strength and durability, and processing costs (Hicks and Morgenstein 1994). Hicks and Morgenstein do not consider whether perhaps the cordage might have been stored in the rockshelters for a variety of other purposes, but spools and bundles of cordage are rare, while most pieces are of a length that suggests they were in use.

For baskets and mats, the terms of *warp* and *weft* are used frequently throughout this study. The warps are the set of elements that are vertical when the piece is oriented as it was while it was being woven. The wefts are the set of elements that are horizontal.

Twining is a technique used on the Plateau in both baskets and mats. It involves twisting two weft strands around upright warps, with a twist between each warp so an individual weft strand changes position from the inside to the outside after each warp (Figure 4). Mats are most often made with open twining, with some distance between each weft row, and bags or baskets are most often made with close twining, with weft rows right next to each other. Twining can also be S or Z slant, which is determined by whether the wefts, when viewed like a piece of cordage without the interposed warps, are S or Z twist (Adovasio 1977).

Sewing and *plaiting* are techniques that on the Plateau are used exclusively for mats. Much as it sounds, sewing consists of holding warps together by means of a cord run through holes punched in the warps (Figure 5). This is frequently combined with twining which forms the *selvage*, or the method of finishing the edges of a mat. Plaiting involves running a single weft element under and over alternating warp elements. A particular kind of plaiting in which the elements are all flat and the weft passes over one element at a time is sometimes called *checkerwoven* in the literature (Swanson 1962). Another type where the elements pass over two or more in the other set at a time, offset, making a staggered pattern (Figure 6) is called *twilling* by some. As there is a type of twining sometimes called "twill twining" and since the term disguises its relationship with other types of plaiting, only the umbrella term of plaiting is used here. Plaiting is often combined with sewing, twining, or both, all forming substantial portions of the finished mat (Adovasio 1977).

Coiling is used exclusively for baskets. In coiling, each loop of a spiraling foundation element is joined to the one before with a series of stitches (Figure 7). In the Plateau these foundation elements were formed of bundles of material, rather than a single rod. On the Plateau, the stitches are most often split, which occurs when stitches

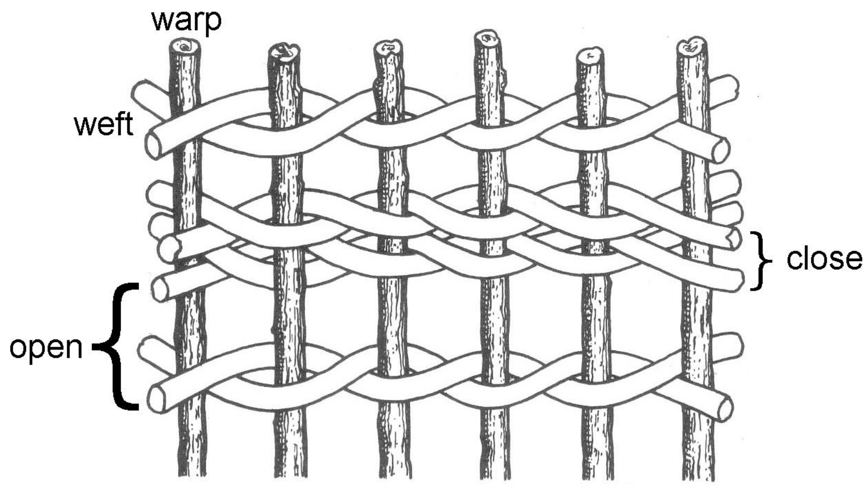

Figure 4. Twining (after Adovasio 1977: Figure 6).

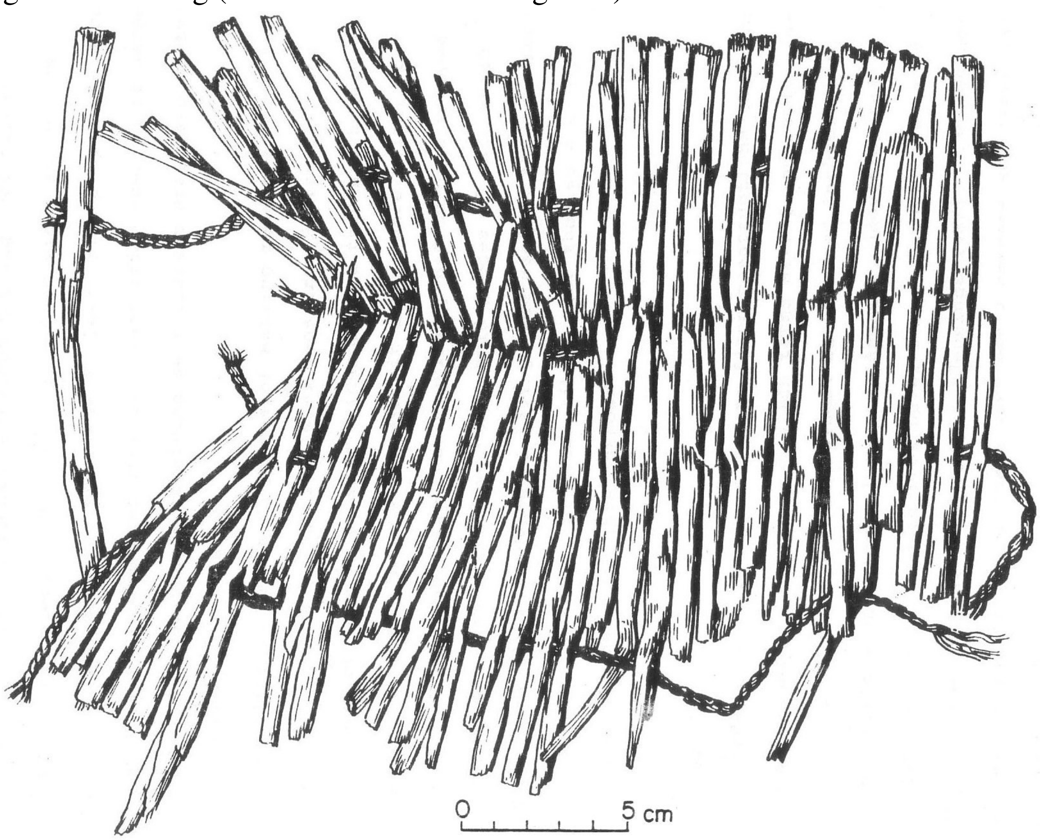

Figure 5. An example of a sewn mat (from Endacott 1992: Figure 23).

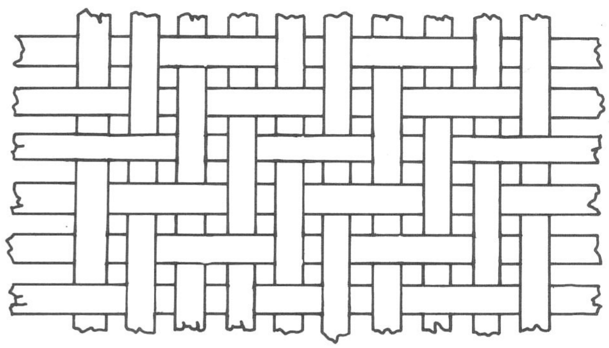

Figure 6. Plaiting, or twilling, 2/2 interval (from Adovasio 1977: Figure 118).

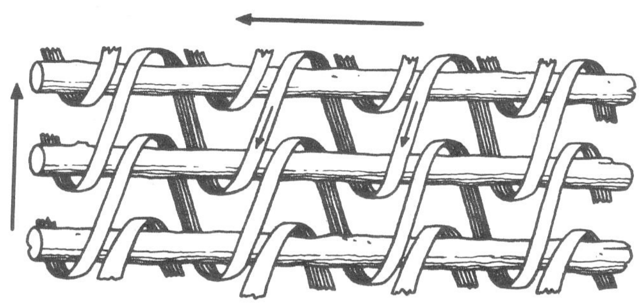

Figure 7. Coiling, arrows show direction of work (from Adovasio 1977: Figure 74b).

are set into those in the previous row. Work can also proceed from left to right or right to left, from the perspective of looking at the outer side of the basket (Adovasio 1977).

Finally, there are four types of decoration used on Plateau basketry. *False embroidery* is a technique used on twining, when a decorative element is wrapped around the outside length of each weft element, therefore never engaging the warp (Figure 8). *Imbrication* is a technique used on coiling that is unique in North America to the Plateau and other Salishan groups on the Northwest Coast (Turnbaugh and Turnbaugh 1986). A decorative strip of material is laid along the color and caught up by each succeeding stitch, leaving squares of color on the surface (Figure 9). In archaeological specimens when these squares have been rubbed off, it sometimes looks similar to *beading*, in which a strip is threaded along under one stitch, over another (Adovasio 1977). The fourth decorative technique used on the Plateau is *twined overlay* (Figure 10), in which a decorative element is twined along with the regular elements, only switched at the back so it is always along the element on the surface (Adovasio 1977).

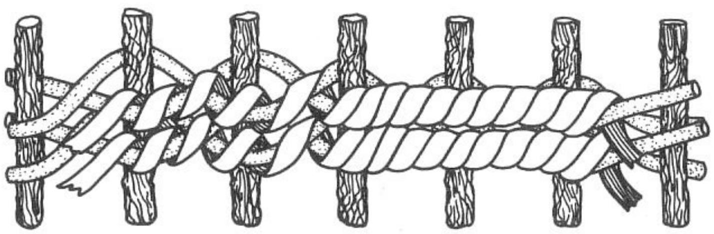

Figure 8. False embroidery (from Adovasio 1977: Figure 57a).

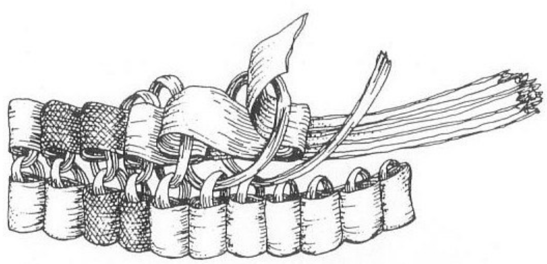

Figure 9. Imbrication (from Schlick 1994:104).

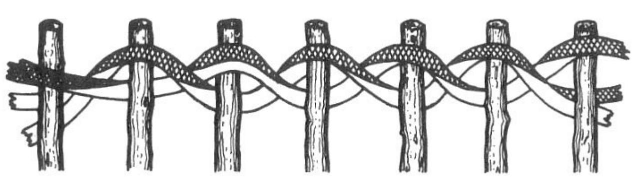

Figure 10. Twined overlay (from Adovasio 1977: Figure 55).

In Chapter 2 of this study, I examine the ethnic patterns in ethnographically recorded textiles on the Plateau, the previous work done with ethnographic and archaeological textiles on the Plateau, the theoretical basis of other textile studies throughout the Americas, and information about each of the sites studied. In Chapter 3, I describe my methods for collecting data, making decisions as to what scale of data to include, and dealing with limitations imposed by published data. Then, in Chapter 4, I analyze the data for simple, multivariate, and temporal patterns to address the questions of ethnicity and temporal continuity.

CHAPTER 2

BACKGROUND

Ethnic patterns in ethnographic basketry on the Plateau have been well-documented, and I examine them here to provide a basis for comparing then with the archaeological textile traditions. There is a solid theoretical base for textile studies in the Americas, some of it complimentary to phylogenetic theory, some of it differing, that I examine since it forms the basis of many of the simple patterns I investigate in the Plateau and offers explanations than ethnicity for variation in textiles other. Finally, I provide the background for each of the sites included in this study and storage rockshelters as a whole, to illustrate the characteristics of the data set.

Ethnographic Plateau Textiles

Different regions on the Plateau were especially known for particular types or styles of baskets in ethnographic times. Many of the general types were fairly widespread, but each group tended to have its own variations. Northern groups did more coiling, while southern ones did more twining. Each of the ethnographically recorded types had a particular use. The following descriptions are summarized from Schlick (1994).

Coiled baskets were most often used in precontact times for cooking. They could be woven tightly enough to be watertight, though that skill was slowly lost in postcontact times. Heated rocks would be placed in the basket filled with water, to heat the water and so cook the food. These baskets were also used by women for gathering materials such as berries. More oblong-shaped baskets were used to bathe babies or for drinking water. Finally, the taller, narrower conical-shaped basket known as the "Klikitat" style is suggested to have been a recent innovation, when metal cooking vessels purchased from Europeans allowed picking baskets to no longer have to be shaped to perform double duty as cooking vessels.

Ethnographic coiled baskets were constructed of cedar root—skin of the root for the outer surface, rougher pieces for the foundation elements, and the smooth, longer pieces for the stitching. For decoration, bear grass (see Table 2 for scientific names) as well as the cedar root skin was dyed and used for imbrication.

Round twined bags tended to be much smaller than the coiled baskets, and were primarily used for carrying roots. They were also used for a variety of other gathered materials, such as mushrooms or sunflower seeds, and for storing personal and household goods. These bags are also sometimes known as "sally bags", though the origins of this term are unclear. Schlick (1994) suggests that the term could come from a particular weaver named Sally, that it could have been used by early traders due to a pocket carried by English women called a Sally, or finally that the term could have been used due to the fact that early bags were twined from willow root back. Willow was known to the British as "sallow" or "salla", which might have yielded "salla bags".

Round twined bags were constructed of Indian hemp, and sometimes hazelnut or willow root bark. The top edge was frequently finished with a piece of leather or fabric folded around the rim. A string or thong was also frequently laced through this finished edge to form loops for carrying. For decoration, bear grass and possibly other kinds of grasses were used, changing to cornhusks once Europeans introduced the plant.

Table 2. Scientific Names for Plants Mentioned in Text.

Common Name	Scientific Name
Alder	*Alnus*
Cattail	*Typha latifolia*
Cedar (Western redcedar)	*Thuja plicata*
Bear grass	*Xerophyllum tenax*
Birch	*Betula*
Indian hemp	*Apocynum cannabium*
Juniper	*Juniperus*
Sagebrush	*Artemisia tridentata*
Sedge	*Carex*
Tule	*Scirpus acutus*
Willow	*Salix*

Flat twined bags were used for transporting belongings and food supplies such as roots from camp to camp. The flat shape enabled them to take up little space when not in use. These bags were also flexible enough to be easily carried on horseback. With the introduction of the horse, the modification of baskets to shapes more easily used for transportation was a general trend. Flat twined bags came in a variety of sizes, ranging from about one by two feet for storing roots and nuts, to about three feet long for personal possessions, to smaller, handbag-sized bags.

Like the round twined bags, the most common material for flat twined bags before contact was Indian hemp. Other fibers such as sagebrush or willow root bark suitable for creating fine-diameter twining elements were also used. Decoration was created by a technique called false embroidery, which performed the added purpose of helping keep dust out of the bag. Similar to the decorative elements in round twined bags, bear grass was likely used prehistorically, but this changed to corn husks after contact.

Flat twined bag designs generally begin a little above the bottom of the bag, leaving an undecorated band at the bottom, and often at the top. In the earlier bags found in ethnographic collections, and thus likely the pre-contact bags before them, only the colored parts of the designs are formed by false embroidery. In later bags, light colored fibers formed a background, creating a surface entirely covered in false embroidery. Almost all Plateau flat bags have a different design on each side, that frequently have nothing to do with each other, such as a geometric design with a different arrangement of shapes in a different set of colors (Miller 1986).

Two other types of ethnographic woven vessels are described by Schlick (1994) and Miller (1986) but they will be covered in less detail here since no examples were found in the archaeological collections I examined. One is a folded cedar bark basket, used for gathering berries, much like coiled baskets. These baskets were made from one long piece of bark, folded over, and stitched along the sides and rim to make an enclosed container.

Another type of weaving is the round twined hat. They were mostly worn by women in the winter—partly for protection from the elements, possibly to protect the forehead from rubbing by a tumpline worn to carry the weight of a basket across the back. They also probably conveyed status messages. Hats were twined and decorated with false embroidery in a manner similar to round twined bags, but with a different shape. Hats are slightly conical instead of straight-sided, and were decorated with designs much more like those used on the coiled baskets than those used on round twined bags.

Winnowing trays, coiled in a flat shape with flared sides and constructed of birch roots or willow, were reported among the Nez Perce. They were used to help separate gathered materials such as seeds and roots from debris associated with them. Hopper mortar baskets were also coiled, in a round form with no bottom. They are also reported among the Nez Perce (Spinden 1908).

For some groups such as the Wishram and the Sanpoil and Nespelem, a final basket type was reported. It was described as a coarse, open-twine, round or flat bag used for carrying fish or general food storage (Ray 1933:37; Spier and Sapir 1930:293). The Wishram example is dissimilar to anything else described in other ethnographies for the Plateau, but somewhat reminiscent of Northwest types, such as the one shown in Croes (2001:370) or type OB39 in Croes (1977:210). This would fit the description sometimes given of the Wasco and Wishram as representing a transitional form of basketry to forms often associated with the Northwest Coast (Turnbaugh and Turnbaugh 1986). However, the presence among the Sanpoil and Nespelem suggests that the type might have been present across the Plateau but unreported in some ethnographies, perhaps due to its utilitarian nature.

Various mats were also very important in Plateau life. By ethnographic times, Plateau peoples lived in lodges constructed of mats laid along a frame of poles. Mats were also used inside the lodges for floor coverings, sleeping mats, or food trays (Miller 1990). The mats studied here, found archaeologically, were used to protect food that was cached in storage pits. After the pits were dug, they were lined with mats to prevent burrowing animals from accessing the food. It has been suggested by some (Hicks and Morgenstein 1994) that mats used in storage pits included mats from the other uses mentioned above that had worn out.

Mats were constructed primarily using the two techniques described above—twining and sewing. Tule was usually sewn, and sometimes twined, and cattail was usually twined (Miller 1990; Spinden 1908). Since tules narrow from base to tip, bigger mats were made rectangular by a technique of alternating base and tip on each of the reeds (Hunn 1990). Grass was the most common material used for making twined mats in the archaeological collections I studied.

Plaited mats also have been found archaeologically, though ethnographic mentions of this technique are few. Haeberlin et al. (1928) listed it for the northern Plateau and Ray (1933:36) mentioned it as being rare among the Sanpoil and Nespelem. The archaeological evidence includes plaited mats along the Snake River (Endacott 1992; Mallory 1966).

Tumplines, or "packstraps" (Spier and Sapir 1930) are another category of woven material recorded ethnographically. They are described as having a wide central braided section to rest against the forehead, often with leather thongs sewn to each side to extend back around the basket.

Cordage is not often mentioned in ethnographies. Archaeologically it has been noted, at least in the large collections from along the Snake River, that a greater percentage of Plateau cordage is constructed with a grass than in any other place in North America (Hicks and Morgenstein 1994; Mallory 1966). The majority is two-ply, with only rare instances of three and four ply.

Textile Theory on the Plateau

Little non-descriptive work has been done specifically on Plateau textiles. One study of flat twined bags done by Miller (1986) focused on illustrating contact-period social changes through changes in textiles. This study provides an extremely comprehensive examination of museum collections and ethnographic descriptions of basket making in terms of materials, design, and design motifs. The changes she found after contact included, at first, a switch to materials brought to the Northwest by the Europeans such as cornhusks and commercial string, and then changes in function, form, and designs as life changed significantly for the peoples of the Plateau.

Swanson (1962) used changes in textiles to illustrate chronology. He based his chronology of the Vantage area on changes in 2-ply cordage. Swanson claimed to have found very similar sequences of changes in the different rockshelters he excavated. These changes were most evident in the ratios of the S and Z types to each other, the proportions of materials used, and to a lesser extent, degree of twist.

It is hard to know whether this is a real pattern applicable to other areas, as many of the other sites where cordage has been found do not have the time depth to lend themselves to such a study. Swanson’s cordage twist changes are still quoted in current summaries of Plateau culture history (Ames et al. 1998), but are as subject to debate as any of the artifact-based cultural phases that were formed in the earlier culture historical studies and are still used today.

Textile Theory in the Americas

Studies of basketry and cordage textiles throughout the Americas are not as plentiful as one might hope. As has been frequently observed, preservation in most areas is rare, and so the subject has been to some degree neglected in all areas. Webster and Drooker (2000) offer an excellent list by subject and region of publications dealing with textiles in the Americas, and Fowler (1996) presents a temporal sequence for Western

North America, neither of which will I attempt to duplicate here. It is interesting to note, however, that the Plateau is completely missing from both of these lists, even the one covering the West. I focus here mainly on studies that are based on theory dealing with "group identity and cultural interaction" as Webster and Drooker (2000:18) have labeled it.

Certain ideas concerning textiles are frequently discussed in the literature. One is the idea that style choices made when constructing a textile can either be active when the choice is being deliberately chosen to carry a social message, or passive when the choice is not made with any particular intent, but usually simply following the motor skills originally learned from a teacher (e.g., Minar 2000; Petersen 1996).

Carr and Maslowski (1995) made a slightly different distinction between attributes that are visible in the finished piece, such as decorations and gross weave type, and those that are not, such as stitch slant. Less visible traits are more likely to be transmitted from teacher to student, and therefore retained unconsciously and used passively, whereas more visible aspects, such as decoration, may change to accommodate whatever social goal is wished. In cordage, for example, direction of twist is an excellent example of a passively transmitted trait.

Another common idea is that even though a particular group might use a particular weaving attribute almost exclusively, it is extremely rare to find one hundred percent consistency within a group given a big enough sample (e.g., Carr and Maslowski 1995; Johnson 1996; Petersen et al. 2001). It would be easy to attribute this to the small percentage of left-handed weavers reversing the dominant trait they had learned, but not all researchers do. Petersen et al. (2001) attribute this pattern in cordage to idiosyncratic variation, some complicated social dynamic, or both, rather than handedness. Carr and Maslowski (1995) instead suggest several possible sources for this variation, including raw material variation, wherein a material has a predisposition to a certain twist or a new material and atypical twist were introduced together; handedness and idiosyncratic variation; or belief systems where one direction of twist is perceived as correct and reversing is restricted to certain contexts. There is no ethnographic report of any such beliefs about cordage among Plateau peoples, however.

While not all authors make the explicit link to phylogenetic ideas, a number do deal with the interaction of different textile styles, primarily focusing on cordage twist in relation to ethnic groups. For example, Petersen et al. (2001) looked at fiber artifacts from contemporary tribes in Amazonia, and found that the cordage twist did vary by the groups studied. They conclude that fiber artifacts could probably not be used alone to identify ethnic groups, but where there are boundaries between different twists or other attributes, it certainly merits investigation. In his study of cord-marked pottery in the Ohio Valley, Maslowski (1996) found some relation to groups also, but emphasizes the need to use artifacts other than cordage as well.

Complementary to the idea that textile traits differ from group to group is the idea that an abrupt change in whole textile traditions in a site or a region (Adovasio and Pedler 1994; Fowler 1994) is indicative of population replacement, since specific traditions are so connected to specific ethnic groups.

What all these studies lacked was any in-depth consideration of the factors that might cause fiber artifact attributes to be linked with groups, which is what the ideas of vertical transmission, learning, and passive and active traits used with phylogenetic theory provide.

The degree of continuity of textile traditions through time is an issue widely discussed in the literature. Croes (1997) was able to demonstrate this continuity on the Northwest Coast by comparing baskets dating to 3000 BP with modern styles. More often, however, this continuity is found in the passive attributes. "We maintain that it is much more likely that isochrestic [passive] attributes will remain unchanged, or constant over longer periods, sometimes millennia…" (Petersen et al. 2001:249). A few authors investigated temporal change in cordage (Maslowski 1996; Swanson 1962), but otherwise temporal continuity seems to be an unstated assumption for the other studies of cordage twist and other passive fiber attributes.

Other authors also investigate temporal change in other textiles. Jones (1968) studied dated baskets in collections, organizing basketry types that she defined for the Northwest Coast by decade. It is essentially a seriation study, though Jones points out that it does not meet the strictest definition that that entails. Given that none of the specimens she studied were older than 1880, she was focusing on basketry affected for quite some time by contact. Contact with Euro-Americans changed styles, especially in terms of what was popular and marketable for the Euro-American market. The effect of contact is visible in Jones' conclusions: while she notes changes in the frequencies of different types through time, which would seem to go against the idea of temporal continuity, the reasons for these changes seem Euro-American driven. She noted that Wakashan baskets were growing smaller and more non-utilitarian with more realistic designs, and Northern groups were showing a trend towards more decorated pieces, all of which would be for the Euro-American market. She also mentions that among the Coast Salish “a single main type predominated, *virtually unchanged in form and design style*, throughout the entire time span covered in this study” (Jones 1968:57, emphasis mine).

Maslowski (1996) compared cordage twist to cultural phase as well as ethnicity in the Ohio Valley, much like Swanson (1962). He concluded that the cultural complexes in the area did seem to have some relationship, but he did not attempt to tease out which complexes represented different ethnic groups, and which were truly one group evolving through time.

Connolly and Barker (2004) and Geib (2000) studied prehistoric textile style change in perhaps the best possible manner—using radiocarbon dates of the artifacts themselves. This is a fruitful area for research, since it allows much more nuanced examination of when and why a textile style change might have happened. Connolly and Barker found an abrupt change from one style of sandals in the Great Basin to another, which, they suggested, threw other cultural changes into a new light. Since the textile change was so abrupt they suggested that it was more than just climatic adaptation that caused these cultural changes in the period. Geib found the opposite pattern in his study of the Colorado Plateau—the sandal style changes took place over a period of several hundred years with an intermediate form, leading him to suggest in-situ change in that case.

The idea of diffusion as an important process for textiles also cropped up in the textile literature. There is a suggestion by Adovasio (e.g., Adovasio et al. 2001; Andrews and Adovasio 1996) that twining as a weaving technique, or at very least the use of fibers for cordage and textiles in general, was brought to the New World by the first immigrants. He bases this on the elaborate state of twining by the time it first appears in North America in a handful of sites older than 11,000 BP, and in South America in the early tenth millennium BP. The oldest cordage in the Americas is found at Monte Verde and dates to between approximately 13,500 and 11,800 BP (Adovasio et al. 2001).

Coiling, on the other hand, seemed to be invented and then spread in North America. Adovasio (1974) suggests that coiling first developed in "a narrow belt or corridor extending from northern Utah through Arizona and down into arid northern Mexico" (1974:125). Coiling traveled through the Great Basin starting in the eastern area around 6500 BC and appearing in the north by AD 900-1600 (Adovasio 1986). Since the first examples of coiling were parching trays, Adovasio links the development of coiling to the seed-processing practices in those areas; twining and plaiting are not suitable for parching.

Bernick (1988) suggests that diffusion was occurring in more modern times as well, in the case of the use of coiling spreading down the Fraser River from Interior to Coast Salish peoples, after contact. This was suggested by the fact that the Coast Salish had coiling in ethnographic times, but, according to Bernick, no examples have been found in a prehistoric context. However, coiling was present at the Ozette site, dated to 500-300 BP (Croes 1977), suggesting that it was present prehistorically, but only in late prehistoric times. This does not invalidate Bernick's suggestion of diffusion, but it does change the timing.

So it seems that innovations in weaving technologies may spread much like functional innovations in other types of artifacts, but the question is whether the traditions stay stable once all techniques are present, as was the case for a substantial period in North America.

Other Explanations for Variation

Twist and fiber type. A trend noted by Mallory (1966) in the cordage of the sites he studied, McGregor and Porcupine caves, is a slight bimodality in the diameters of the cords that corresponds roughly to different types of material and a choice of Z or S twist. From Mallory's personal examination of cordage from the Plateau as well as Great Basin sites, he suggested that Z twist was used for coarser, stiffer fibers and cords of larger diameter.

Another issue is whether the link between diameter and twist type is cultural or technological. The link between material type and diameter is clearly technological—certain materials such as Indian hemp are too fine to be used in large-diameter cords, and other fibers are naturally of larger diameter already. In Mallory's opinion, in the case of the relationship between twist type and either of the other two variables, "it is suggested that a technological bias is present" (1966:28).

Others suggest that such a link is mostly a cultural choice. In her study of ethnographic cordage, Minar (2000) found that neither method, fiber type, nor handedness explained the conservation of final twist type. Instead, she suggested that "the teaching and learning process, automatization of motor skills, the practicality of efficient production, and cultural beliefs about directionality" (2000:95) were the important factors that determined the twist type.

Handedness. Most authors treated handedness simply as a catchall source of variation, without studying it closely ethnographically to determine what its true effect might be on the proportions of opposing twist directions such as S and Z in cordage. Minar (2000) did examine the issue using modern weavers, but given that the subjects were found first through a spinning magazine, they lacked a shared culture or tradition of learning and style. In the study population, the percentages of left-handed spinners and the minority spin direction (S) were very similar, which might lead one to believe that being left-handed caused a spinner to spin differently than the norm. However, all of the left handed spinners spun Z, the majority direction, so the variation from the norm was among some of the right-handed spinners. Fisher's Exact Test showed that the null hypothesis of no correlation between handedness and spinning could not be rejected. This suggests that it is not inherently easier for a left or right-handed person to spin S or Z, but doesn't speak to whether a left-handed learner will reverse the spin learned from a right-handed teacher, or vice versa.

Trade. An issue to consider when studying textiles is that of trade—the ethnographic record is filled with examples of textile objects being highly valued trade items, both given the time and effort that goes into manufacturing them and their relative transportability. This of course complicates any study attempting to link specific attributes with certain groups, since the traded basket might be excavated far from the home of the people whose style it embodied. One ethnography, for example, says that one of the basket types that the Wishram used was "Klikitat baskets", though whether they were directly traded or made in imitation of the Klikitat form is not clear. The

Klikitat, on the other hand, stated that neither the Wishram nor Wasco made their own coiled baskets (Spier and Sapir 1930).

Fortunately, trade is less of a factor in the Plateau archaeological collections, because the depositional conditions have preserved mostly utilitarian textiles. As discussed below, nearly all Plateau textiles are found in dry rockshelters, and so are associated with storage activities. The mats and baskets buried for entire seasons to protect food were not likely to be valuable enough to be trade items. While baskets were often ethnographically recorded as being highly traded, mats are not mentioned as being traded great distances, and the archaeological mats found on the Plateau far outnumber the baskets.

Intermarriage. Various opinions have been expressed about the effect of patrilocality on transmission of weaving styles. Most Plateau tribes were ambilocal with bilateral kinship, though patrilocality was an ideal among some, such as the Nez Perce (Ackerman 1998). Croes (2005) found among the Northwest Coast tribes he studied that women marrying into a different family were obliged to learn the basketry of that family. In contrast, a weaver informant told Pryor and Carr (1995) that a girl would retain the weaving style of the group from which she'd originally learned weaving. Given that Pryor and Carr were studying Californian tribes, this could easily be a cultural difference. The difference could also be due to whether the informants were speaking of where they had learned basic weaving techniques or more visible decoration styles. Even if women were expected to adopt the visible attributes of their new group, it is possible that nonvisible, passive traits learned in childhood would continue to be used.

Active vs. passive. The distinction between active and passive traits in textiles seems especially important to make in the Plateau. Several groups are described as having textile traditions that have taken on attributes of nearby groups, which would not support the idea of vertical transmission. Examples of this include the Wasco and Wishram whose textiles are sometimes described as a "transition" type from the types found on the Plateau to those found on the Northwest Coast (Turnbaugh and Turnbaugh 1986). The clear trend towards rectangular baskets in the Northern Plateau has also been attributed to the influence of Northwest Coast rectangular cedar boxes (Turnbaugh and Turnbaugh 1986).

However, all of these traits are ones that are visible. A basket's square shape is extremely obvious, and Wasco and Wishram baskets are still visibly different from Coast ones. The ethnographic examples of diffusion fit with things found by researchers in other areas, such as Jordan and Shennan (2003) described in Californian groups—that visible elements do seem to spread through diffusion. It does not rule out, however, that passive attributes might be subject to vertical transmission.

Geographic traditions. A potentially complicating factor when linking textile traditions to ethnic groups is that many studies seem to have found a pattern of general geographic traditions, but ones that did not necessarily correspond to the distribution of languages or possible ethnic groups. Croes (1997) found a north-central split on the Coast and preliminary data suggests a north-south split on the Plateau. Jordan and Shennan (2003) found north, midland, and south groupings in California. In the latter case, the geographic divisions cross-cut language groups, whereas on the Coast and Plateau, the geographic divisions roughly correspond with them. Which are the north/south traditions on the Plateau caused by—geographic proximity, the shared language families, or a combination of the two factors? It is difficult to tease that out on the Plateau, especially from archaeological sites without known prehistoric ethnic affiliations.

Material availability. Some materials were obviously better suited to certain tasks than others. The air stored in the stems of tule acts as an excellent insulator (Mastroguiseppe 2004). Tule also are good for lodge mats because when sewn, they have no raised weft to impede flow of water and cause leaks, making them quite waterproof (Mallory 1966). Sagebrush bark, while it might not have great tensile strength, has more resistance to abrasion than most other materials (Hicks and Morgenstein 1994)

Beyond this, many of the materials used for a given type of textile were functionally very similar. This could mean that choices of material could be made according to a textile tradition, or simply based on the availability of materials. All of the specific plant species used in textile artifacts in McGregor cave were identified by Hicks and Morgenstein (1994) as ones that would have been available near the cave. This also appears to be the case for most of the other sites. The Snake River sites were all in the Agropyron-Poa zone, and the rest were in the Artemisia-Agropyron zone. This meant abundant sagebrush, as well as tule and cattail in wetter areas and trees such as birch, alder, and juniper along watercourses (Daubenmire 1942), meaning that the majority of fibers used were widely available in the areas they were used.

The one exception is cedar (western redcedar) bark, which for the Snake River sites at least was not local. It could have been traded for or brought in, or taken from driftwood along the river (Hicks and Morgenstein 1994).

Along with the fact that artifacts studied here were mostly utilitarian, these patterns suggest that it is likely that variations in materials chosen for artifacts would be more influenced by variations in the plants available in the local surroundings and less by traditional choices made by the weavers.

The Sites

McGregor Cave (45FR201). McGregor Cave is a rockshelter located along the western side of the Palouse River canyon. Specimens used for this study were collected in two different excavations—one in 1953 (Mallory 1966), and one in 1993 (Hicks and Morgenstein 1994) (Figure 1, #9).

There was no evidence of habitation at McGregor Cave—the only cultural remains were those associated with the storage pits and caches. The original excavation noted 34 depressions in the floor of the rockshelter from storage pits that had been prehistorically opened. Twelve pits were actually excavated, all with layers of rocks and matting. There was also evidence of multiple uses of a few of the pits, where layers of grass were caught between layers of rocks that had formed a new bottom for the next pit (Mallory 1966).

In the later excavation two additional pits, an area of the cave without visible surface pit depressions, and the berm at the entrance to the cave were excavated. Dates from the two pit features placed their construction at 220 and 110 years ago. Charcoal from an anthrosol elsewhere in the rockshelter dated to 1,910 ±70 BP (Hicks and Morgenstein 1994).

Porcupine Cave (45FR202). Porcupine Cave is located on the east side of a scabland butte about three-quarters of a mile southwest of McGregor Cave. It was first excavated in 1953, at the same time as McGregor Cave (Mallory 1966), and then later in 1994, as part of the Palouse Canyon testing program (Hicks 1995) (Figure 1, #9).

In the original excavation, eleven pits were visible on the floor of the rockshelter, two were excavated, and once again no evidence of habitation was recovered (Mallory 1966). In the later excavation, testing consisted of a trench which found storage features below the surface. There was a radiocarbon date of 730 +/- 165 BP associated with the storage features, and older dates associated with other cultural levels such as a date of 1,765+/-215 BP on a hearth feature at the back of the cave, though these levels were not well-represented by artifacts (Hicks 1995).

Other Palouse Canyon Caves. Testing of sites in the Palouse Canyon Archaeological District was carried out in 1992, and there were three sites, other than McGregor and Porcupine mentioned above, with textile artifacts: 45FR53, 54, and 276. 45FR53 had four visible pit features, one of which was excavated during testing (Figure 1, #9). 45FR54 had two visible pit features. Radiocarbon dates from the top, middle and bottom of one of the pit features yielded dates of 600 ± 90, 370 ± 85 and 700 ± 70 BP respectively, revealing the stratigraphic mixing common to storage sites. 45FR276 had one visible pit feature. The radiocarbon date from the excavated feature was 480 ± 90 BP.

All were taken to be storage caves, though it was suggested that 45FR276 might have been used as a temporary camp site before its use for storage (Draper and Morgenstein 1993).

Squirt Cave (45WW25). Squirt Cave is located on the south side of the Snake River, west of its confluence with the Palouse (Figure 1, #8). The original excavation was carried out in 1964. Eight storage pits were identified, seven of which were actually excavated. Five radiocarbon samples were taken from 4 of the pits, and date from 1750 to 405 BP (Endacott 1992).

Marmes (45FR50). Due to its considerable chronological depth, there has been much study of Marmes rockshelter, located in the Palouse River canyon, about a mile and a half from its confluence with the Snake. The original excavation was carried out in the 1960s before the site was inundated by the nearby reservoir of the Lower Monumental Lock and Dam. The site actually consisted of both a rockshelter and the adjoining slope and floodplain, though only the rockshelter had the correct type of preservation for textiles (Hicks 2004). This site only contributed two specimens to this study, though the presence of more unrecorded textile material present at the time of the original excavation is suggested. One of the cordage pieces was labeled as “from matting area”, and excavation notes record layers of matting and grass very similar to those encountered at the other Snake River rock shelters. Unfortunately, however, it does not seem that much care was taken to save any of the textiles in the push to reach lower levels (Mastroguiseppe 2004).

In any case, it is likely that the textile specimens lost from Marmes were roughly contemporaneous with those above, as all were recovered from Stratum VI and VII, layers with storage pits above the habitation layers, dated to 1300-1940 BP and 660-1600 BP (Mastroguiseppe 2004).

Vantage Sites. Swanson (1962) excavated a series of rockshelters along the Columbia River near Vantage, Washington (Figure 1, #4). These sites, at the mouth of Whiskey Dick Canyon, were excavated in 1953 and 1954. Seven of the sites mentioned in the report contained textiles. Cedar Cave was the largest of the excavated sites, and was interpreted as a habitation site, based partly on the presence of a large earth oven. In the talus slope below it there were also several stone pits that had been used for human burials. Two small shelters, 8B and 8C, were next to Cedar Cave. Two rock pits were identifiable in 8C, and the artifact assemblage of 8B suggested that it too was used for storage.

Crabtree Cave also consisted of a rockshelter and an associated talus pit, which in this case contained the bones of one adult and one immature horse. The shelter contained a rock pit and a charcoal lens. Shelter 7A was located opposite Crabtree Cave and contained four rock-lined burial pits. Hole-in-the-Wall rockshelter was located down the Columbia from Shelter 7A, and quite high up on the canyon wall. It also contained one identified storage pit. Finally, Duck Cave was located farther south on the east side of the Columbia and was fairly disturbed. Swanson makes no classification of its purpose, but there is no evidence to suggest that it is anything more than a storage cave, though no defined pits were found (Swanson 1962).

These sites had no independent dates at the time, though Swanson tried to create a chronology of his own. He defined three phases: Vantage, Frenchman Springs, and Cayuse, with numbered subphases in each. The Vantage phase he dated approximately to the Anathermal, Frenchman Springs phase to the end of the Altithermal, and Cayuse phase sometime after AD 1000 or 1300 (Swanson 1962). Ames et al. (1998) link the Frenchman Springs period to one lasting from 1900 BC to AD 1, and the Cayuse to one from AD 1-1720.

Windust (45FR46). The Windust Caves are located at Farrington Rapids at the upper end of the Ice Harbor Reservoir (Figure 1, #6). The original excavation was conducted in the early 1960s. All the textile artifacts were relegated to an appendix in Rice (1965) with little information about their provenience, but they were found within a layer dated from the present to 2500 BC. While the oldest layers were probably related to use of the caves as hunting camps, the most recent one, and thus likely the one where the textiles were found, was associated with the use of the caves for storage (Rice 1965).

Grand Coulee Sites. In the late 1950s and early 60s, survey and test excavations were undertaken in and around the Grand Coulee in central Washington (Figure 1, #2). A number of rockshelters were discovered around the Sun Lakes in the course of the survey, with results published in a series of reports (Clinehens 1961; Mallory 1962; Osborne 1967). 45GR78 is located just west of the upper end of Lake Lenore, and was notable for the presence of several pictographs. Features included fire or cooking pits and a storage pit. The presence of horse bones suggested an early historic or protohistoric time period. 45GR80 is located near Blue Lake and had two storage pits and was probably used for a much longer period. 45GR94 is located in the Grand Coulee's east wall, near Park Lake. It also contained pictographs, soot blackening on the ceiling and evidence of several occupations or uses of the rockshelter for a camp (Osborne 1967).

45GR79 is located in the east wall of Lower Grand Coulee near where Alkali Lake drains into Lenore Lake. It was likely used for nothing more than storage. 45GR102 is located near Deep Lake. It contained a couple of storage pits. 45GR104 was located near the Deep Lake camping ground. No storage pits were mentioned. 45GR119 is located near the southern tip of Lake Lenore. It also contained a storage pit. 45GR121 is located a little farther south from 119. It had two burial pits in the talus slope below it, and the basket artifact was found in one of them (Mallory 1962).

45GR84 is located northeast of 94. It has a soot-blackened ceiling and evidence of a fire area and a storage pit feature. 45GR101 is on a mesa, rather than in a rockshelter, and is located along the east side of the Grand Coulee, overlooking Lenore Lake (Clinehens 1961). The report records only rock features, including one built around a cleft in the rock that was excavated. Other features were described as stone circles, semi-circles, and a cairn and a wall structure. No artifacts were listed in the report, but several textiles in the Washington State University Museum of Anthropology collections, where most of the Grand Coulee site collections are stored, are labeled as coming from this site. It is unknown whether they came from the excavation reported in Clinehens (1961) or from elsewhere in the site.

Quilomene 1-7. The Quilomene rockshelters are located on the Quilomene bar along the Columbia River in central Washington, and were excavated in the late 1950s and early 60s (Figure 1, #3). They were never assigned proper site numbers, and were instead referred to by numerals. The extent of the test excavation done on the sites was not specified, but with the exception of site 3, all were estimated to date to late prehistoric to early historic times. No other information was given about site 3's age. They were likely all used for storage (Osborne 1969).

Wexpusnime (45GA61). Wexpusnime is located on the Snake river, on the Offield Bar and was excavated in 1969 (Figure 1, #11). An open village site, it is the only site studied that was not a rockshelter. A basket found there was preserved due to burning. The basket was found near the inside edge of a house. The house consisted of a living surface with the burned remains of the structure on top and was dated to 1190 +/- 60 BP, but clearly stratigraphically overlain by a house with a date of 1050 +/- 100 BP (Nakonechny 1998).

45GR2. This rockshelter is located in the wall of the Upper Coulee, near the town of Grand Coulee in central Washington, and was excavated in 1950 (Figure 1, #7). It was interpreted as a camping shelter, and not a habitation or storage site (Mills and Osborne 1952).

Burr Cave (45FR272). This site is located on the north bank of the Snake River, about a quarter mile downstream from the Windust caves. It was tested in 1977 in a program to survey the area. The basket found there was directly radiocarbon dated to 2660 +/- 90 BP (Gilbow 1978).

Unnamed rockshelter near Crab Creek. This rockshelter is located in Grant County, Washington, near Crab Creek, and was tested in 1953 (Figure 1, #5). In the only published article about the rockshelter, it was given neither a site number nor a proper name. All that was published about the site was a list of artifacts, and no suggestions were made either about its age or its use (Swanson and Lee 1959).

Trinidad and Cox Caves. Both of these rockshelters were part of a larger survey of rockshelters in Washington carried out in 1952, though only those with artifacts were mentioned in the published article (Figure 1, #4). Trinidad cave is located near the town of Trinidad on the Columbia, and Cox is located near Vantage, Washington. No conclusions were formed about the age or use of the rockshelters (Swanson and Bryan 1954).

Allison Creek Shelter (10AM201). This shelter was found during a survey of Hells Canyon in the 1950s. It is located beside Allison Creek (Figure 1, #12). The authors of the report seemed to assume that the cave was some kind of camp, though it had numerous grass and mat layers, as well as a few grass and mat lined pits (Caldwell and Mallory 1967). It is thus tempting to assume the rockshelter was instead used for storage, but without access the authors' original reasoning for their determination of function, some combination of the two uses cannot be ruled out.

Storage Caves

With the exception of Wexpusnime, and possibly 45GR101, all of the sites above are rockshelters, and a large portion of them were used for storage, whether exclusively, or after earlier, different uses. The characteristics of storage caves and the construction methods for storage pits have been given the most in-depth examination in the sites along the Snake River (Draper and Morgenstein 1993; Hicks 1995; Hicks and Morgenstein 1994; Mallory 1966).

Mallory (1966) characterizes the process of building a pit as removing rocks until the pit was the right size and then filling it will grass and matting. Hicks and Morgenstein (1994) found in their excavation evidence of pit sides constructed with the flat sides of rocks carefully placed to form walls facing the interior in at least one feature. They also found evidence of frameworks of sticks placed over the lowest layer of grass and matting in the bottom of the pit, perhaps to help hold the stored resources up off the ground to help in preservation, or to help keep animals and insects away.

Cordage from several of the excavations was found holding a circular form, suggesting that perhaps the stored resources were tied in bundles when they were placed in the storage pits (Hicks and Morgenstein 1994).

The upper layer of matting was often found in a more fragmented state, probably due to it being shifted aside when the stored resources were retrieved. None of the storage pits in any of the reports studied here were found with their original contents. This also highlights another point of disagreement between Mallory (1966) and Hicks and Morgenstein (1994)—Mallory described the pits as having been constructed with “scraps” of matting, while Hicks and Morgenstein suggest that the fragmented nature of the matting found was the result of cleaning before reuse of the pits, combined with natural deterioration. They suggest that features were originally constructed with whole or nearly whole mats that had been used for other purposes such as food trays or lodge mats until they wore out. These whole mats were then reused in the construction of further storage pits if they were still relatively intact after one use, yielding very fragmented mats by the time they were discarded.

Finally, as part of a cleaning process, before the pits were reused, Hicks and Morgenstein (1994) suggest that the left over matting and grass materials were burned to clear them away. Mallory (1966) attributed the presence of charcoal and ash lenses, along with the sticks mentioned above, to the smoking of fish. Hicks and Morgenstein (1994) argued that the lenses were too small to have come from proper hearths.

Partially burned specimens were something that was quite prevalent among the collections from all three locations that I studied personally (McGregor, Porcupine, and Squirt), and also visible in selected specimens pictured in other reports (e.g., Osborne 1969:423, and possibly Mills and Osborne 1952:354). This suggests that this practice of burning as part of the cleaning process extended beyond the Snake River. This is hard to study in detail, however, as no other authors seem to have either remarked on the burned specimens or suggested any reason for them.

Use of burning also depended on whether a storage site was used more than once—Hicks and Morgenstein (1994) remarked on the fact that the most recent layer of matting and grass in McGregor cave was unburned, since the site was not used after that, and the cleaning process was presumably performed just before a new years worth of resources were stored there. This suggests that smaller rockshelters that were not reused would not show any evidence of burning.

It is clear that differences in ethnographic basketry, at least, do relate to differences in ethnicity. This offers support for the idea of looking for such ethnic differences archaeologically. Previous work on the Plateau shows patterns of textile change relating to contact, but is also suggestive of archaeological temporal change. Textile work in the Americas provides ideas for why textiles varied in other areas, such as active and passive traits, material type, handedness, intermarriage, and trade. The site backgrounds show the patterns towards rockshelters and particularly rockshelters used for storage on the Plateau, as well as illustrating how poorly dated many of the previous excavations are.

CHAPTER 3

METHODS

The data set I used in this study was biased in some predictable ways by the preservation contexts on the Plateau, as well as by the fact that much of it came from previously published reports. In this chapter I explore what kinds of textiles preserved on the Plateau, what choices I had to make in classifying and identifying them, and what limitations were imposed by using previously published data, to try to make it clear what biases might remain and how I've minimized the others. Chapter 4 has the analysis of the data.

Textile Types

There are definite biases in my data set towards one type of textile over another—and by types I mean the large categories of textile artifacts: cordage, mats, and basketry. Since these categories of textile are used and treated differently, they are often worth considering separately, and it is important to know the proportions in a given site. The sample sizes for cordage, mats, and basketry in my data set are very unequal (Table 1). The majority of the data used for this study comes from mats and cordage rather than baskets.

Other authors (Endacott 1992; Hicks and Morgenstein 1994) have also noted that it is highly unusual for baskets to be found in a storage context. Hicks and Morgenstein (1994) point out that baskets would not even have been necessary if resources were tied into bundles as the shape held by cordage specimens suggests they were. Endacott offers this about the basket scraps that were found in Squirt Cave: “If these baskets were used for storage, they probably would have been retrieved unless they became so worn out that they were useless. The alternative explanation is, of course, that these baskets were not used for storage” (1992:110).

Other explanations that occur to this author include the idea that worn out baskets were used in the same manner as worn out mats for storage pits. Tools are suggested to have been cached in storage caves in bundles on the surface rather than in pits (Endacott 1992:136), so another explanation is that baskets were cached in a similar manner as tools or used in the caching of the tools. This seems fairly unlikely, however, since the basket fragments were found in pit features rather than outside them, as most of the tools were.

One might expect that if the mats in my sample were used just for storage they would be made expediently, with a simple set of techniques. However, if people were using worn out mats originally intended for other purposes, as seems to be the case, then the techniques used should be fairly representative.

There were also a few isolated examples of netting mentioned in reports. Other reports suggested that isolated knots were remains of nets, but for reasons discussed below I chose not to make that assumption.

Also sometimes preserved were artifacts used in making textiles, such as netting shuttles, awls, or spools for cordage (e.g., Endacott 1992). These artifacts were not covered in this study, since the interest was the attributes of the finished textiles themselves.

Attributes Recorded

As is a problem when working with any previously published data, the resolution of measurement and choice of variables varied greatly from report to report. The most frequent problem was that it was impossible, given the form in which the data was published, to relate two attributes of a given specimen, such as material type and twist, which were listed separately. Despite the worries in the literature (Adovasio and Gunn 1977:139; Osbourne 1969) that textile items were not being recorded properly, I found that most reports made some effort to identify the attributes of the specimens, even if the information was relegated to an appendix.

I was able to study a few of the collections myself, which made those data, along with those recently analyzed (Draper and Morgenstein 1993; Hicks 1995; Hicks and Morgenstein 1994; Mastroguiseppe 2004) the most consistent. I personally studied the McGregor, Porcupine, Squirt, and the Grand Coulee sites (45GR-- with the exception of 45GR2), all of which are housed in Washington State University's museum. In studying them, I tried to collect the maximum amount of information from the fragments. When adding data from published reports, some of those categories obviously had to be left blank.

Cordage is fairly simple—there are only a few choices to be made about twist direction, number of plies, and how these combine on specific artifacts. Thus, those attributes were recorded, as well as length, diameter, and raw material for all cordage.

Basketry and mats can, to a certain degree, be treated as one category for the attributes for analysis, since mats are essentially two-dimensional versions of the same techniques available for baskets. Basketry offers a much wider variety of attributes to be recorded, however, so the categories were narrowed down to ones tailored to this analysis. I followed Adovasio (e.g., Adovasio and Pedler 1994) in relying primarily on the "wall" attributes of basketry and mat for analysis. The wall is the portion of a basket or mat that is not the beginning, center, or any edge, but the portion of similarly constructed material that makes up the bulk of the vessel. Information about the wall includes whether the basket is coiled, plaited, or twined; the interval of that technique, etc. This resolution was chosen for a variety of reasons—it has been shown that it is sufficient to distinguish different ethnic groups in other areas (Adovasio and Pedler 1994), and more prosaically, archaeological fragments more often consist of fragments of wall than they do of selvage or centers. Similarly, much of the data for this analysis was pulled from published reports, and wall attributes are the most consistently recorded attributes of textile specimens, even when non-experts are doing the recording.

On the other end of the scale of resolution for textile attributes are those that have been demonstrated in the past to help identify individual weavers within an assemblage of textiles (Adovasio and Gunn 1977). These include wefts or warps per centimeter and methods of splicing. While the former were recorded for the collections the author studied personally, they rarely were by anyone else. The latter is extremely hard to tell on archaeological textiles, since splices are purposely hidden, even if chance determined that a splice actually occurred within space of a particular fragment. However, the resolution of an individual weaver is far beyond what is necessary for this study. More often in these collections, there are a few specimens from several scattered sites, rather than several specimens from one site that might allow one to examine the work of individuals.

Between the resolution of using only wall attributes and using enough attributes to identify individual weavers, there lay the one used for this study. It consisted of recording wall, center, and selvage attributes; decoration method; and material types whenever available on the archaeological fragments. This allows the possibility of differentiation of ethnic groups even in the Plateau, where basketry styles may have been more widespread and similar between ethnic groups than the situation of hypothetical population replacement that Adovasio was dealing with in the Great Basin when he used only wall attributes.

Identification Choices

Given archaeological fragments, misidentification is often an issue. Within the collections studied, there were several categories of textiles that were especially easy to mistake for each other. The first is tumpline and cordage. Tumpline is technically just cordage used for a specialized function, it was ethnographically recorded as being constructed of a three-ply braid (Spier and Sapir 1930) and braiding was otherwise extremely rare in Plateau cordage. Tumpline identified by other authors (e.g., Mallory 1966) was lumped with cordage, meaning a loss of resolution as to variation in tumpline versus other cordage construction, but avoiding the problem of identification.

The second identification problem I encountered in my personal analysis was cordage versus sections of twined matting weft. In most cases, weft sections from which the warp was missing were distinctive enough in terms of spaces left between the wefts that I could identify them confidently. However, a common side selvage technique in twined matting is to continue one weft as the next row, going the opposite direction, and leaving a short length of cordage-like twining along the side of the mat parallel to the warp (Figure 11). These fragments of weft, separate from the mat, are virtually indistinguishable from cordage except perhaps using the combination of unusual material and looser twist, but not enough to be confident in the identification. This is simply a possible bias to keep in mind—since Plateau twined mats are nearly always Z-slant, their weft looks like Z-twist cordage, which might bias the Z vs. S ratio to an unknown but probably minor degree.

Some reports have suggested that isolated knots found in sites should be taken as evidence of netting (Combes 1969:9). However, overhand knots were also apparently used to prevent the ends of cordage from unraveling (Hicks and Morgenstein 1994). Since I had no complete specimen of a net to compare netting knots to knots in isolation, I chose not to interpret isolated knots to mean the presence of nets for any of the samples I studied, and certainly not for those mentioned in published reports. Mallory (1966) undertook an identification of all the different types of knots, but I chose not to do this myself for Squirt Cave, given a lack of comparative information in any of the published reports. There is also little general information in the literature about how types of knots vary among ethnic groups.

Material Identification

Material identification in the collections I personally studied was done with the aid of comparative artifacts that already had been labeled with a material type. I also had a tutorial with Joy Mastroguiseppe, who has extensive previous Plateau botanical identification experience (Hicks 1995; Hicks and Morgenstein 1994; Mastroguiseppe

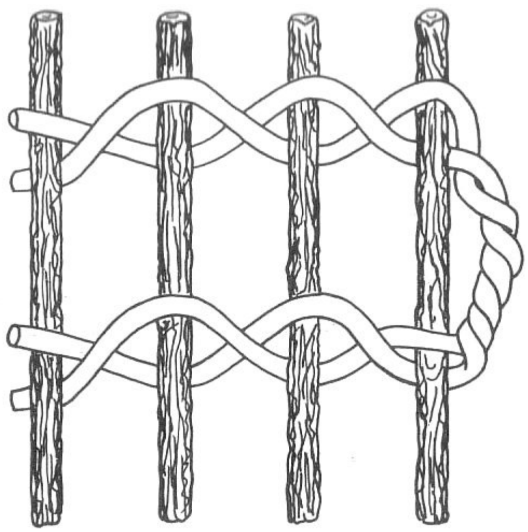

Figure 11. Example of side selvage that can be mistaken for cordage (from Adovasio 1977: Figure 44d).

2004), wherein we spot checked my type artifacts and identified stubborn unknowns. I am very grateful for her help.

In some cases, I decided on lower resolution in material types. Grasses and sedges are biologically separate, but difficult to identify in textiles given that the differentiating features lie in the cross-section of the stem near the base and the tissue where leaves branch off from the stem, which are very rarely preserved or visible in archaeological textiles (Joy Mastroguiseppe, personal communication, 2006). Mallory (1966) acknowledged that issue, and also chose to combine them in his report, probably because of the difficulties of identification mentioned above. Other reports presumably include sedge in their grass category.

Sedges preserve better than grass, meaning that the high incidence of sedges in archaeological sites could either mean that they were originally chosen for manufacture because of their long-wearing attributes, or that they have survived better postdepositionally (Hicks 1995). Very few other site reports split them out, making an inter-site comparison of that issue impossible. Such a comparison on a regional level is unnecessary—other culture areas used neither sedge nor grass in as great a quantity as Plateau peoples did.

The other categories used for material identification were also somewhat informed by ethnobotanical categories, rather than biological ones. Tule specimens were not identified to species, for example, as has been done in other cases (e.g., Endacott 1992) as there is no indication in the ethnographic literature that different tule species were differentiated by Plateau peoples.

Limitations

Terminology confusion from old publications. As one might guess, since textiles are consistently understudied, the specialized terminology mentioned above created one of the limitations on the data set. When not used, as in older sources, or when used by people who don't really understand it, as in many site reports, it often forces one to make educated guesses about what the author really *meant*. Some data was discarded from this study for this reason. Cordage was recorded at the Wakemap mound (Collier et al. 1942), but the twist was listed as clockwise. Given that this changes whether one is looking at given piece of cordage oriented one way, or the opposite way, and that a diagram for one specimen showed S twist when Z is commonly taken to be the equivalent of clockwise (Mills and Osborne 1952), these data were discarded.

Most other mistakes only led to lower resolution of data. A twined basket cannot, by definition, be imbricated, so I had to throw out decoration information for a specimen reported by Swanson (1962:60). Sometimes, educated guesses had to be made. The definition of sennit, for example, was deduced by a combination of the dictionary definition and process of elimination—it is not any other type of cordage explicitly described in the same report. In this study, "sennit" as used by Swanson (1962) was taken to mean a braided rather than twisted cord.

In a few cases, mistakes could be corrected simply by logic. One of the worst-offending reports consistently used twilling when they, as shown in their figures, clearly meant twining, and later confused weft with warp. This is obviously simply caused by ignorance of the terminology.

Finally, a more sophisticated mistake in Miller's (1986) otherwise high quality work is her statement that "in nearly all the bags examined, the twined stitches are S-pitched, slanting from upper left to lower right" (Miller 1986:95). Adovasio, in the commonly accepted manual of basketry terminology, clearly states that "When the stitch slants down to the *left*, it is commonly called 'S'…The slant down to the *right* is called 'Z'…" (Adovasio 1977:20, emphasis mine; Figure 12). This also fits better with Miller's own diagrams, which, using Adovasio's definition, illustrate z-pitch.

This is perhaps an understandable mistake. Adovasio's definition is based on viewing the weft vertically, as if it is a piece of cordage with the warps interposed between each twist. Viewed with the warps vertical, as one usually looks at a specimen as a whole, the twists of separate wefts stack to form a false picture of an s-twist running down the warp.

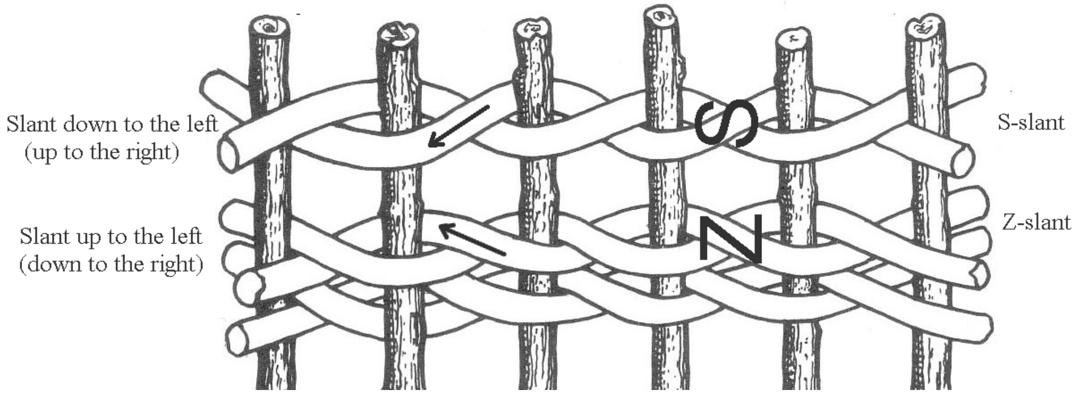

Figure 12. Twining slant (after Adovasio 1977: Figure 6).

Temporal issues. Many of the sites studied did not have good temporal control, due partly to the fact that many were surveyed in the 1960s, before radiocarbon dating was widely used on the Plateau. Also, since many had only small scale test excavations, it is not surprising that researchers chose not to spend the money on radiocarbon dates. The dates that do exist in the literature for the sites studied are shown in Figure 13, though despite the ability to direct date textile artifacts, most of the dates are from other organic materials at the sites. None of these dates were listed as calibrated.

One way that others have dealt with this issue is to simply assume continuity in the textile traditions for the last few thousand years. As mentioned above, this seems to be an attribute of textiles that has been found in a variety of places. Close to the Plateau, Croes (1997) was able to demonstrate this continuity on the Coast by comparing basketry dating to 3000 BP from a number of sites and different regions.

Textile traditions, while possibly having great continuity, are not unchanging. They seem as susceptible to diffusion of a new functional innovation as any other type of technology. After contact, the Plateau basketry underwent obvious changes (e.g., Jones

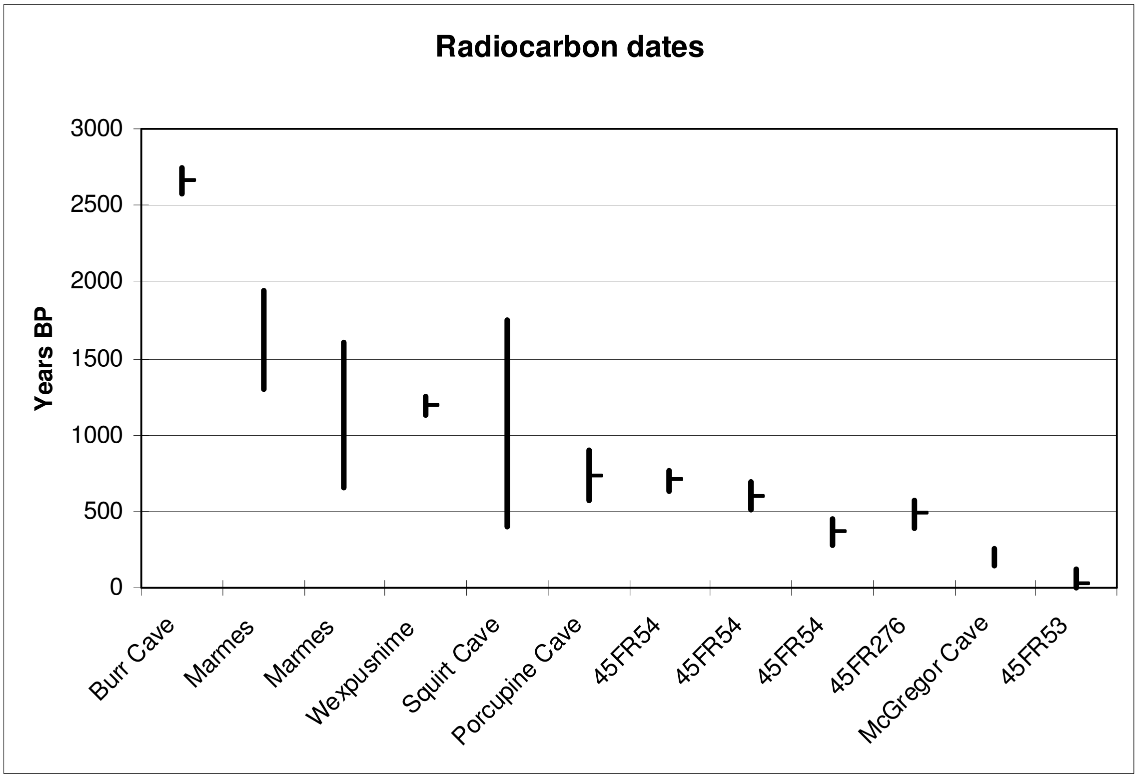

Figure 13. Previously published radiocarbon dates for the studied sites. The Burr Cave date is from the only directly dated textile.

1968; Miller 1986), not just to appeal to Euro-American markets, but also even earlier to adapt to transporting materials in the baskets or bags by horse.

To address this issue, I gained permission from the Washington State University Museum of Anthropology to directly date twelve textile samples. Nine were from McGregor Cave and three were from Porcupine Cave, from the collections produced by the excavations of the rockshelters in the 1950s. The samples were selected from mats and baskets to represent as many different types as possible, including ethnographically documented styles, from what were hoped to be the oldest stratigraphic contexts. I guessed at the age of the samples primarily by depth of the artifacts, though some of the specimens' provenience had been lost. It was thus hoped that the samples would illustrate the time depth of the various styles.

The radiocarbon dates were analyzed through the student internship program at the University of Arizona NSF AMS lab. Their pretreatment consisted of the samples being "cleaned with 1N HCl acid, 0.1% NaOH and 1N HCl (acid-base-acid (ABA) pretreatment), washed with distilled water, dried, and combusted at 900 °C with CuO." (Jull et al. 2003:4)

This data set is mostly composed of mats and cordage, and I recorded mostly wall attributes when examining the weaves. When identifying attributes I combined some categories, such as tumpline and cordage, and several categories of plant material. Remaining biases that might affect the data include selvage mistaken for cordage, errors in interpreting published data because of old terminology, and poor temporal control of sites, though this last was addressed through a new set of radiocarbon dates.

CHAPTER 4

ANALYSIS

To investigate locations and movements of ethnic groups on the Plateau, I used a number of different analyses to examine the question of ethnic groups from different angles. First, to map which sites might have been used by different groups, I used single variables or combinations of variables that had been used for differentiating groups in other studies. I used multivariate analyses to look at textile traditions as a whole that might have belonged to different ethnic groups. For these analyses, temporal continuity was assumed at least at first, given that textiles often have great temporal continuity, and though the sites are poorly dated, most are estimated to come from late prehistoric to early historic times. I then used new radiocarbon dates to add the temporal dimension to examine the idea of textile tradition continuity or change, and movement of ethnic groups. Finally, phylogenetic analyses were used to attempt to identify a phylogenetic signal in the textile traditions and if present, to use it to form conclusions about the past relationship between the groups.

Variation in single variables such as cordage twist is often used to find boundaries between groups in other areas (see Chapter 2) and also on the Plateau (Swanson 1962). I explored whether such conclusions applied across my the whole sample set, as well as testing suggested relationships between variables such as cordage diameter and twist and material (Mallory 1966; Swanson 1962), which would suggest other reasons for variation than just differences between different groups' traditions.

Cordage

The first analysis performed was calculating the proportion of the total 2-ply cordage at each site that was S or Z twist, as Swanson (1962) did to create his Vantage phases. In Figures 14-16, each phase at the Vantage sites is graphed separately, to allow comparison as to whether sites showed similar patterns cross-phase, or within phases. There are no immediately clear patterns. One could argue that there are some geographic similarities—the Quilomene rockshelters all have the same S dominant cordage, and McGregor and Porcupine are very close to each other. However, many of the Grand Coulee Survey sites are only a kilometer or so away from each other, and they show no particular pattern.

Several of the sites had no more than one or two specimens of cordage, which would create an artificially predominant S or Z result, so I also graphed only those sites with a sample size of 50 specimens or more (Figure 17). Here, the Snake sites do seem to have similar proportions.

To investigate more regional patterns in the cordage, I also explored the cordage twists when aggregated by the Upper Columbia, Mid-Columbia, and Snake regions. Textiles in other culture areas have tended to vary by region (see Chapter 2), and so looking for patterns among the Plateau regions covered in my data set seemed meaningful.

Using a χ^2 test, the frequency of each twist type by location is significantly different—closer to equal (random use of either) in the Snake, and more S dominant in the upper Columbia (Figure 18; χ^2=50.54; df=2; $p \leq 0.001$). The strength of association

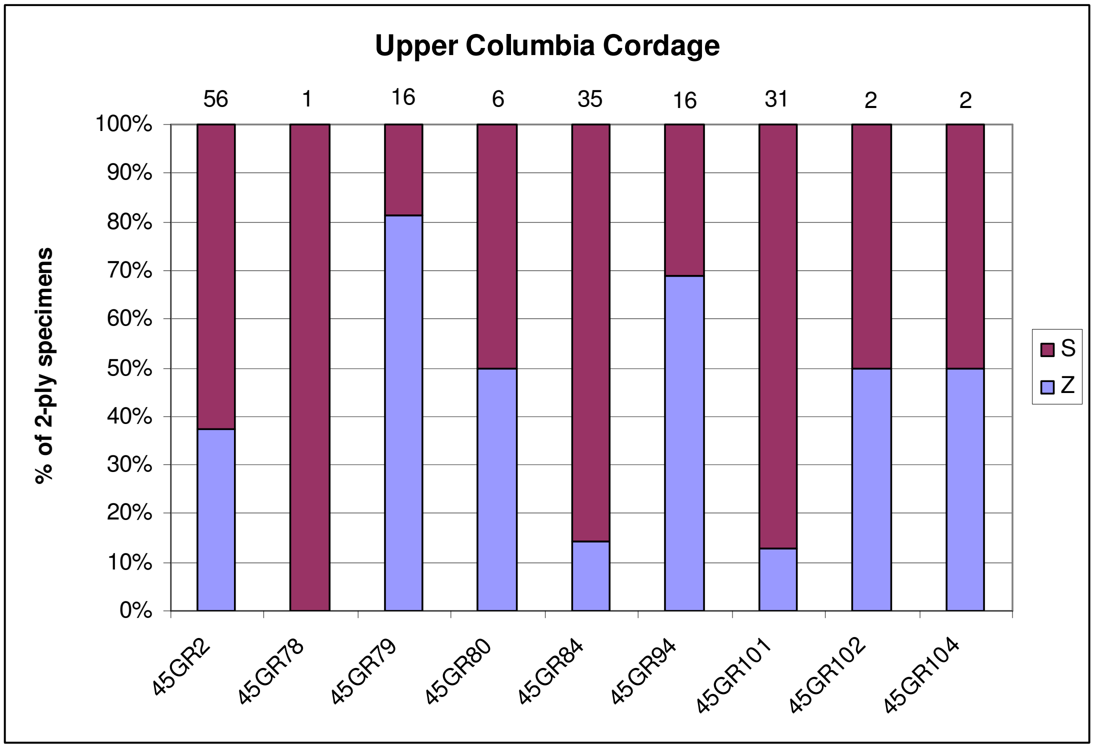

Figure 14. Two-ply cordage twist in Upper Columbia sites. Sites are arranged in approximate downstream order from left to right.

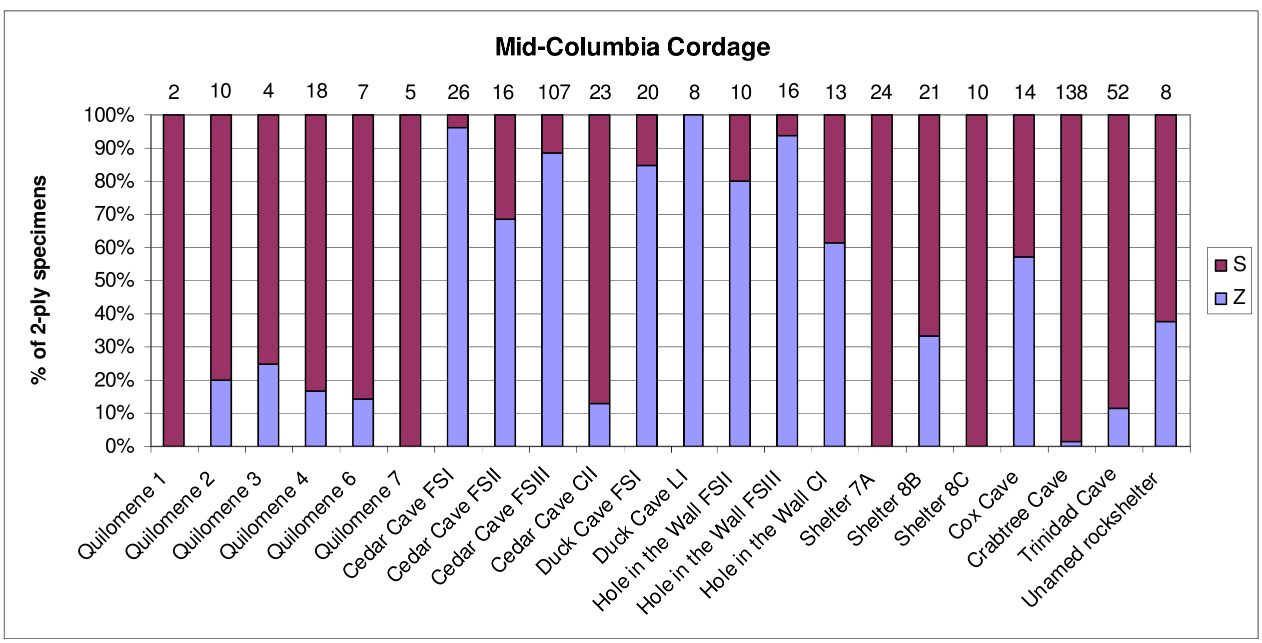

Figure 15. Two-ply cordage twist in Mid-Columbia sites. Sites are arranged in approximate downstream order from left to right.

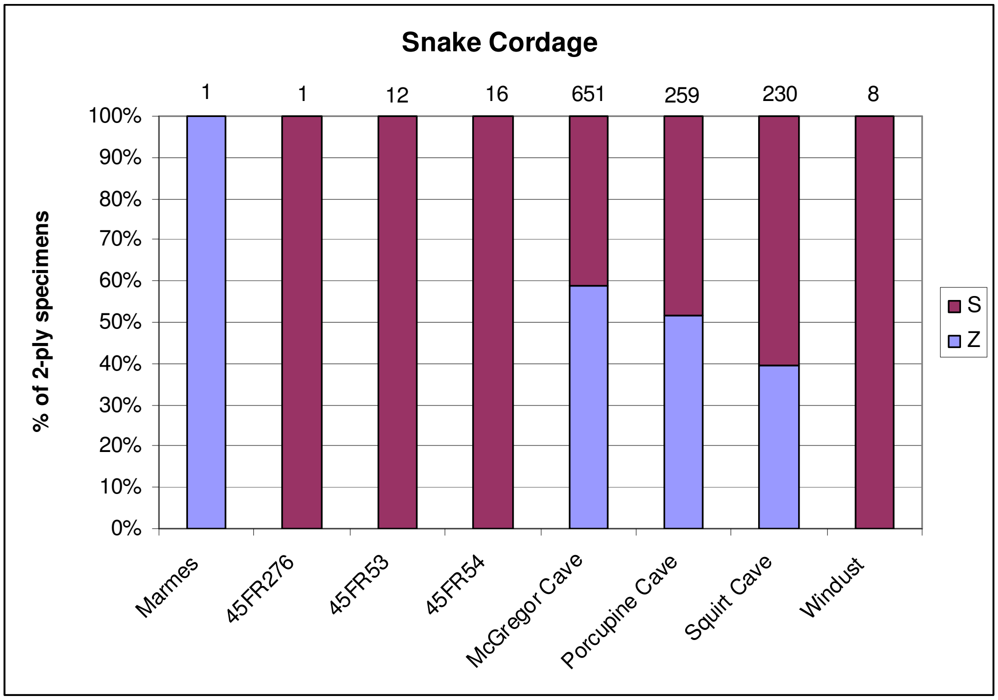

Figure 16. Two-ply cordage twist in Snake sites. Sites are arranged in approximate downstream order from left to right.

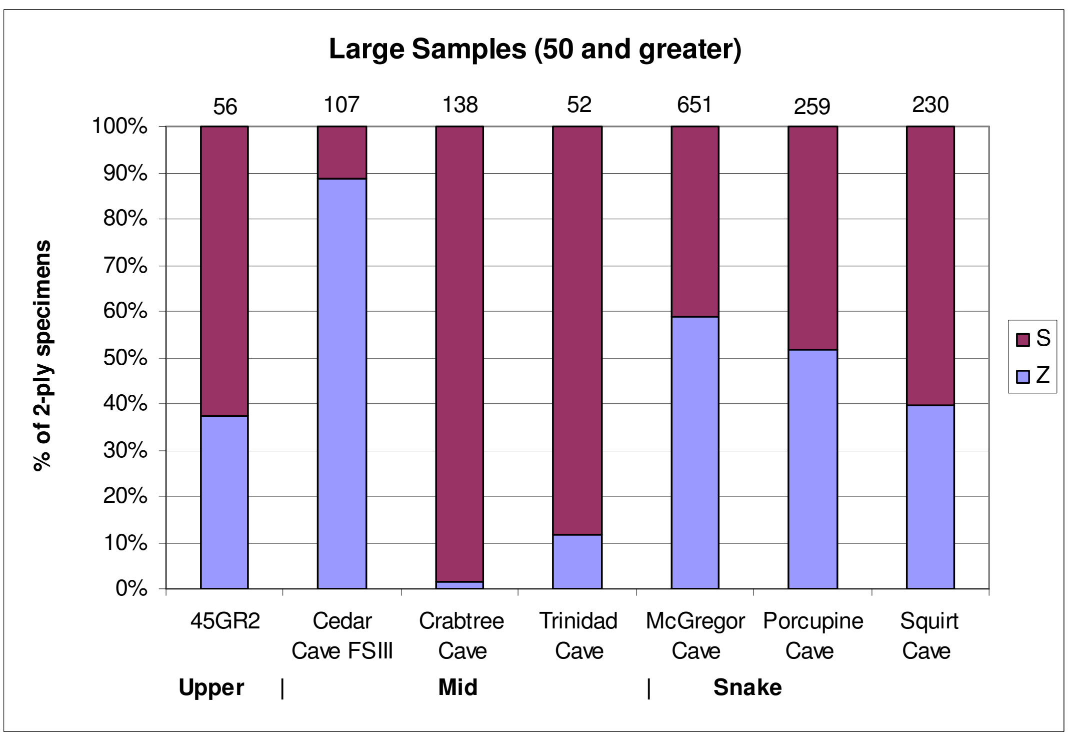

Figure 17. Two-ply cordage twist in those sites with 50 or more cordage specimens. Sites are arranged in approximate downstream order from left to right.

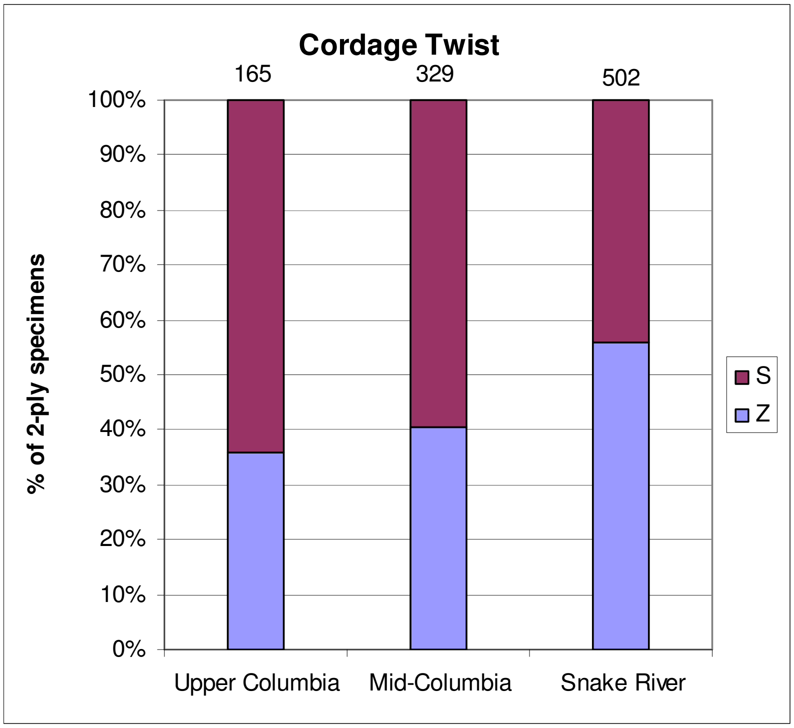

Figure 18. Combined 2-ply cordage for regions.

measure Lambda (λ) showed a significant but weak relationship between twist and region with twist as the dependent variable (λ=.151; $p \leq 0.001$).

It appears, then, that a fairly even mixture between the two twist types is present across the Plateau or at least in the Snake drainage, which is interesting given that some hold that "the presence of approximately equal frequencies of different final twists within a cordage sample may indicate population mixing, either by the influx of alien groups displaying different cordage manufacturing techniques or through proximity to a boundary between areas with different cordage and textile-manufacturing traditions" (Johnson 1996:147). Even if the mixture of twists was caused by the mixture of sites in time and space, it still suggests the presence of such a boundary either back in the past or within the geographic regions I chose.

If we accept the idea that the cordage proportions are due to mixing across a boundary, the mixing would presumably be between Sahaptin and Salishan speakers, or a larger spatial scale from the interaction of more Coast and more Great Basin influences. That latter seems unlikely, as the Plateau has its own very distinctive textile traditions, and in the Great Basin cordage often is predominately Z (e.g., in the Fort Rock Basin, Connolly 1994), and in studied sites in the Coast area it is also mostly Z (Croes 1980).

Another possibility is that one of the twist types is linked with a new material or new spinning technique which would have been transmitted wholesale with the differing twist. As discussed in Chapter 2, Mallory (1966) tried to link twist to material and diameter of cord which might suggest that one twist was associated with a type of cord that used a particular new technique. Hicks and Morgenstein (1994) found a correlation between larger diameter cords and Z-twist and smaller diameter cord and S-twist, but didn't find any correlation between twist type and material.

Mills and Osborne (1952) also suggested a link between fiber type and twist direction. At their site in the northern Plateau, cedar and tule cordage were always Z-twist and Indian hemp was predominantly S-twist. However, the sample size of cedar bark cord was very small (n=4) and the tule specimens must be considered in light of the fact that cordage is sometimes hard to tell from twined mat fragments, and Plateau twined mats are almost invariably Z-slant which would make wefts that look like Z-twist cordage.

On the Northwest Coast, at the site of Ozette, Croes (1980) linked twist to diameter. The percentages of Z vs. S varied for the various diameter classes, but only the 2-ply cedar bark string (1 to 5 mm) had a majority S twist. This matches Mallory's original findings that link S with smaller-diameter cords.

Swanson (1962) also gave diameter information linked with twist for the Vantage sites, though he didn't analyze it further. An independent samples *t*-test shows that the mean of the diameters of the S cords is significantly different than that of the Z cords (t=-5.26; df=430; $p \leq .0001$).

The only other site for which I had data of sufficient resolution to study this question was Squirt Cave. There, for 2-ply cords, the twist type was significantly different by material (χ^2=56.56; df=4; $p \leq 0.001$), but once again Lambda showed a significant but weak relationship between twist and material with twist as the dependent variable (λ=.151 p $\leq$ 0.001). The mean of the S cord diameters is 6.01 mm and the mean of the Z is 9.81. An independent samples *t*-test shows that the mean of the diameters of the S cords is significantly different than that of the Z cords (t=-8.07; df=228; $p \leq .0001$). An ANOVA test shows the same for the diameter means by material (F=5.93; df=3,191; $p \leq .001$). So in Squirt Cave there seems to be a relationship between diameter and material—which is intuitive, given that for materials like Indian hemp it takes too much time and effort to make large cords. It is odd that Hicks and Morgenstein (1994) didn't find that relationship. There also seems to be a relationship between S twist and smaller diameter and Z twist and larger diameter. This is also visually apparent in the graphs from McGregor Cave (Figure 19), and Squirt (Figure 20). On the other hand, material

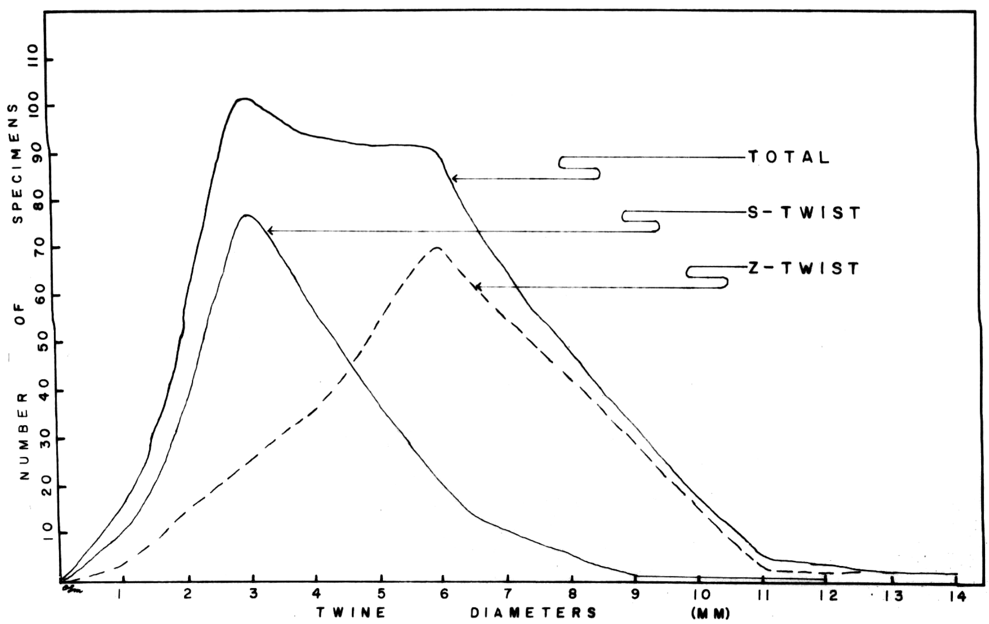

Figure 19. Twist related to diameter in 2-ply cordage in McGregor and Porcupine Caves (From Mallory 1966: Figure 14).

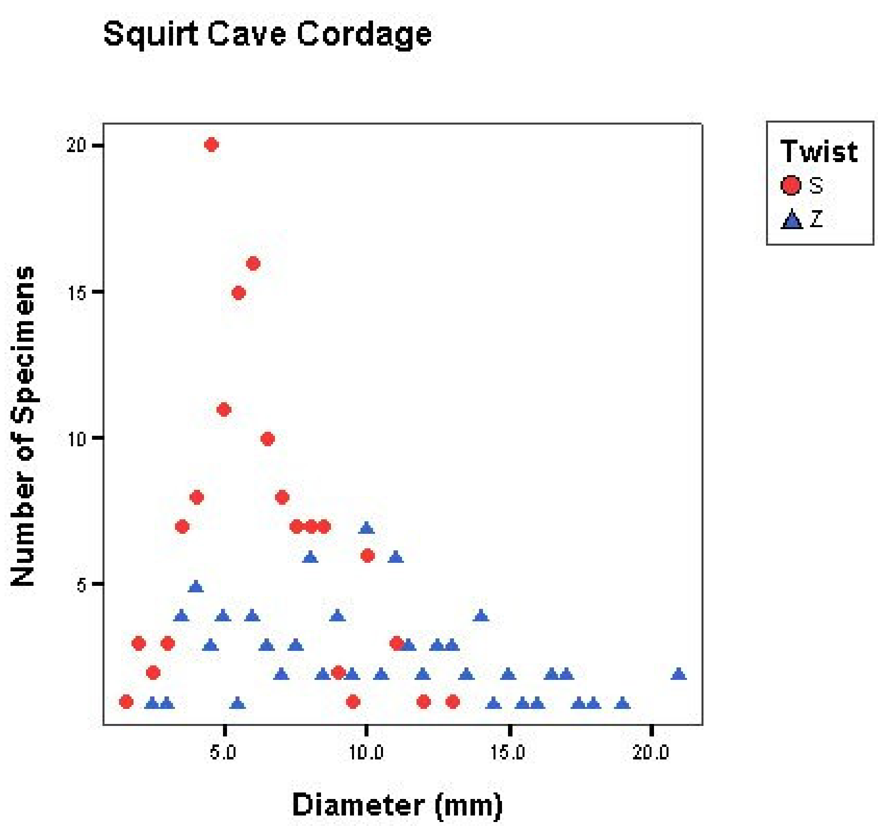

Figure 20. Comparison of twist and diameter for 2-ply cordage from Squirt Cave.

does not seem to have a strong statistical relationship with twist, as Mallory (1966) seemed to think.

Other areas also sometimes show patterns between twist and material, but also illustrate the importance of considering the techniques and functions involved. In the Fort Rock Basin, Connolly (1994) found that 97 percent of tule, grass, and sagebrush cords were Z, while only 12 percent of Indian hemp cords where. However, Connolly also notes that the Indian hemp cords appeared to have been used predominately for netting, rather than plain cords. This fits the idea that a particular technique that is new to an area, either for a different product, or to spin a new material, will be transmitted with a particular twist, but it is hard to find evidence of this in the Plateau.

There is also the issue of the switch in twist that Swanson noticed in the Vantage sites. This was camouflaged above given the combination of various sites' cordage. When all of the Vantage individual site components are compared, the frequency of S and Z are significantly different (χ^2=301.3; df=12; $p \leq 0.001$), as well as having a fairly strong relationship between twist and individual site component with twist as the dependent variable (λ=.794; $p \leq 0.001$). This supports Swanson's contention that there are differences between the cordage in the site phases, but the more important question is what caused it.

Swanson argued for a gradual change, which would not fit with population replacement as a possible cause, since this would tend to cause fairly abrupt changes. Then again, since Swanson was designating phases by individual occupations, without absolute dating, it is hard to know the amount of time between each phase. In Figure 21, the phases are arranged in temporal order as Swanson designated them. Some signs of a gradual transition can be seen the beginning of the Cayuse phase (CI), but are hard to evaluate without knowing how long the phase was. There seems to be no accompanying pattern of a new material becoming more important (Figure 22), unless it was one not identified.

This issue is related to the question raised above—perhaps the switch that Swanson found is a sign of the entrance of a group with a predominately S twist tradition to the area, but the question still remains. Where did that group's S twist tradition originate?

There's also the question of diameter—if S twist was used more frequently for smaller diameter cords, perhaps a switch to S indicates an increased use of smaller diameter cords in the site, perhaps due to a change in site function. Apparently through analysis of his graphs (Figure 23), Swanson suggested that diameters increased through time in storage shelters, and decreased through time in habitations, though he decided that 8B, which was a storage shelter, showed the characteristics of a habitation. Regraphing does not reveal a clear pattern (Figure 24-25). To investigate the trends, Spearman's Rank Correlation coefficient was used, since the temporal phases are ordinal data. Following Swanson, habitation and storage shelters were calculated separately. The same phases at different sites were combined into the same rank. For the habitation sites, the correlation was significant but weak (r_s= -.197; p= .003). For storage sites, it was a highly significant but slightly less weak correlation (r_s = -.317; $p \leq .0001$). It interesting to note that though Swanson saw storage site diameter increasing, the correlation is negative.

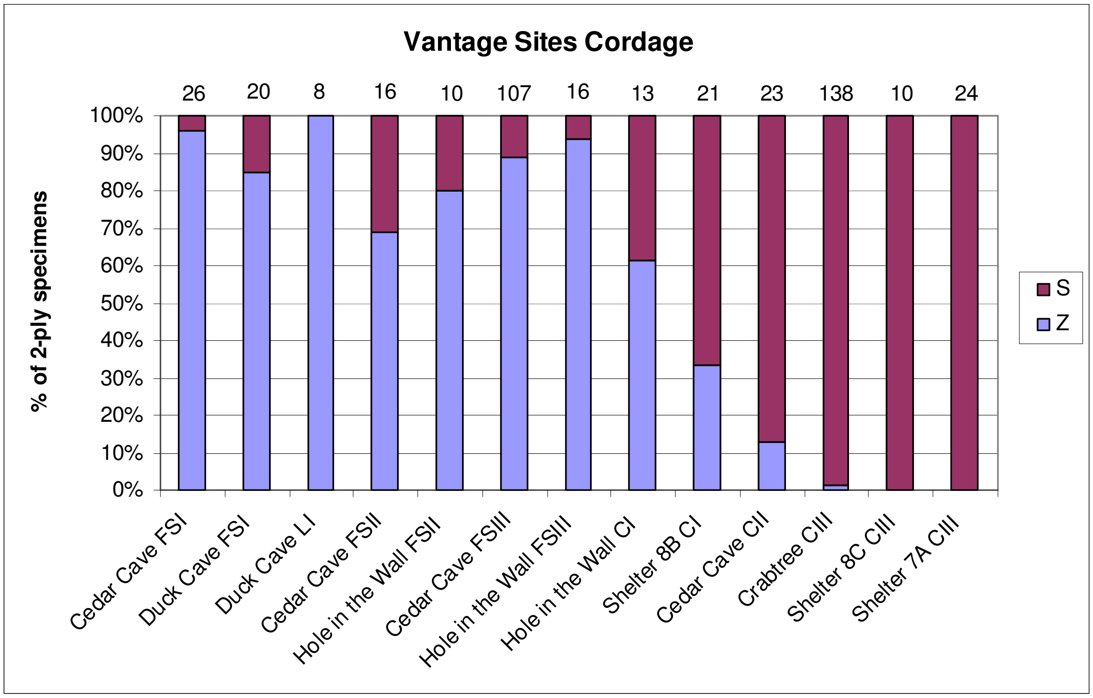

Figure 21. Two-ply cordage twist for Vantage phases, roughly chronological from left to right.

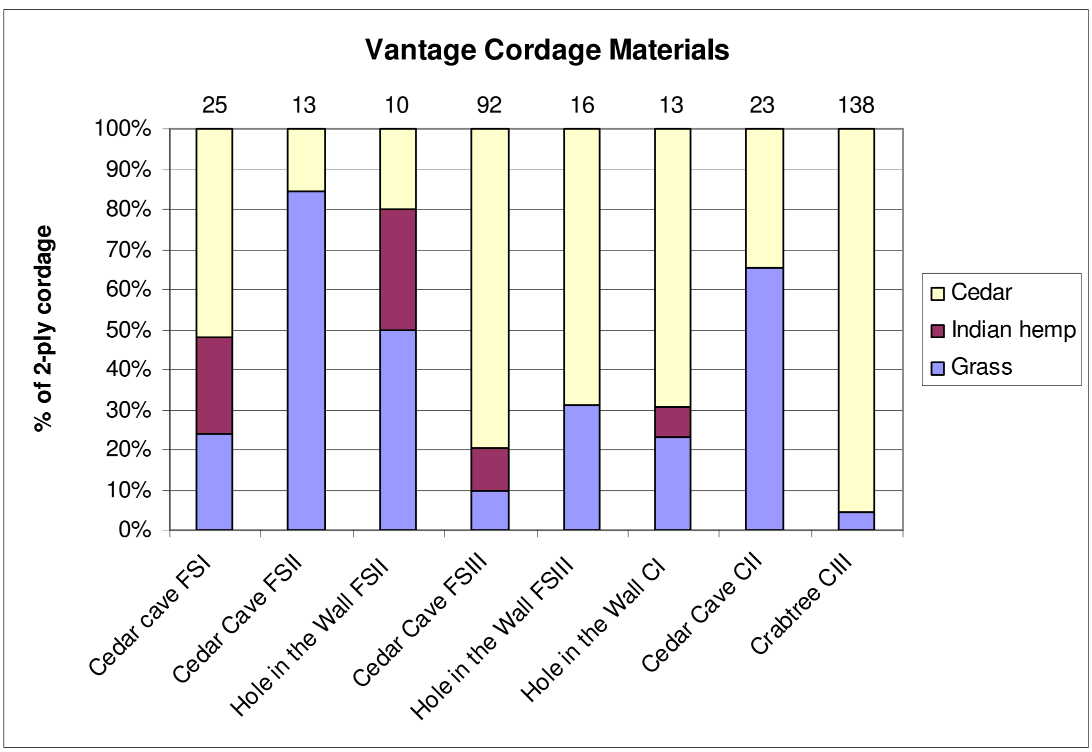

Figure 22. Cordage materials for Vantage phases, roughly chronological from left to right.

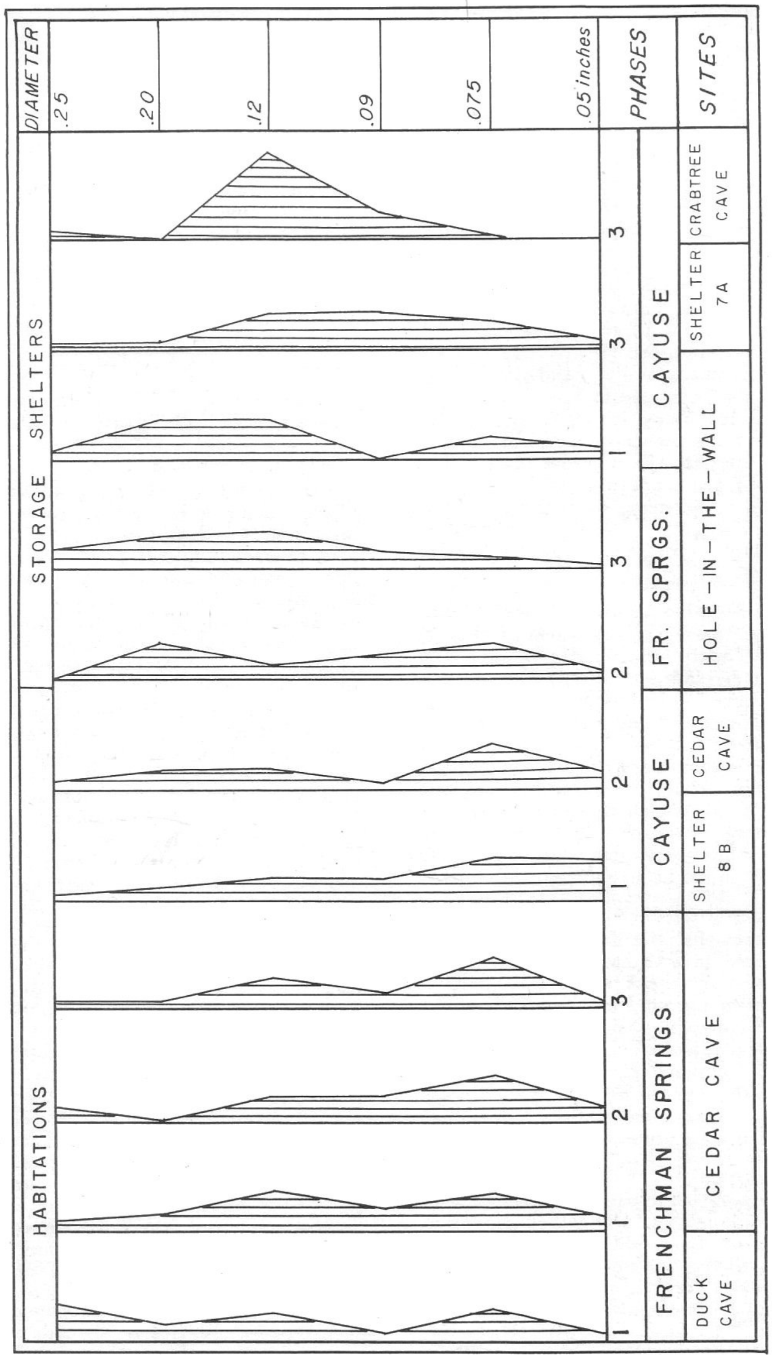

Figure 23. The change in cordage diameters as graphed in Swanson (1962: Figure 18), divided by site type. Shelter 8B was a storage shelter, but Swanson thought it showed the characteristics of a habitation.

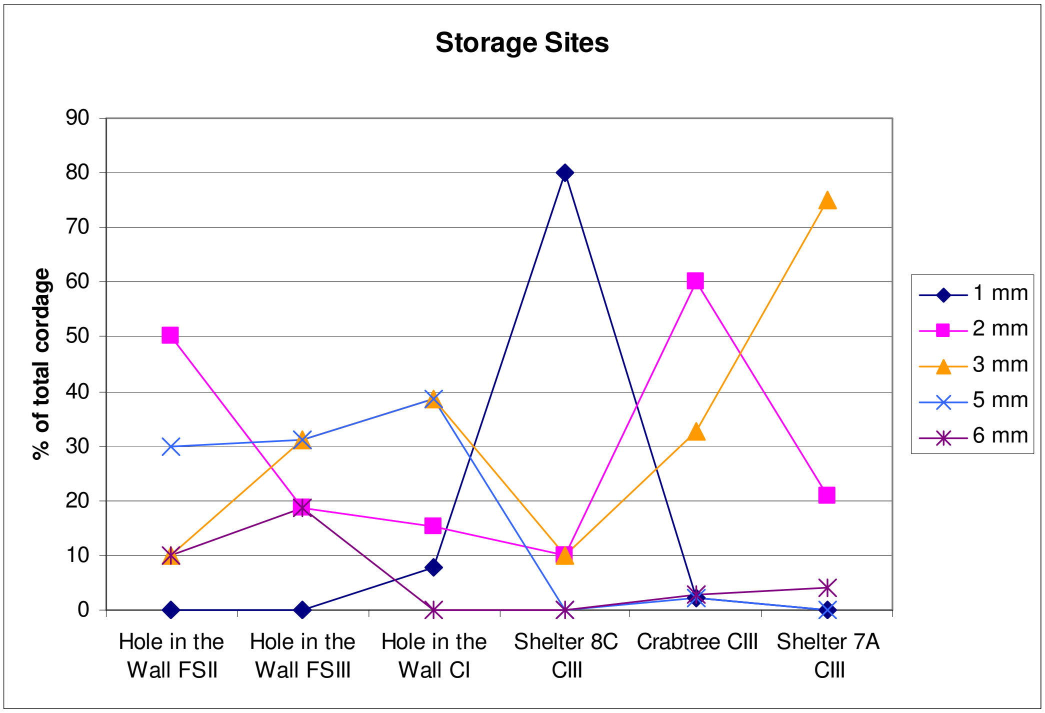

Figure 24. Cordage diameters by storage site and phase. Phases are roughly chronological from left to right.

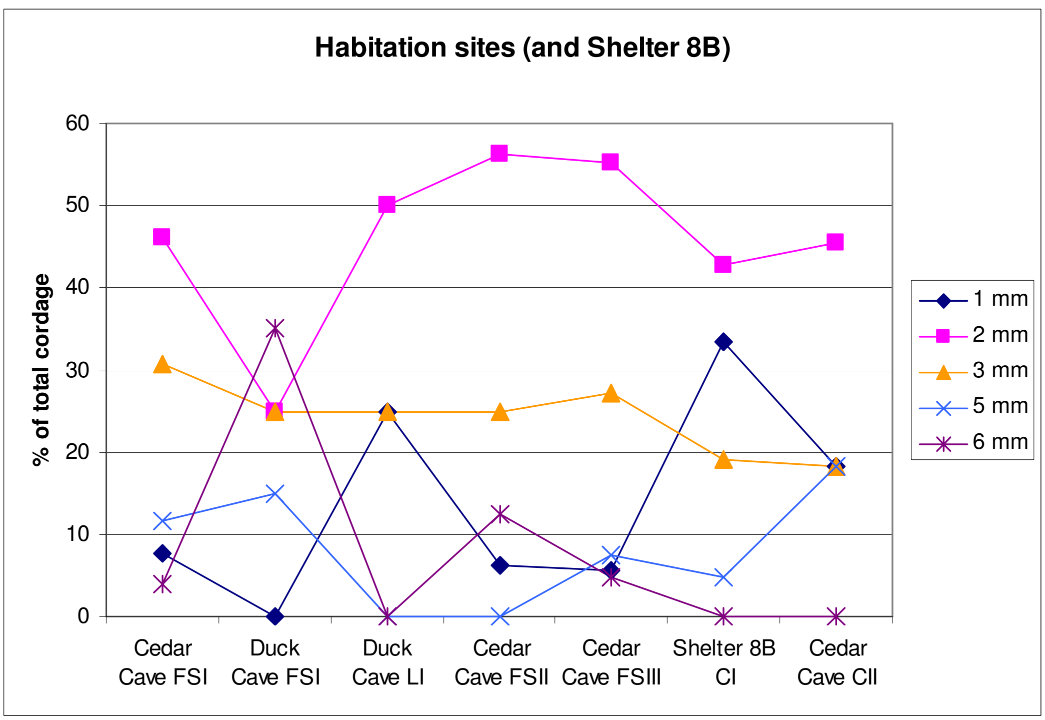

Figure 25. Cordage diameters by habitation site and phase. Shelter 8B is included, following Swanson (1962). Phases are roughly chronological from left to right.

Patterns in cordage include even twist in the Snake River and Mid-Columbia regions when the frequencies are grouped by region. This mixture of twists could perhaps be caused by intersection and mixing of different groups or different weaving techniques. To see if a certain twist seems linked to a certain technique, the relationships between twist, diameter and material were explored. S twist is linked to smaller diameter cordage in several sites and material to diameter, but there were no obvious links between material and twist. Finally, the switch from primarily Z twist cordage to primarily S twist in the Vantage sites seems real, though it does not seem related to a change in diameter or material, as the patterns of increasing or decreasing diameter noted by Swanson (1962) do not hold up. This raises the possibility of population replacement, though it is unclear where the S twist tradition would have originated.

Material

The proportion of the total number of cordage specimens identified to various materials were also graphed (Figure 26-28). The sample sizes in this analysis were often smaller, given that the materials from which cordage specimens were made could not always be identified. Specimens classified as “other” or “unidentified” were also excluded, given that the composition of this category is likely so different from site to site that a presence of “other” specimens in two sites is meaningless for comparison.

For cordage materials used, there do seem to be patterns by area, which are especially obvious once sites with very small sample sizes are excluded (Figure 29). The Upper Columbia tends more towards sagebrush, Indian hemp, and tule, while the Mid-

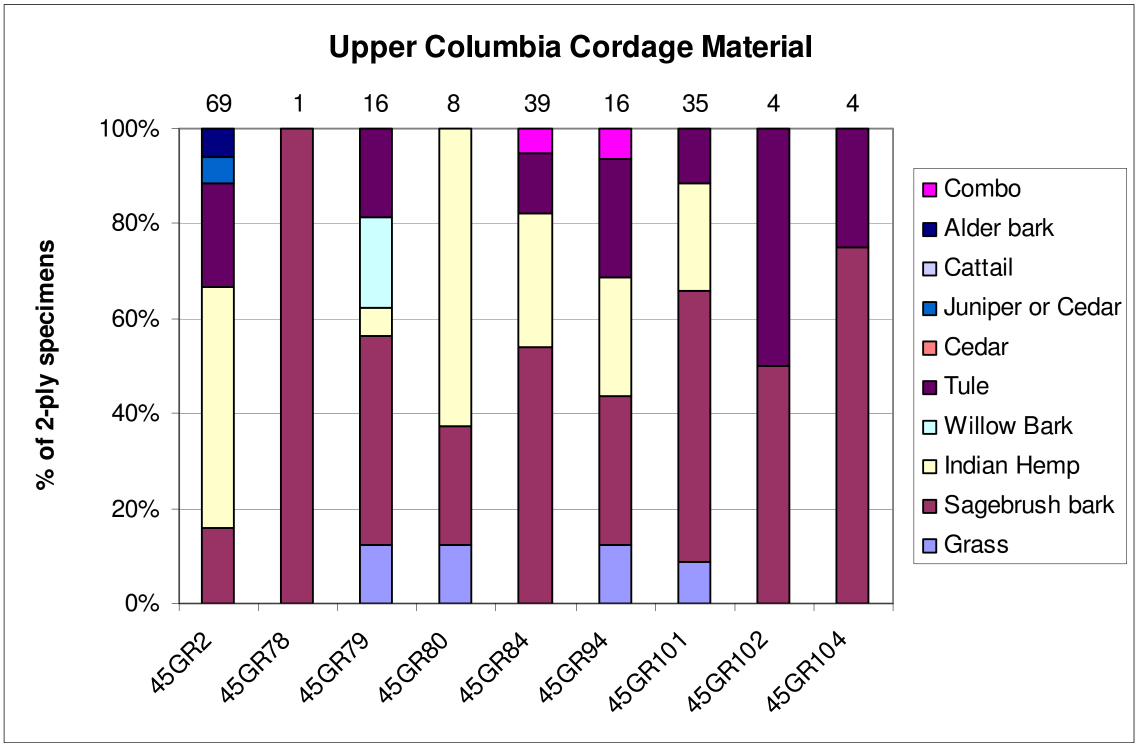

Figure 26. Cordage materials for Upper Columbia sites. Sites are arranged in approximate downstream order from left to right.

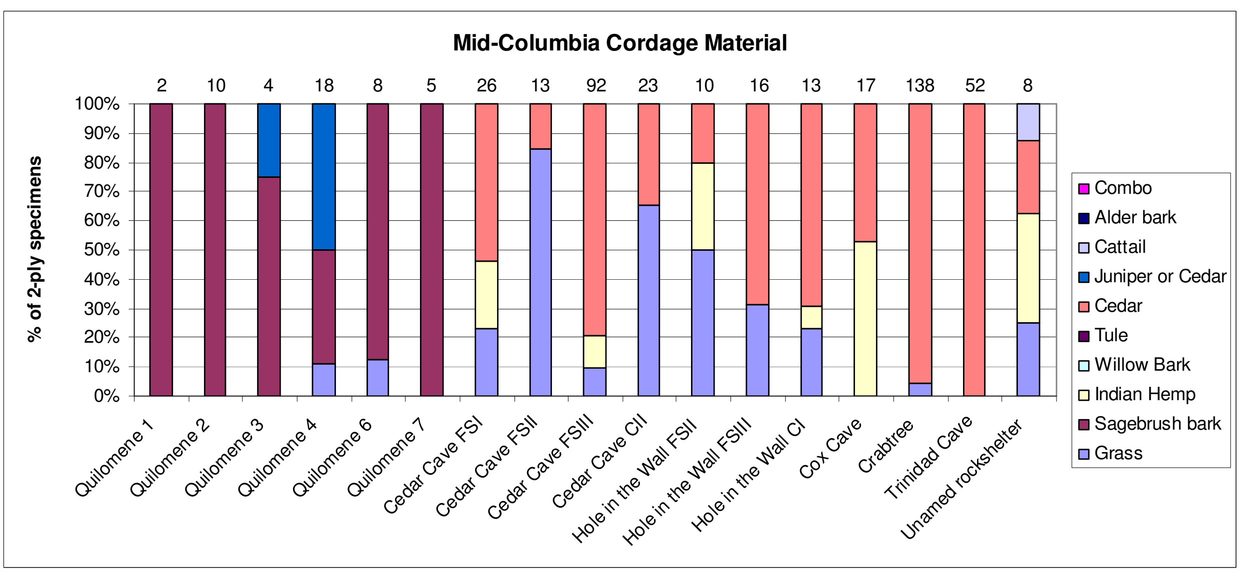

Figure 27. Cordage materials for Mid-Columbia sites. Sites are arranged in approximate downstream order from left to right.

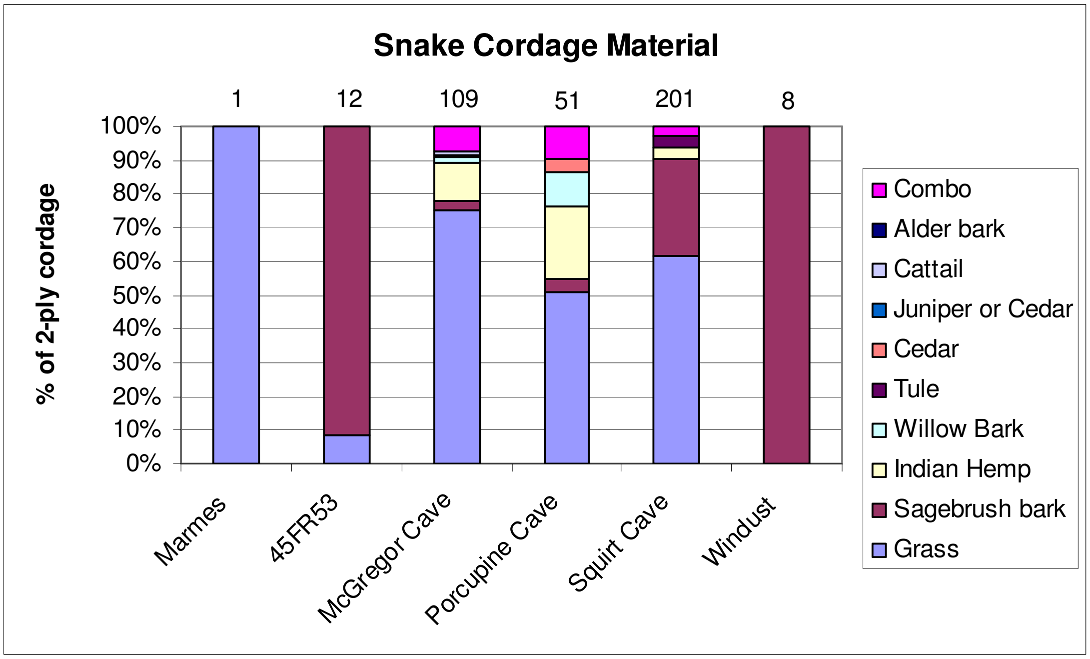

Figure 28. Cordage materials for Snake River sites. Sites are arranged in approximate downstream order from left to right.

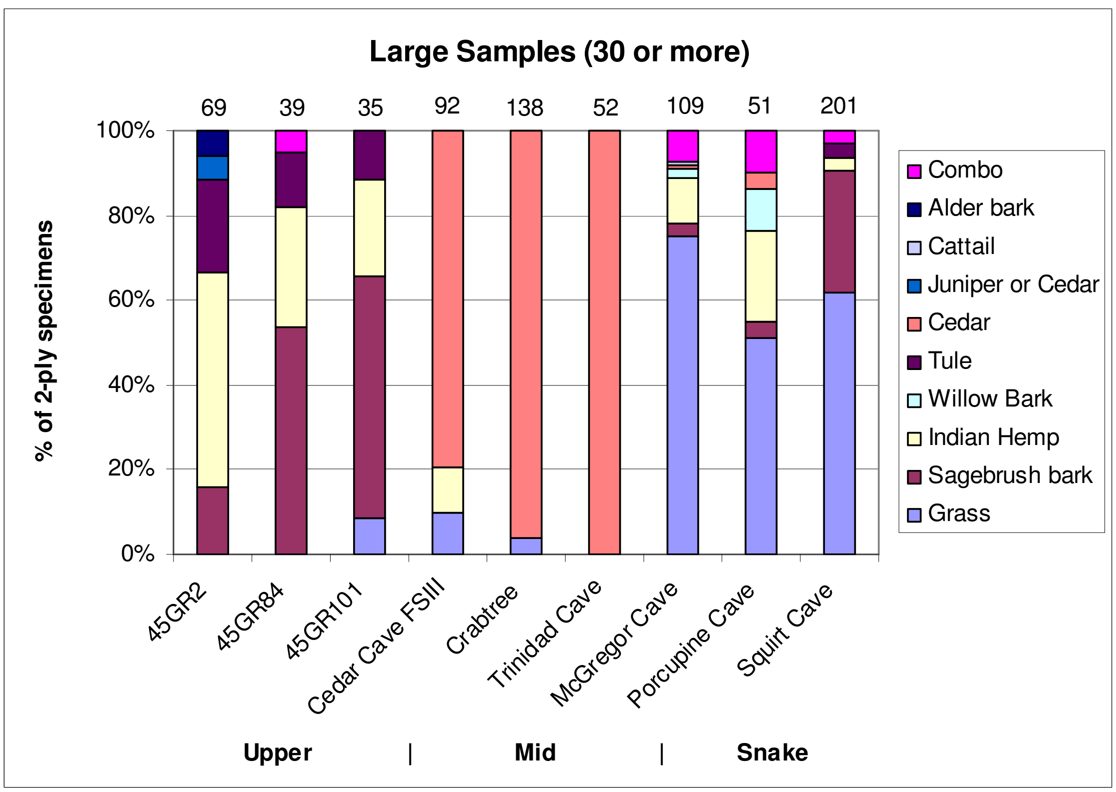

Figure 29. Cordage materials for sites with thirty or more specimens. Sites are arranged in approximate downstream order from left to right.

Columbia has the most cedar bark, and the Snake sites have large proportions of grass. This is corroborated by a highly significant χ^2 for the frequencies of cordage materials in the three areas (χ^2=1014.7; df=20; $p \leq 0.001$). The strength of association test showed that there was a moderate relationship with material as the dependent variable (λ=.421; $p \leq 0.001$).

Given that cedar was a nonlocal material over much of the steppe vegetation of the Plateau, it suggests that for some reason, the people who used the Mid-Columbia sites had access to a source of cedar, whether it was a stand within traveling distance, good trade connections, or a location for finding driftwood. Since bark is used for cordage and other sites outside the Mid-Columbia did have cedar wood, if not many bark, artifacts, one of the first two possibilities seems likely.

Mallory (1966) suggested, based on results in the Snake sites, that the common use of grass for cordage might be a Plateau pattern, but it is perhaps more likely that it is a Snake River pattern. Mallory contrasted this with Great Basin sites. Plateau textiles are quite different from those in the Great Basin on a whole suite of characteristics, however, and not just the raw materials available and used. Intra-Plateau differences are more useful for forming conclusions about ethnic groups.

For twined mat materials, additional categories were added to encompass mats that were made using different materials for the warps and wefts—there did seem to be consistencies in what materials were used for each weaving technique, and which materials were usually used together. These mixed-material mats were fairly rare. Overall, there does not seem to be much of a pattern in the twined mat materials (Figures

30-32). The statistical tests supported this (λ=.181; $p = 0.02$). Sample sizes for the twined mats were smaller across all sites. This could help explain the difficulty in finding a strong pattern.

Sewn and plaited mats offer little opportunity to study materials: in the case of plaiting, it is because so few sites have any examples of the technique. In the case of sewing, only one or perhaps two species seem suited to the task. At first, there seemed to be a dichotomy between sites that used tule and sites that used cattail or “rush”. However cattails are composed mostly of overlapping leaves, and so are not as suited to being used for long, straight warps as tules are. Examination of a picture in one of the reports that refers to cattails (Osborne 1969:423) reveals that the “cattails” are actually tules. That leaves only “rush” mats in the Vantage sites, and while Swanson referred to tules specifically elsewhere in the report, it seemed safer not to make anything of the distinction.

The reasons for the patterns observable in materials are difficult to tease out. Variation might be expected simply because of environmental differences between the sites, given that local materials seemed to be used, except in cases of materials such as cedar bark. The Columbia and Snake sites are in two different environmental zones, the Artemisia-Agropyron and Agropyron-Poa respectively (Daubenmire 1970).
To examine this, further comparisons of sites described in reports as environmentally similar were done. Comparisons within reports also seemed prudent given that identifications would then have been performed by the same person, so worries about identification biases from report to report would be cancelled out. Similarities in materials among the sites would not prove that materials were chosen based

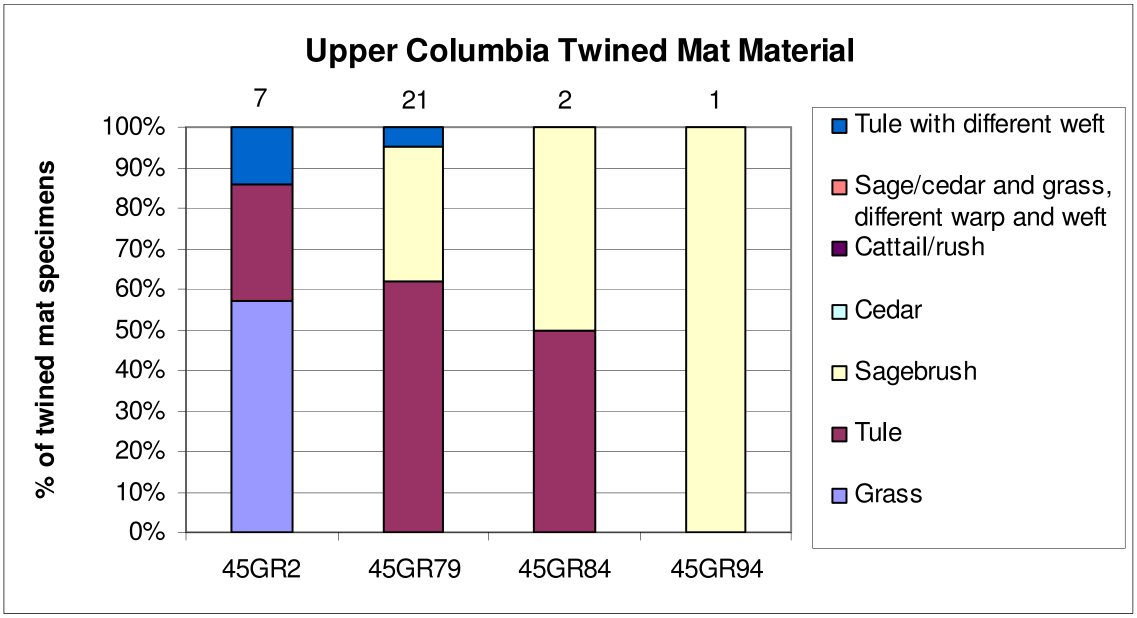

Figure 30. Mat materials and common combinations of materials for Upper Columbia sites. Sites are arranged in approximate downstream order from left to right.

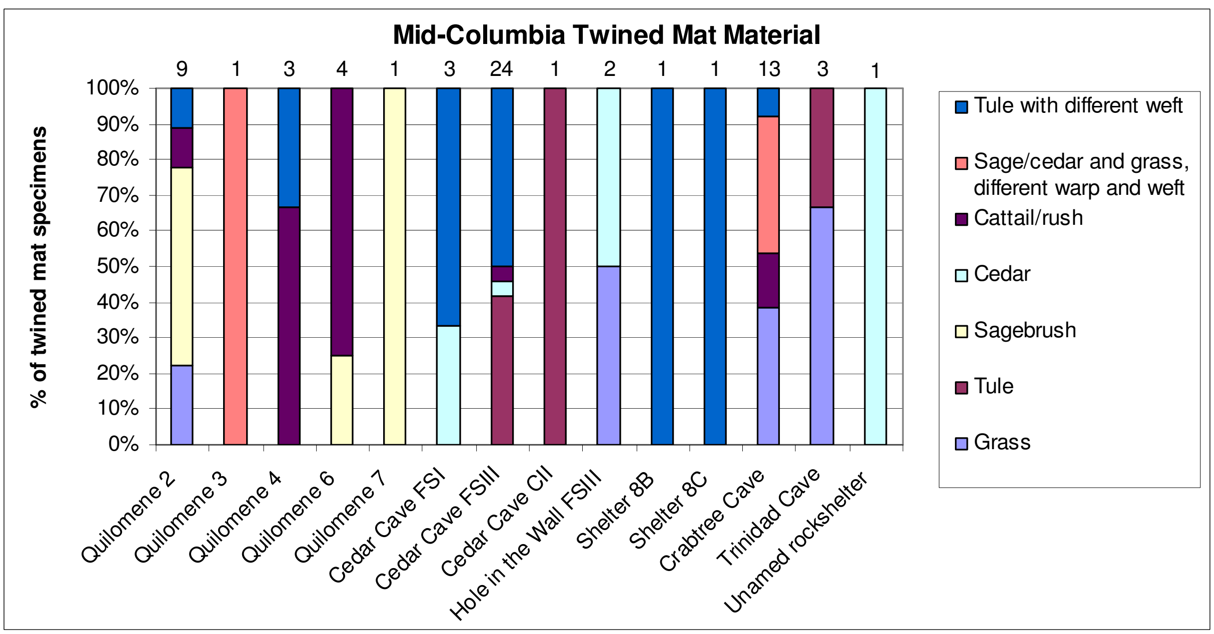

Figure 31. Mat materials and common combinations of materials for Mid-Columbia sites. Sites are arranged in approximate downstream order from left to right.

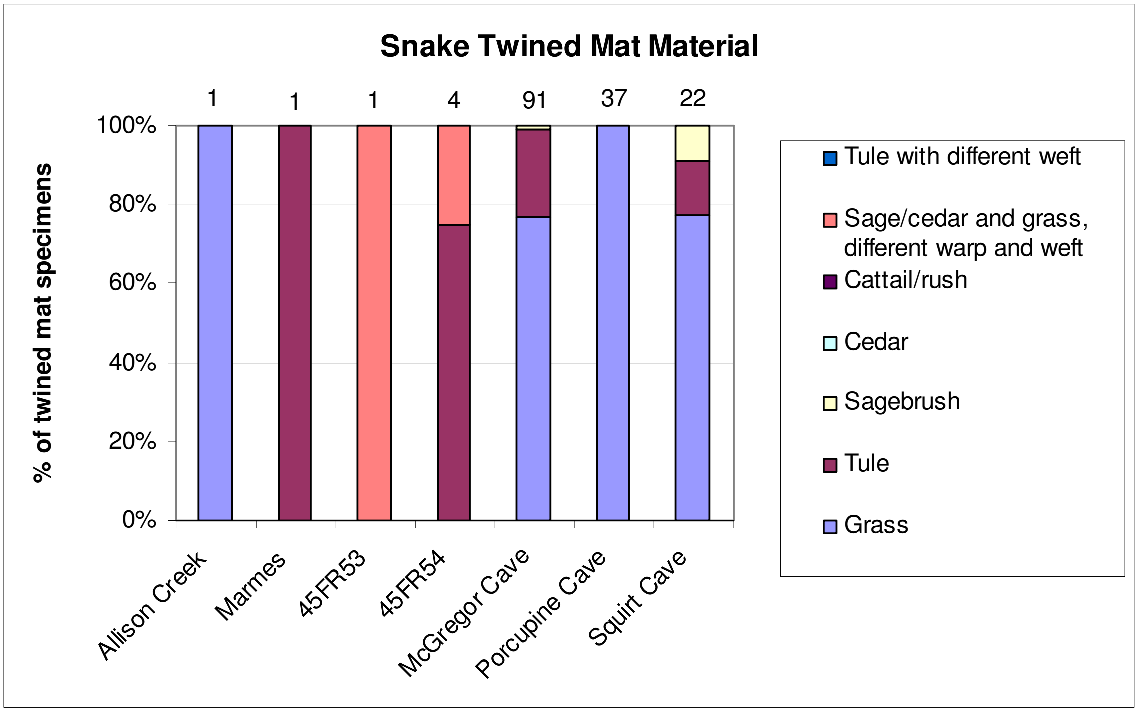

Figure 32. Mat materials and common combinations of materials for Snake River sites. Sites are arranged in approximate downstream order from left to right.

expediency—one group with the same tradition of material choices could have been using all the rockshelters within an area. However, differences within those environmentally similar sites would be suggestive choices being made based on something other than expediency.

The Grand Coulee sites (Figure 1, #2) did seem to all be similar in raw material use. They have a significant χ^2 value (χ^2=49.13; df=35; p = 0.05), but a not very significant, weak relationship with material as the dependent variable (λ=.048; p = 0.25). The Quilomene rockshelters showed the same pattern (χ^2=19.6; df=10; p = 0.03; λ=.154; p = .616). The three closest Snake sites, McGregor, Porcupine, and Squirt, also showed little difference. (χ^2=92.4; df=14; p = 0.03; λ=.000; p = N/A). The Vantage sites, separated by phase, were the only ones to show any sort of relationship (χ^2=21.7; df=18; $p \leq 0.001$; λ=.375; $p \leq 0.001$).

That all makes sense, since as I mentioned above, either the same group using several sites or the similarity of the local environment could lead to similar material choices. The Vantage sites, with the differences in material by time period, are suggestive that stylistic choices of material were made, perhaps by different groups that used the Vantage rockshelters at different time periods.

Mat Techniques

Mat twining demonstrates one of the common properties of textile traditions discussed in Chapter 2, namely that there is rarely one hundred percent consistency for any trait in a textile tradition. Twining on the Plateau is almost invariably Z-slant (Figure 12) for dozens of specimens across all of the sites, except for three examples of S-slant, three in the Quilomene 2 site, and one in Crabtree Cave.

An area for variation between the sites is the frequencies of all the different weaves (Figure 33). However, there seemed to be little to no statistical variation whatsoever, even in the χ^2 test, which had been giving high significances to most of the tests performed on textile data (χ^2=6.92; df=4; p = 0.14). The strength of association test on weave and region with weave as the dependent variable showed even weaker results (λ=.000; p = N/A). Even the Vantage sites, separated by phase, where changes were seen in other attributes, showed only a weakly significant relationship with weave as the dependent variable (λ=.136; p = .314). This is interesting, given the changes in mat techniques over time discussed below. It suggests that perhaps if there were changes in

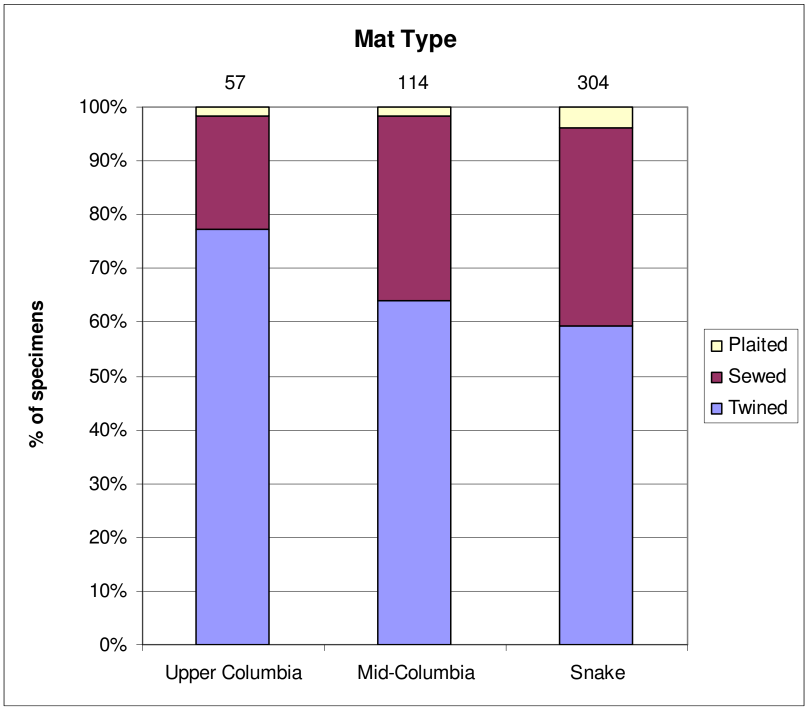

Figure 33. Mat weave types for the combined Plateau regions

the popularity of a particular weaving type over time, they occurred throughout the Plateau, rather than only in some areas.

Multivariate analyses have proved successful in other studies (Jordan and Shennan 2003; Tehrani and Collard 2002). A textile tradition encompasses a multitude of elements, many of which might occur in a neighboring tradition, but never in the same configurations. This is clear in the fact that all the variety of the world's basketry is formed using only a very few basic body weave and decoration techniques, but in many different combinations.

Another argument for multivariate techniques is the way in which people experience the artifacts. Pryor and Carr suggested that people do not "perceive and interpret style simply by breaking it down analytically into discriminating attributes.

Rather, they also perceive it in a Gestalt-like manner, in which each attribute serves as a context for the others and provides meaning through association." (1995:269) This means that multivariate tests that take into account the various attributes together more closely approximate the way that the artifact was interpreted and designed to be interpreted by others.

Clustering

In the first of the multivariate analyses, I explored all of the sites with hierarchal clustering, using presence/absence data for the various weaving attributes in each site. The attributes used for the presence/absence varied for the different classes of textiles. For cordage, twist type and number of plies in the cord were some of the only possibilities, but a much greater variety was used for mats. These included not only the basic techniques such as twining, sewing, etc., but attributes of these techniques such selvage type, ply and twist of the cordage elements, and unusual material types that were really design decisions such as different materials for warps and wefts in one mat. Figure 34 is a dendrogram based on the centroid method, calculated on a distance matrix using the Jaccard Coefficient, which was chosen because it discounts shared absences when calculating similarity (Shennan 1997). For this particular cluster analysis, sites with only one or two specimens in both mats and cordage were discarded.

The exact distances at which various sites split off from the others varied based on what clustering method was used, but the groups that are marked here by dotted lines were relatively constant throughout the different clustering solutions. It is very hard to tell just what it is that is making the sites cluster this way—neither geography as a proxy

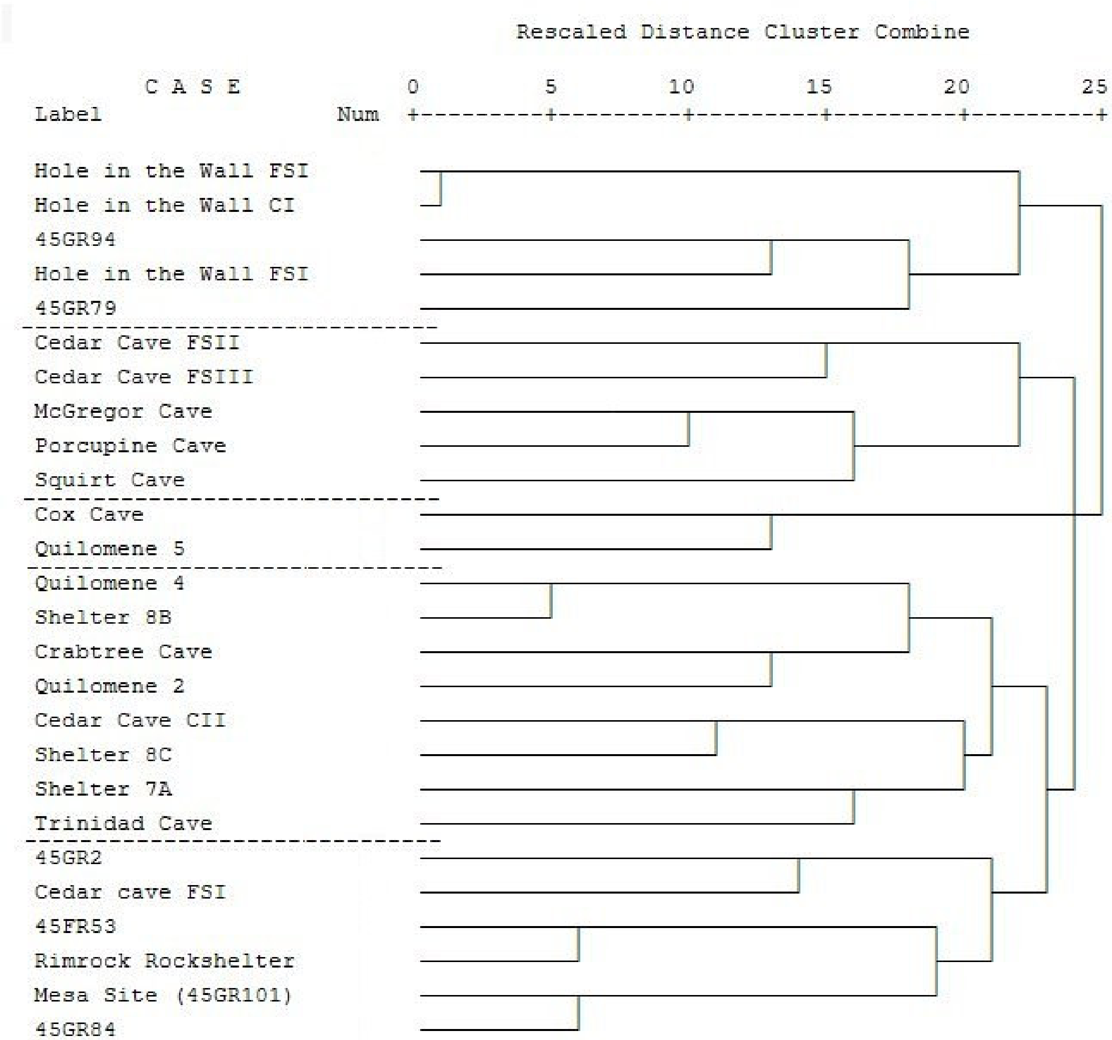

Figure 34. Dendrogram based on the centroid method, calculated on a distance matrix using the Jaccard Coefficient.

for ethnic groups or environmental similarity, nor Vantage phase, nor site type seems to explain the clusters. A cluster run on only those sites with sample sizes greater than three in both mats and cordage produced similar groups that were no easier to explain.

One disquieting group in the cluster is that of Squirt, McGregor, Porcupine, and Cedar Cave FSIII, since those are the sites with the four largest sample sizes. The first three were also all sites where I had been able to personally record the attributes of the specimens. This allowed both a greater number of different types for the presence/absence, and also the identification of subtle attributes that might have been present at other sites, but not noted by researchers. That suggests the clusters are reacting to a larger sample size providing more opportunity for rare attributes to appear.

Sample Size

To explore the sample size issue, I performed a linear regression on the number of attributes present versus the sample size (Figure 35). The very strong positive r^2 is driven mostly by the McGregor Cave data point, and the rest seem to be less affected by the sample size/ number of attributes relationship. Still, hierarchical clustering has limited interpretive power at the best of times, and so other methods seemed more likely to be successful.

Correspondence Analysis

Another exploratory statistical method that it is possible to use with presence and absence data is correspondence analysis. Correspondence analysis is similar to principal components analysis, which collapses variation in many variables into fewer dimensions

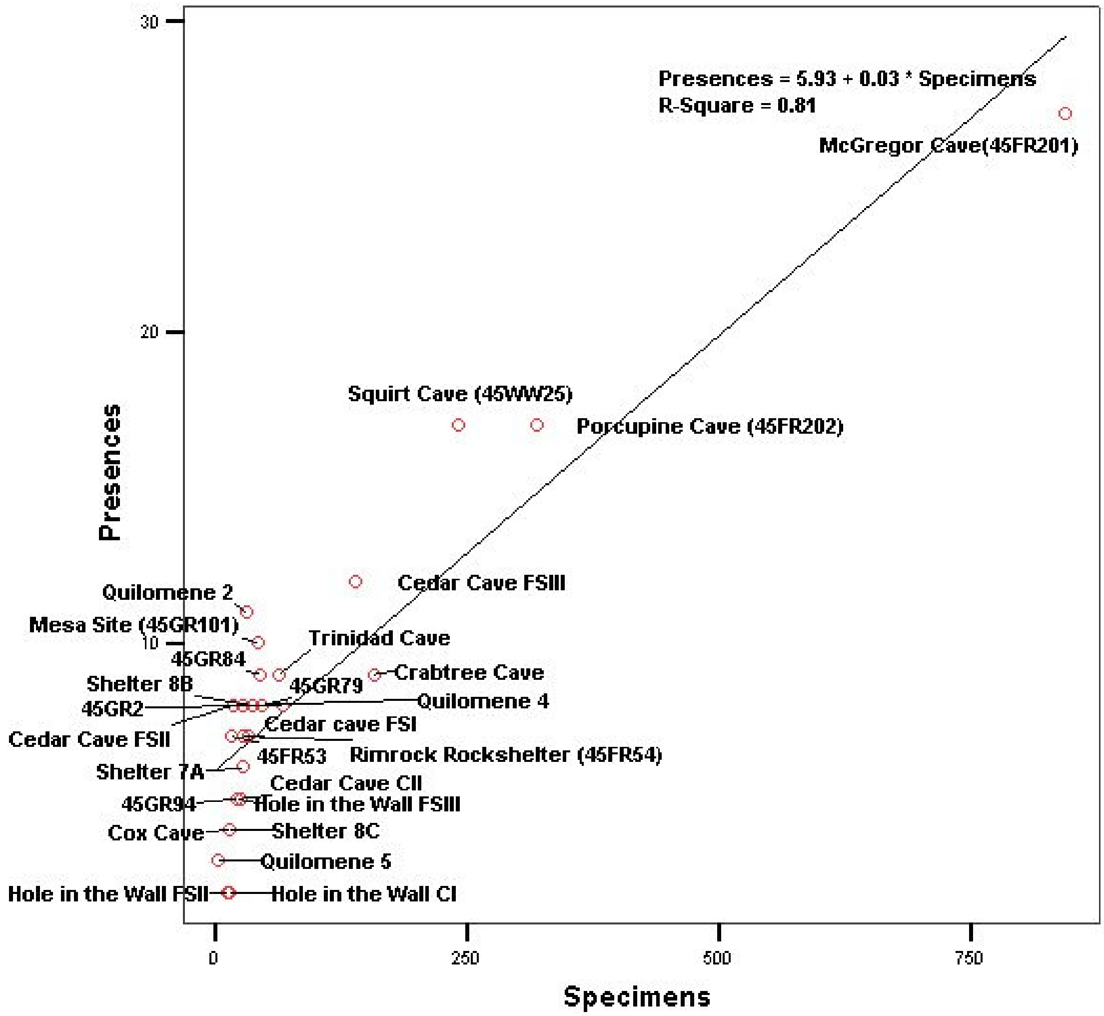

Figure 35. Linear regression performed on number of attributes present versus the number of specimens at the sites.

that each explain as much of the total variation in the data set as possible. Correspondence analysis also plots the locations of the variables in relation to the cases, making it possible to simultaneously see relationships between the cases, as well as which variables are most influencing their placement on the plot (Shennan 1997).

The first CA (Figure 36) is all of the presence/absence variables mentioned above: all sites and all attributes, including those for cordage, mats, and basketry. Presence/absence data was chosen to work with following Jordan and Shennan (2003). With the exception of Marmes, the Snake sites do cluster in something of a line, with a couple of geographical subgroupings such as Porcupine and McGregor Caves, and 45GR53 and 54 that show up in most of the CA plots. The Quilomene bar caves also all clustered together, which makes sense. Several of the Vantage sites separated most strongly upwards. The variables shown are those that did not just cluster around the origin. Predominately Z and S twist seems to differentiate along the y-axis and other mat variables pull sites along the main, linear grouping, either up and to the left of the plot by primarily plaiting variables, or down and to the right of the plot by more twining.

Unfortunately, the first two axes only accounted for 19.6 percent of the total variation, suggesting it would be worth trying other combinations of axes that explained at least similar percents of the information. Unfortunately, the plots in which the sites did not simply form one large undifferentiated cluster did not show any more patterning than did the plot pictured.

Something to consider is that the sites might have clustered by site type, if the presence of certain attributes is linked to site function. Labeling the previous CA with the site classifications and omitting the attributes for ease of reading (Figure 37) shows that

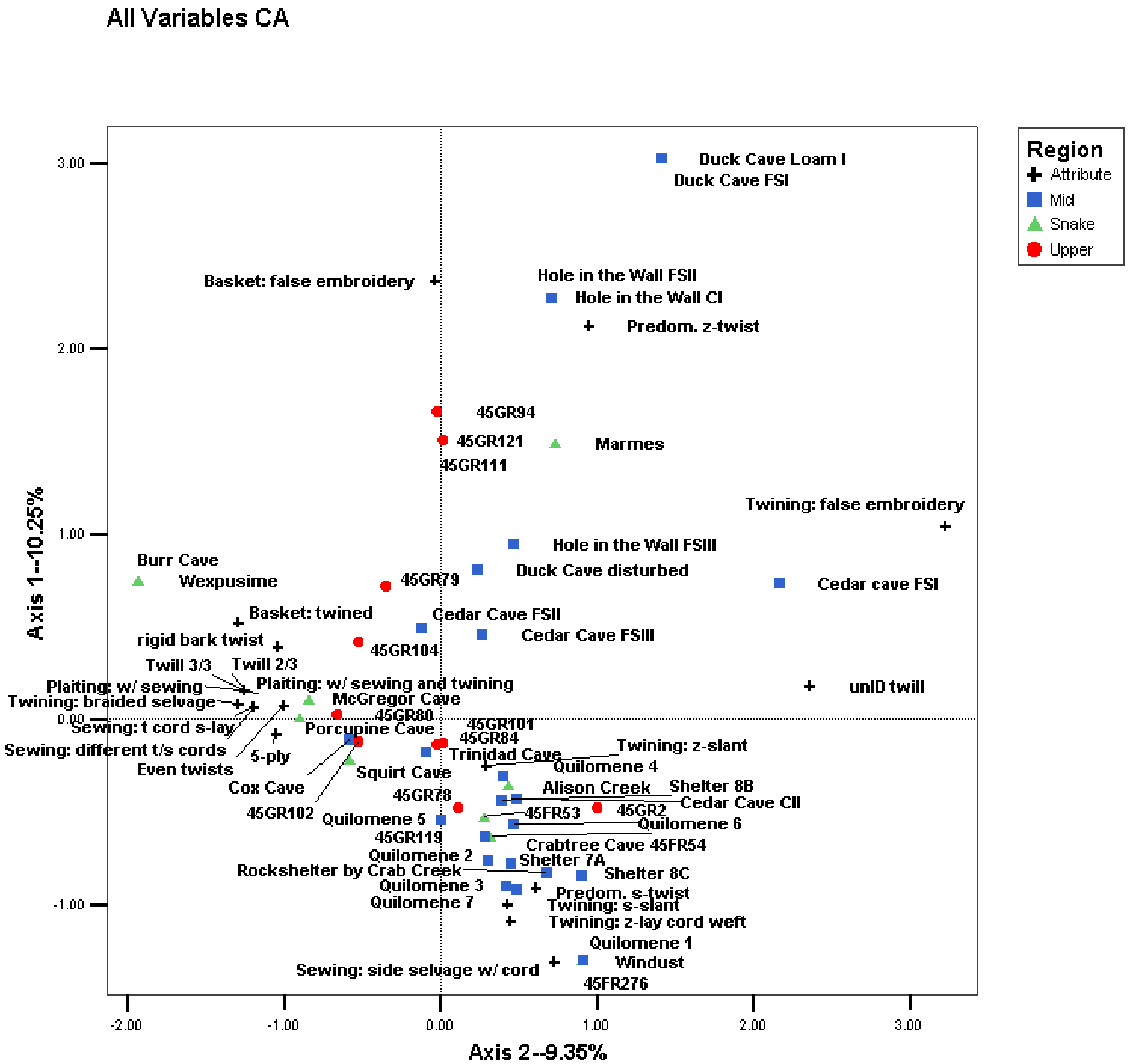

Figure 36. Correspondence analysis plot calculated with all sites and all attributes. Sites are labeled by region. Not all attributes are plotted, just the ones that differentiated strongly.

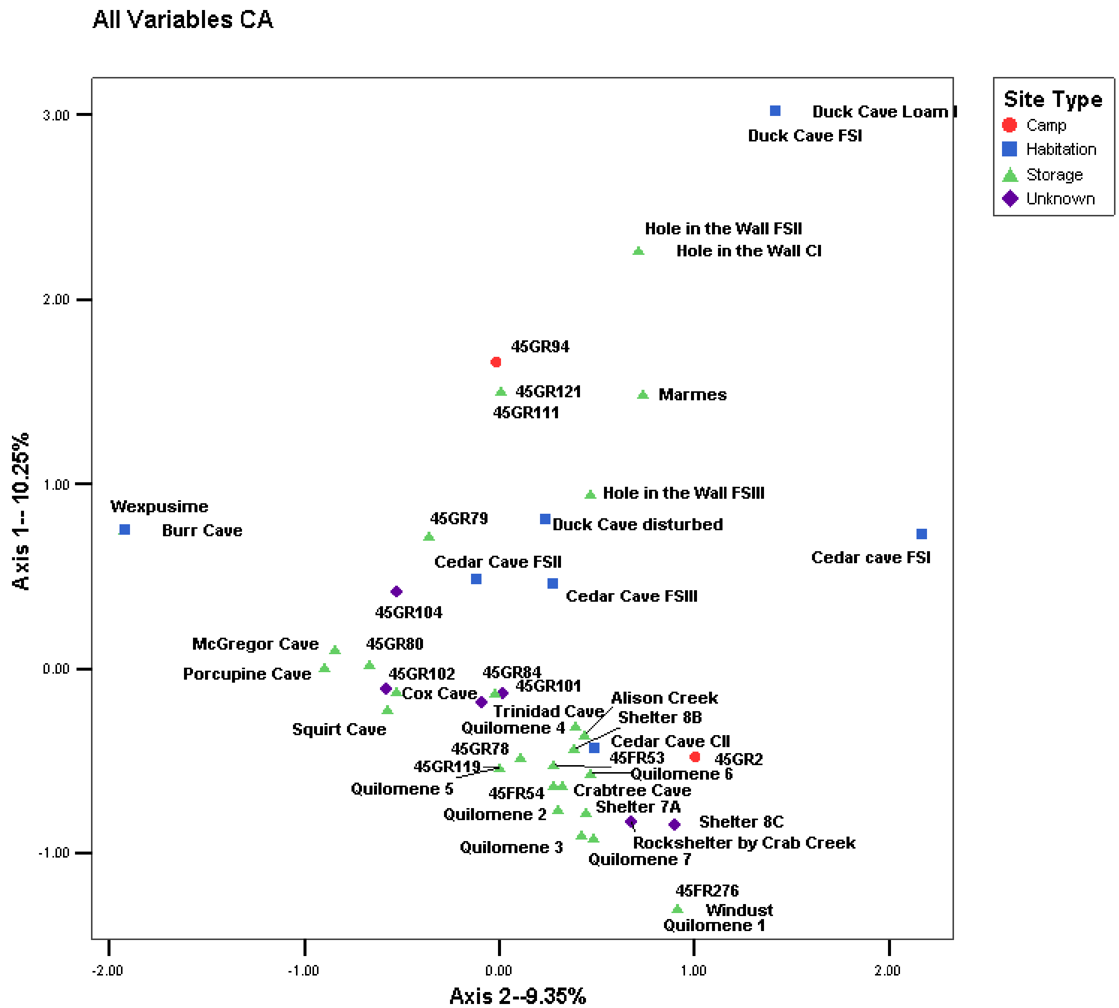

Figure 37. Correspondence analysis plot calculated with all sites and all attributes. Sites are labeled by function.

the different types are fairly intermixed, even when you consider that the unknown sites are likely to have some mixture of the camp and storage attributes since those two types were usually the possibilities for unknown sites. Unfortunately, the dates of too many of the sites were unknown to be able to do the same thing with temporal designations.

The next CA performed was without the basketry variables, because though the sites did not seem to be clustering by site type, baskets were rarely present in the storage contexts, which might bias the non-storage sites (Figure 38). This necessitated the dropping of several sites where the only specimen was a basket. This CA showed many of the same patterns as the one with the baskets in terms of the clusters: the Snake sites were in much the same order, the Quilomene sites were together, and the Vantage sites separated upwards. The variables that separated strongly were the biggest difference—cordage twist was still important, but the different types of twined selvage were more important.

Just to make sure that sites with very few specimens weren't cluttering the pattern, I performed one more CA with just the cordage and mat variables, and with those sites with only one or two specimens omitted (Figure 39). Most of the remaining sites in fact have sample sizes of 5 or more specimens. Doing so removed the outlier in terms of the Snake cluster, but didn't particularly make Upper Columbia sites cluster more strongly. Interestingly, yet another set of variables are the ones that separate most strongly along the main linear cluster of sites.

Correspondence analysis can also be performed on frequencies, so one was performed on the frequency data for the sites (Figure 40). The first axis explained a fairly

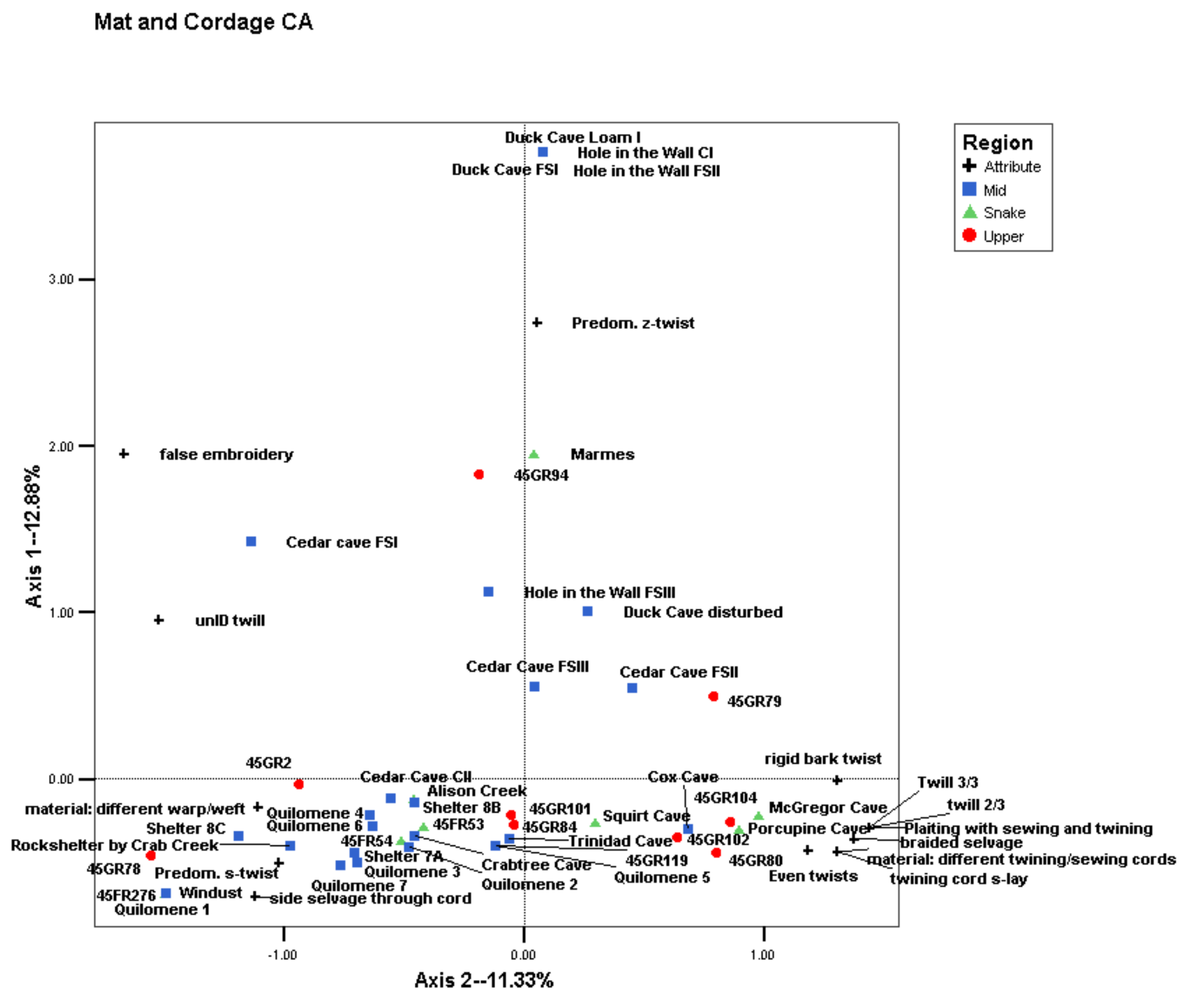

Figure 38. Correspondence analysis plot calculated with all sites and mat and cordage attributes. Sites are labeled by region. Not all attributes are plotted, just the ones that differentiated strongly.

Mat and Cordage CA

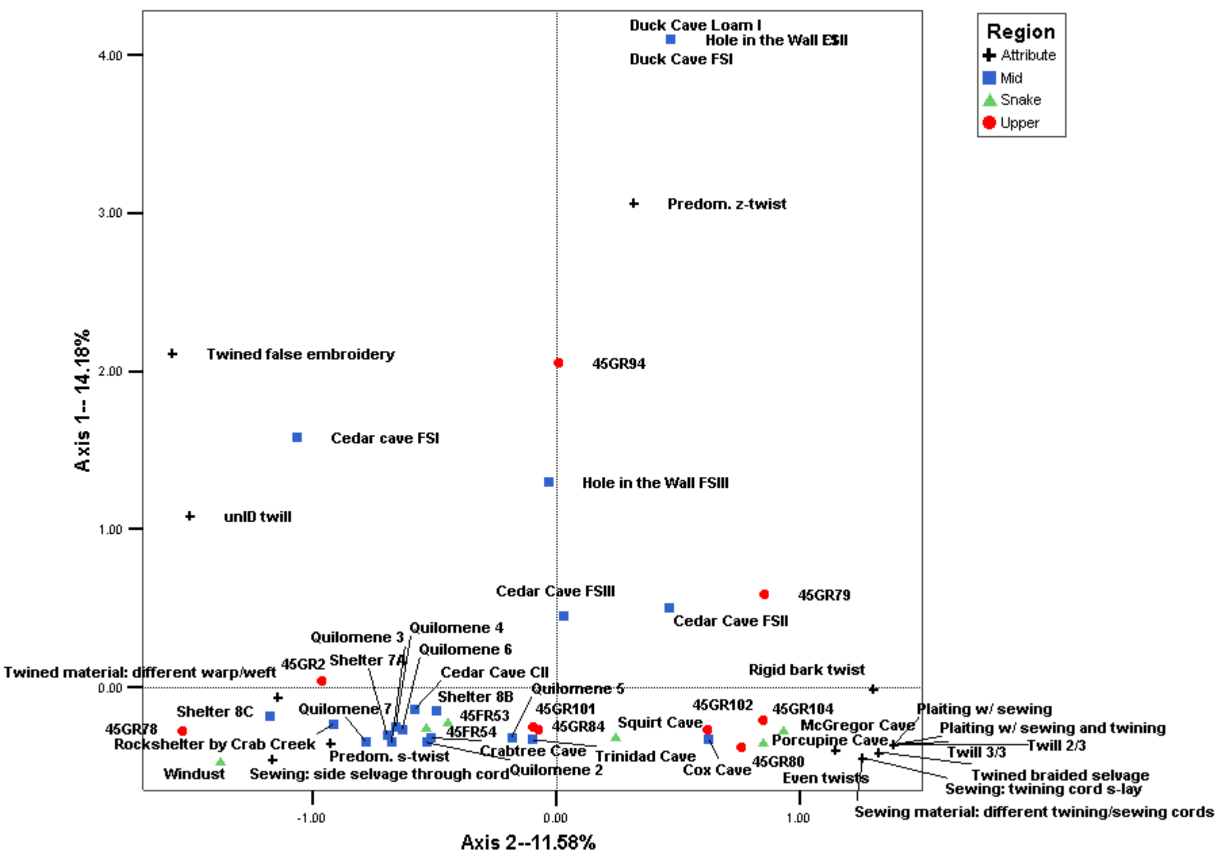

Figure 39. Correspondence analysis plot calculated with sites with 3 or more specimens and mat and cordage attributes. Sites are labeled by region. Not all attributes are plotted, just the ones that differentiated strongly.

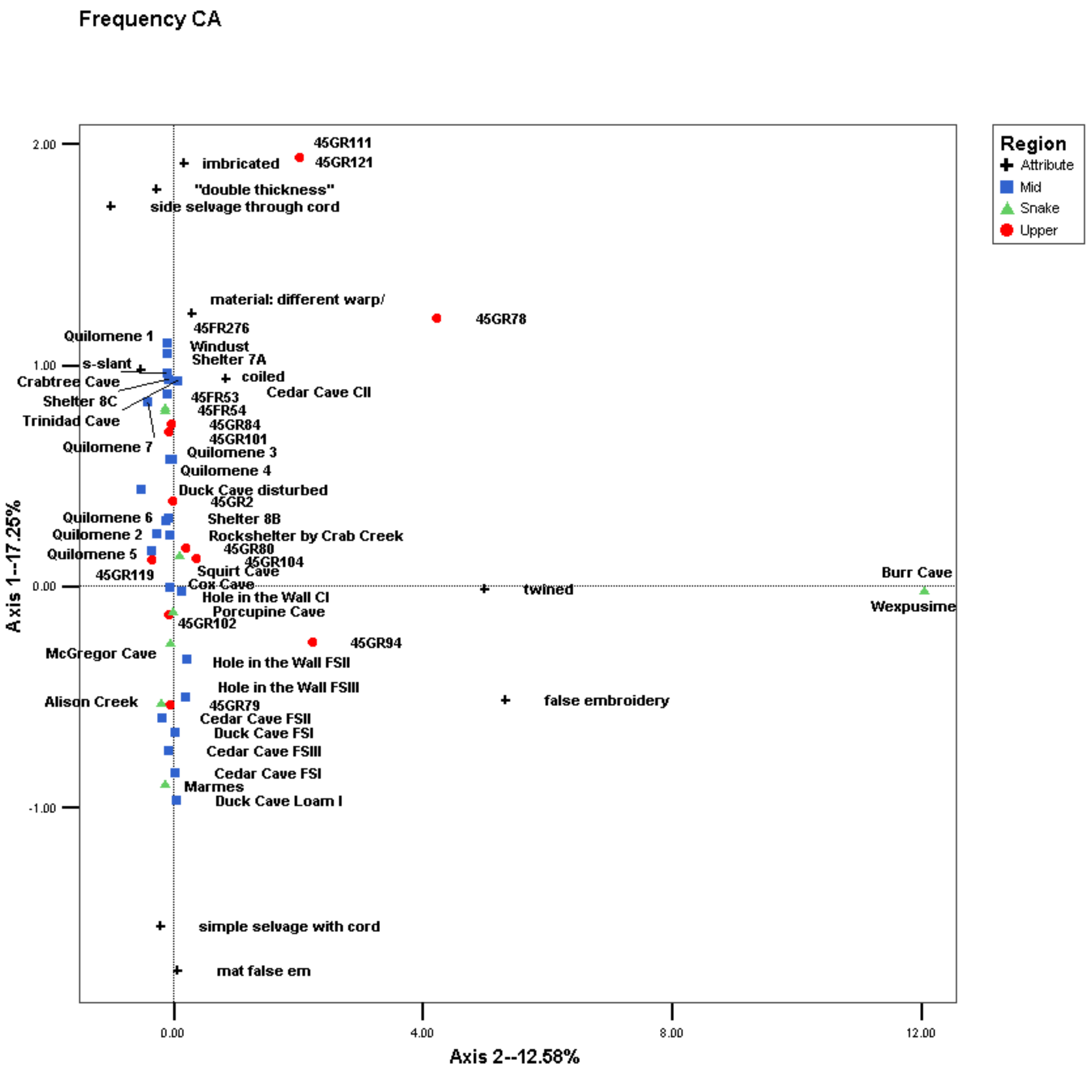

Figure 40. Correspondence analysis plot calculated on frequencies for all sites. Sites are labeled by region. Not all attributes are plotted, just the ones that differentiated strongly.

high percentage of the data, but the second or third, etc., axes did not differentiate the sites much at all, leaving us with no clear patterns.

The various presence/absence correspondence analyses support the idea that it is a variety of factors that differentiate weaving traditions, since different attributes were identified as the major sources of variation between sites in various analyses, even though the placement of sites on the plots stayed relatively stable. While the geographic groups did cluster somewhat together, there wasn't anything especially clear. The correspondence analysis performed on frequency data had even less differentiation of the sites.

Radiocarbon Dates

Continuity of textile traditions through time is often assumed, but has never been explored using direct dating of textiles on the Plateau. If one is to draw any conclusions not just about ethnic group boundaries, but change through time of those boundaries, such an assumption has to be explored.

The radiocarbon dates performed directly on textile specimens from McGregor and Porcupine caves suggest that the textile continuity found on the Northwest Coast cannot be assumed for the Columbia Plateau. Of the eleven samples dated (Table 3, Figure 40), six were in a range from about 80-350 BP. The other five ranged from approximately 1200 to 3100 BP. Those five were all located in McGregor Cave. The dates were also calibrated (Table 3) using CALIB 5.0 (Stuiver and Reimer 1993) and using calibration data from Reimer et al. (2004).

Table 3. New Radiocarbon Dates. Ranges marked with a * are suspect due to impingement on the end of the calibration data set.

Lab No.	Material	δ13C	Type	Date (± 1σ)	2σ cal age ranges	Relative area under distribution
AA71069	Sagebrush bark	-24.9	Close twined basket	174 ± 42	1664-1691 AD	0.19
					1729-1788 AD	0.46
					1791-1810 AD	0.13
					1922-1952* AD	0.21
AA71070	Grass	-23.2	Grass open twining	192 ± 32	1647-1694 AD	0.24
					1727-1813 AD	0.56
					1839-1841 AD	0.002
					1853-1858 AD	0.005
					1862-1866 AD	0.005
					1918-1952* AD	0.18
AA71071	Tule	-24.9	Sewing	340 ± 40	1462-1642 AD	1
AA71072	Tule	-25.0	Sewing	285 ± 27	1497-1503 AD	0.008
					1512-1601 AD	0.61
					1616-1663 AD	0.38
AA71074	Tule	-24.6	Plaiting	1,916 ± 42	16-16 BC	0.001
					1-218 AD	0.99
AA71075	Tule	-25.7	Plaiting	2,296 ± 36	407-351 BC	0.65
					299-227 BC	0.32
					224-210 BC	0.02
AA71076	Cedar bark	-24.9	Cedar open twining	1,253 ± 63	655-895 AD	0.99
					925-936 AD	0.01
AA71077	Sagebrush bark	-25.3	Open twining	86 ± 26	1691-1729 AD	0.26
					1810-1923 AD	0.73
					1952-1954 AD	0.004
AA71078	Tule	-25.0	Tule twining	3,103 ± 46	1492-1477 BC	0.02
					1459-1262 BC	0.98
AA71079	Tule	-25.3	Diagonal twining	1,575 ± 49	393-595 AD	1
AA71080	Tule	-26.1	Sewing	156 ± 34	1665-1709 AD	0.17
					1717-1785 AD	0.34
					1794-1890 AD	0.3
					1910-1953* AD	0.19

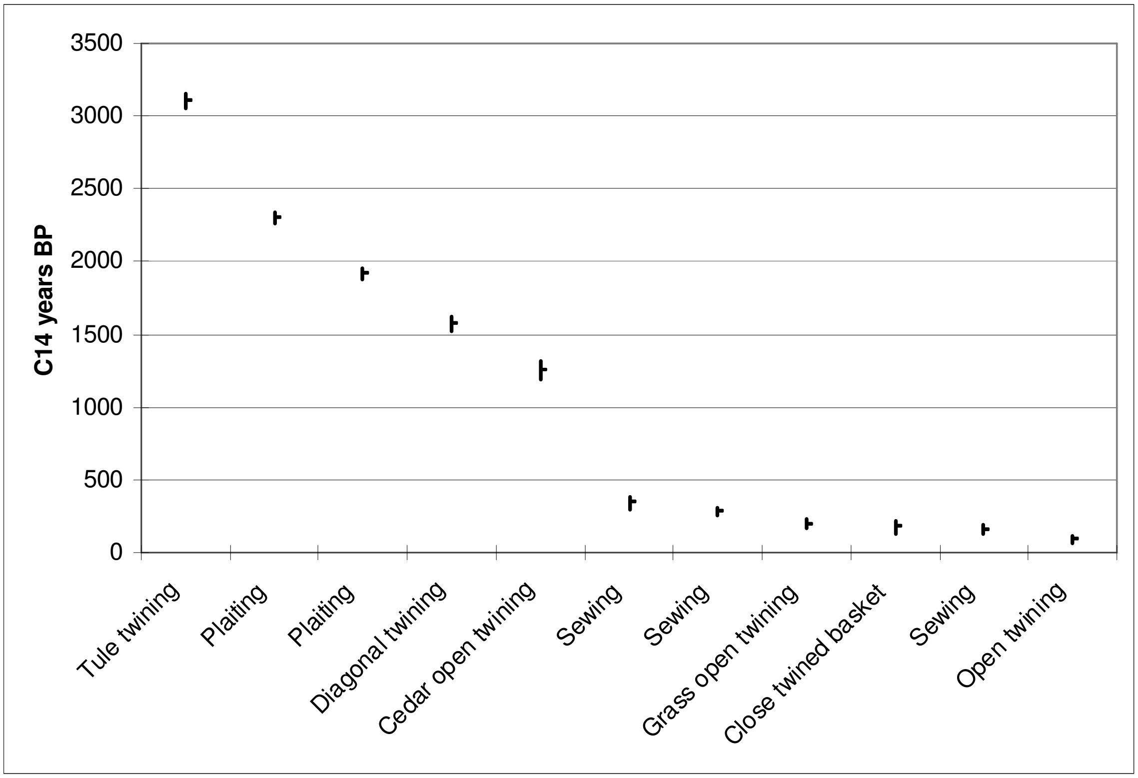

Figure 41. New radiocarbon dates.

These dates also have independent implications for McGregor Cave. The oldest previous date found at the rockshelter was 1,910 ±70 BP (Hicks and Morgenstein 1994) on charcoal from an anthrosol. Two of the specimens dated for this study date earlier than this, 2,296 ± 36 BP, and 3,103 ± 46 BP, pushing the possible earliest use of the cave back perhaps a thousand years. The new dates follow the previous ones in terms of the use of the cave for storage, since 86 ± 26 BP, 285 ± 27 BP, and 340 ± 40 BP all fit right around the approximately 100 or 200 BP dates previously obtained from pit features.

Unfortunately, due perhaps to the amount of time since the excavations were performed, most of the oldest specimens at McGregor Cave lacked provenience information. The one specimen with provenience information, dating to about 2300 BP, came from a location without an identified storage pit. This fits the idea of two sets of occupations or uses: one from around 3000-1200 BP, and the other around 350 BP and early historic times. Hicks and Morgenstein (1994) have suggested that both were episodes of storage. While there were no actual storage pit features associated with the early use, the anthrosol was composed of widespread granular charcoal, fish bone, and mammal bone. It might be related to the process of cleaning out and burning storage pits described in the Storage Cave section in Chapter 2, or some other use, perhaps fish or other resource processing, though Hicks and Morgenstein argue for the former.

The Porcupine cave dates are not too surprising. The previous dates show storage features from 730 BP (see Chapter 2), with use into late prehistoric/early historic times, which fits with the new dates of 156 ± 34 BP, 192 ± 32 BP, and 174 ± 42 BP.

The differences between the types of textiles in each set of dates from McGregor are intriguing. Both age groups have mutually exclusive types of mats. Those types of mats or baskets that occur the older group—both plaited mats, a diagonal twined mat, a close twined tule basket or mat, and a cedar bark open twined basket or mat with fine wefts—are all rare types across the whole data set, with few ethnographic connections. The one exception is plaiting, which Haeberlin et al. (1928:361) mentions as being present among the northern Plateau peoples and Ray (1933:36) describes as rare among the Sanpoil and Nespelem.

The oldest directly dated textile on the Plateau before these new dates was an open-twined basket in Burr Cave, dated to 2660 ± 90 BP (Gilbow 1978). A twined basket fragment found at The Dalles is sometimes mistakenly quoted as the oldest textile on the Plateau at nine thousand years old (Schlick 1994:16). In fact, the fragment was assigned to a period lasting from 6100 BP until contact (Cressman et al. 1960:61), and it was the style of twining that dated to 9000 BP in the Great Basin.

The Burr Cave basket is an unusual type, since in the other sites, open twining is used almost exclusively for mats, not baskets, though there are some ethnographically open twined soft bags. This fits with the idea that before a few thousand years ago, different types of textiles were being used on the Plateau, and that these types are not common in the archaeological record due to the preponderance of late prehistoric to early historic sites.

The younger McGregor and Porcupine specimens, on the other hand, have plenty of ethnographic connections. Sewing as a technique for making mats for lodges, for example, is well-documented, and flexible close twined baskets are one of the common types on the Plateau. Open twined mats with grass for both warp and weft were the final type of textile in the younger group of dates.

Not all of the suggested ages for these types stand up to cross-site comparison (Table 4). A close-twined basket was found at Wexpusnime in a house pit, as mentioned in a previous section, dating to around 1,100 or 1,000 BP. Squirt Cave had plaiting, though the rockshelter has a large enough age range that plaiting there could be contemporaneous with plaiting at McGregor. McGregor also has incidences of sewing and plaiting in the same mat. Cedar Cave and Hole in the Wall have several specimens of sewing and a few specimens of twining with grass for the warp but not both warp and weft in their older levels, though the Vantage sites do corroborate the new dates in that they have close twined flexible basketry only in the more recent levels and plaiting only in the older ones.

Table 4. Temporally Linked Types by Site.

	Flexible close twined basket	Grass twined (warp and weft)	Sewing	Plaiting	Sewing and Plaiting	Diagonal twined tule
Early (3000-1200 BP)						
Wexpusnime	1					
Cedar Cave			11	2		3
Hole in the Wall		1	1			
Duck Cave			1			
Late (1200 BP-historic)						
Porcupine	2	34	13			
45FR54			7			
45FR53		1	2			
Cedar Cave	1					
Shelter 7A			1			
Shelter 8C			2			
Shelter 8B	12		1			
Crabtree		5	5			
Unknown						
McGregor	2	72	78	8	3	3
Squirt	5	14	17	1		
45GR2		2			1	
45GR79			1			
45GR80			1			
45GR84			3			
45GR94	2					
45GR119			2			
45GR101			3			
Quilomene 2			7			
Quilomene 5			2			
Quilomene 4			4			
Quilomene 7			2			
Trinidad		2	3			
Cox			1			
Alison Creek		1				

Therefore, before too much is made of the switch in types, one has to evaluate how real the pattern is. There are several possibilities—since the techniques could very well have been present but not often used in the earlier periods, the one or two examples could be types when they are not yet common, or no longer common types persisting into more recent times. It seems best not assume this kind of change in degree of use for the close twined flexible basketry, as the bias against basketry in all the sites muddies the picture even more, so it could well have been present throughout the entire time period in question. If sewing is used to differentiate the time periods, it would have to be in terms of relative frequency since it is clearly present in the early periods.

Another possibility is that old or recent specimens of the types were dated by chance, and that there were other specimens that would show them to be in more continuous use. If further dates corroborate this idea, so be it, but it seems imprudent to simply ignore the current dates.

Preservation and identification are another issue. If there is a preservation bias among the materials, it would explain why materials like grass mats were not found in older contexts, and why sewn tule mats might seem common among all the sites. The remains of sewn tule mats are also easier to identify, as when partially disintegrated, they are still recognizable, while disintegrated grass mats are very hard to tell from loose grass that was used to line storage pits. This doesn't rule out the comparison of tule mats to tule mats, as in the case of diagonally twined mats and sewn mats, however.

I would argue, then, that the apparent switch in textile types is real for most of the dated types. There appears to have been a perhaps Plateau-wide reduction in plaiting, diagonal twining of tule mats, and open twined basketry through time; and perhaps an increase in grass twining and sewing.

Greater Plateau Temporal Patterns

To investigate possible reasons for the switch in textile types identified in McGregor and Porcupine caves, one has to link it to broader changes happening in the Plateau around the time period between around 3000-1000 BP.

In the Vantage sites, the Frenchman Springs phase corresponds approximately to the earlier textile period shown by the specimens dating to around 3000-1200 BP, and the Cayuse corresponds approximately to the late textile time period shown by the specimens dating to 350 BP and later. Swanson (1962) estimated the Frenchman Springs to end at a time that converts to 950-650 BP, though this was based on geochronology. Others (Ames et al. 1998) consider Frenchman Springs to have ended much earlier at around 2000 BP.

Around this time there is a commonly accepted switch from the Pithouse II pattern to the Winter Village pattern. This involved a switch from relatively isolated groups of pithouses to large pithouse “villages” along with the “inception of new cultural patterns, including settlement patterns, burial practices, and artifact styles” (Chatters 2004:68). This is commonly suggested to have happened around 2,000 or 2,500 BP.

Nelson (1973) estimated his theorized spread of Salishan south and east into the Plateau to have occurred around 2,550 BP to no later than 1850 BP, and though this theory has since been discounted (Ames and Marshall 1980), others have suggested the movement of Salish groups into the northern Plateau on smaller scales (Prentiss and Kuijt 2004; Rousseau 2004).

However, in all cases, this trend is harder to link to the textile changes visible in McGregor cave since the ethnographic association of the area was with Sahaptian language groups, not Salishan. Ethnographic language distribution does not guarantee that the distribution at the time period in question was the same, but the proposed spread was north to south, and McGregor cave is well south of the ethnographic boundary. Of course, it might be possible for the attributes of the Salish textiles to spread farther than did the language.

The switch from the Pithouse II to the Winter Village pattern is also sometimes linked to a greater use of rockshelters for storage away from villages (Chatters 2004). Other rockshelters show a timing at least similar to McGregor's for their use for storage. In the Marmes rockshelter, evidence of storage activity was found in Strata VI-VIII, with an oldest date of 1940 BP. The only date for the preceding Stratum V is 4250 BP, though with single dates for layers, any discontinuity is hard to illustrate (Hicks 2004). In the Windust caves, the rockshelters were first used as hunting camps, and then later as storage caves. The storage period is lumped into a phase lasting from 2500 BC to present, but Rice (1965) characterizes the organic materials associated with the storage as coming from the period immediately preceding contact. Porcupine Cave also probably had earlier uses before storage—there is for example a previous date of around 1700 BP on a hearth at the back of the shelter, but the earlier cultural levels are associated with few artifacts. Finally, one of the storage pits in Squirt Cave dates to as early as 1750 BP.

It is tempting to link the change in textiles with the rise of storage, whether because different textiles were linked with different uses of sites, or because of a change in textiles as a whole due to the trends that caused the rise in storage. However, the advent of rockshelter storage seems to occur independently from the change in textile types illustrated by the new dates. The timing may be similar, but Burr Cave, Squirt Cave, and the Frenchman Springs level of Cedar Cave all have identified storage pits before the point of the change in textiles suggested by the McGregor Cave dates.

So unfortunately, none of the dates for the various events quite match up. We have a switch in settlement patterns around 2000 BP Plateau-wide; a possibly contemporaneous or earlier emphasis on rockshelter storage beginning as early as 3000 or 2600 BP; a possible switch in textile types including a rise in twined grass mats, sewing, and a reduction in plaiting and twined tule mats as late as 1200 BP on the Snake and Mid-Columbia; and a switch in cordage suggesting population replacement from local ethnic group to another on the Mid-Columbia around 1000 BP.

In the Great Basin, Adovasio (1986) attributed the spread of coiling to reasons relating to subsistence. The rise in twined grass mats or sewn mats might also be related to subsistence changes, meaning textiles would be more economically important than ethnically significant, as I had been expecting them to be. However, the exact link to subsistence is unclear. Unfortunately, baskets can be more directly related to food-gathering strategies than can mats. If one accepts sewing as gaining in importance, though it is hard to tell that given its presence in the early levels at Cedar Cave, one could perhaps link it to the rise of mat lodges, which use that technique to create the mats to cover them. Mallory suggests that sewn mats are "limited in distribution to areas of the

Northwest where permanent or semi-permanent housing was built and apparently was used almost exclusively for roofing, flooring, and room dividers" (1966:45). Pithouses could also have been roofed with mats (Ames et al. 1998), and mat lodges or the larger groups of pithouses were hardly the first semi-permanent dwellings on the Plateau. But then, the technique of sewing might have been in use earlier, and gained in importance when more houses were being built.

Sewing would also have had to originate somewhere if it was spreading through the Plateau at this time, but where and when is something no one seems to have considered before. Sewing is not a commonly recognized matting technique--for instance it is absent from Adovasio's (1977) Basketry Technology manual. It is mentioned ethnographically for the northern Great Basin (Cressman 1956:392), though it appears to be unknown or at least unreported throughout the Great Basin prehistorically (Adovasio 1986; Adovasio et al. 1976). Sewing is also mentioned on the Coast ethnographically (Barnett 1955:122) and has been found in two archaeological contexts. One is at Ozette, which is dated to around 500-300 BP (Croes 1977), which doesn't clarify the origins of the technique, and the other is at the Hoko River wet site, dated to 3000 to 2600 BP (Croes 1995). At that site, the mats were probably used for covers for canoes, fishing shelters, and sleeping mats. Given that the earliest examples of sewn mats on the Plateau are in the Frenchman Springs phase, as compared with those at Hoko River, it is hard to point to either the Coast or the Plateau as the origin for the technique used in both by ethnographic times.

There are two other possibilities: the dated mat types could still be ethnically significant, and the changes could be related to the other suite of "new cultural patterns"

(Chatters 2004) that cropped up when people shifted into larger villages. This seems fairly unlikely, because as mentioned in the beginning, most of the aspects of utilitarian mats are not visible, and so would not be used to carry messages about ethnicity.

Finally, the dated change in types of textiles could be caused by some kind of population replacement. Whether the dates for the earliest pithouses match Nelson's theory or not, the Salish migration theory is still intriguing in light of changes in textiles being associated with movement of groups. There is also glottochronological data on which he based his theory, that put the spread of Salishan into the Okanagon highlands by 1000 BC and continuing south as late as AD 1000 (Nelson 1973). However, similarities in basket types to ethnographic ones such as the basket from Wexpusnime, and the fact that the Salish migration is not well-accepted currently on the Plateau, makes the Salish migration as the cause of the textile change seen in his study seem still unlikely. In the specific case of the Vantage sites, more localized change in what groups used a particular rockshelter seems more likely for the reasons mentioned previously.

Phylogenetic Analysis

Phylogenetic analysis was used to explore how much of a phylogenetic or branching signal was in the data, and therefore how much of the textile traditions arose through vertical transmission and groups splitting to form new traditions, and how much horizontal transmission, or blending was operating. If horizontal transmission was primarily operating on the Plateau at this time, it would be hard to talk about textile traditions linked to specific groups since there would be so much blending of traits together.

Phylogenetic software links groups so the number of changes necessary to produce the similarities among them are reduced. The software will always produce possible trees, but the real analysis is to assess how well the data fits into tree-form, and thus how much phylogenetic signal is present in it. There are other tests such as bootstrapping and the permutation tail probability, or PTP, test that help assess how well the data fits a tree format (Jordan and Shennan 2003).

Analyses were carried out using PAUP* 4.0 (Swofford 1998a). Two specific methods were used to build the trees: the Neighbor-Joining method of tree creation is a distance method, based on minimizing the distance between individual taxa, in this case sites, but it does not guarantee that the tree created will have the shortest overall length. It is mostly useful for exploration of the data (Hall 2001). Maximum Parsimony is the method most often used in the archaeological literature, and is based on creating the tree that needs the fewest number of changes to explain the data. Maximum Likelihood is also sometimes used, but was not used here due to the need to find the correct evolutionary model of the rate of change to compare the tree to.

Trees can also be displayed as rooted or unrooted. Unrooted trees illustrate relationships and distances between taxa, but don't say anything about which is oldest and thus the order of descent. Diagrams of unrooted trees still often appear to have a root, but this is usually produced by placing the root midway between the two taxa farthest away from each other. To root a tree properly, one needs an outgroup, a related group, but one the split away from the others so that all other taxa are more related to each other than any of them are to the outgroup.

Data was coded the same as for the correspondence analysis—the presence or absence of a particular weaving attribute at a site. Given the bias against baskets appearing in the sites, the absence of a basketry weaving attribute wouldn't mean the same thing at a site with no baskets as one with them, so I coded the basketry attribute data as missing from those sites that had no baskets.

It is obvious from the Neighbor-Joining trees based on all the sites (Figures 42-43) that McGregor, Porcupine and Squirt sites are still a problem, since they are so far from all the other sites, even nearby Snake River sites. Their larger sample sizes and more fine-grained data might set these sites apart from the rest, or Squirt and McGregor Caves could be set apart because they are a mixture of time periods, as suggested by the radiocarbon dates.

Bootstrapping is a method to assess the reliability of a tree and how well the data fits a bifurcating model. New random samplings of the data are created and trees are calculated from them using the same parameters as for the original tree. The number of times that each clade, or set of relationships, occurs in the resamples is calculated, with high percentages of reoccurrence supporting the reliability of a clade. In this case, 1,000 replicates were performed (Figure 44). The clades that were replicated say little about the smaller sites, though the bootstrapping does seem to support the differentiation of the big three sites from all the rest.

Maximum Parsimony was much less successful. PAUP*, when evaluating all the sites based on that method using a heuristic search, created over a million apparently equally parsimonious trees. The PAUP* software allows one to code a limit on the number of rearrangements of the data the program makes when searching for possible

Figure 42. Tree calculated by the Neighbor-Joining method, arbitrarily rooted for reading ease.

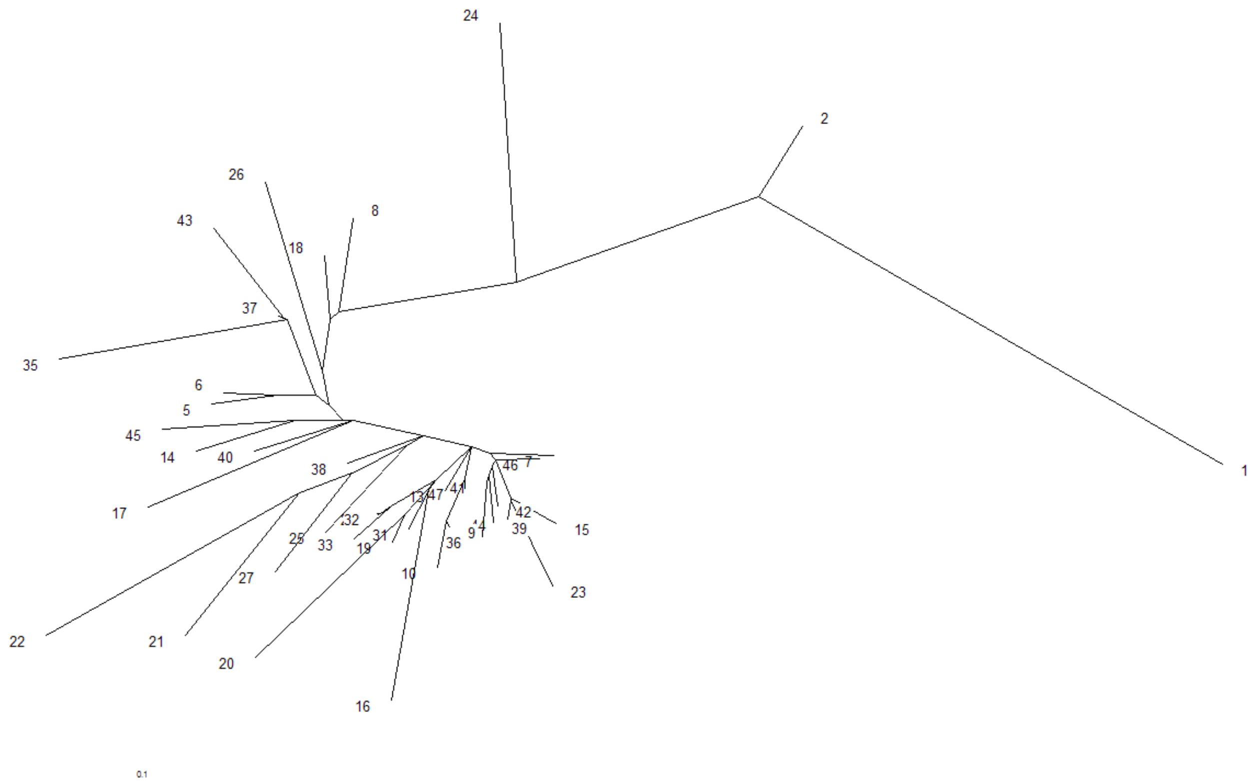

Figure 43. The same tree as Figure 41, but displayed unrooted. The relationships are more correctly represented.

4. 45FR276
5. 45FR53
6. 45FR54
7. Wexpusnime
8. 45GR101
9. 45GR102
10. 45GR104
11. 45GR111
12. 45GR119
13. 45GR121
14. 45GR2
15. 45GR78
16. 45GR79
17. 45GR80
18. 45GR84
19. 45GR94
20. Cedar Cave FSI
21. Cedar Cave FSII
22. Cedar Cave FSIII
23. Cedar Cave CII
24. Squirt Cave
25. Cox Cave
26. Crabtree Cave
27. Duck Cave disturbed
28. Duck Cave FSI
29. Duck Cave Loam
30. Hole in the Wall FSII
31. Hole in the Wall FSIII
32. Hole in the Wall CI
33. Marmes
34. Quilomene 1
35. Quilomene 2
36. Quilomene 3
37. Quilomene 4
38. Quilomene 5
39. Quilomene 6
40. Quilomene 7
41. Unamed rockshelter
42. Shelter 7A
43. Shelter 8B
44. Shelter 8C
45. Trinidad Cave
46. Windust
47. Alison Creek

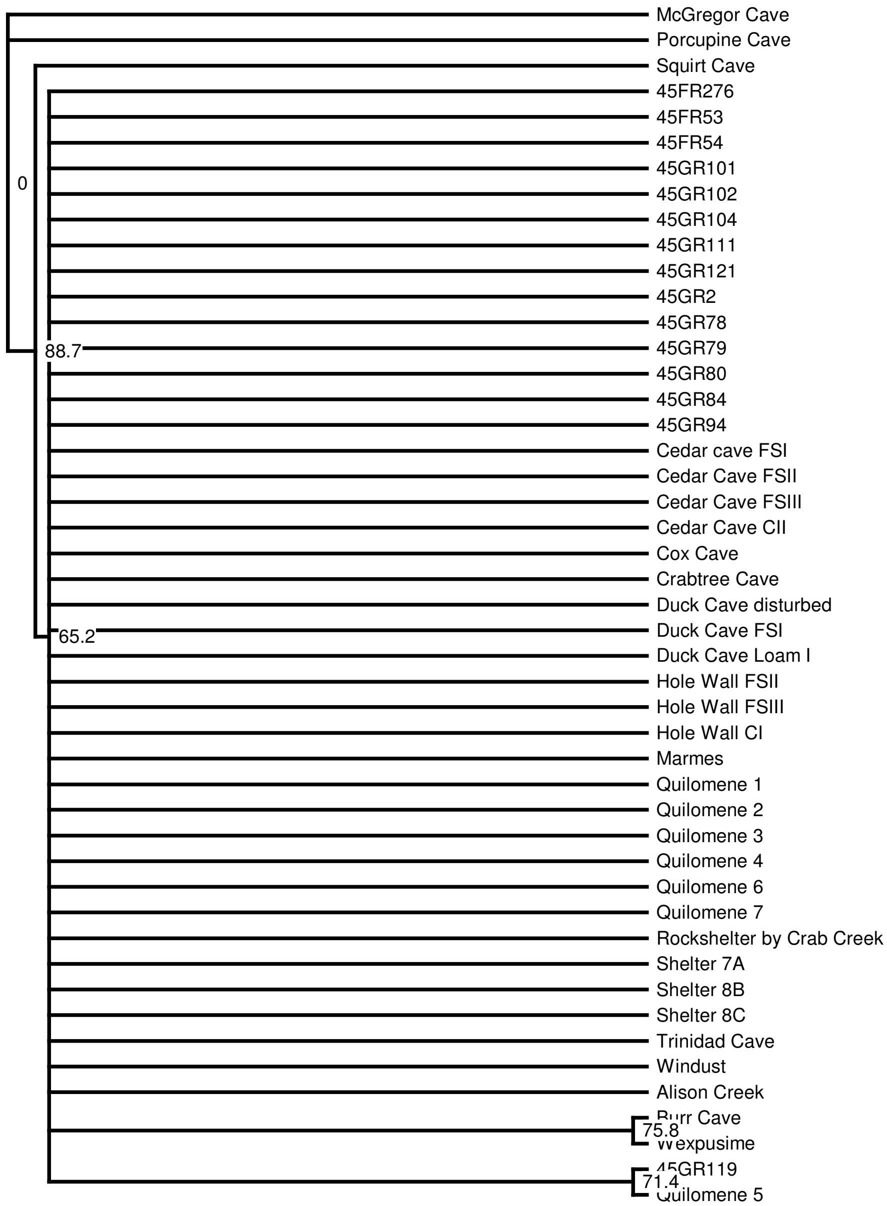

Figure 44. Bootstrap analysis for the tree in Figure 42 and 43. Numbers indicate the percent of times the indicated clades reoccurred in 1,000 replications.

trees, decreasing the amount of computing time the process takes (Swofford 1998b). Without this limit, bootstrapping a single dataset using maximum parsimony could have taken months. In this case, with the limit, the program found 175 trees (Figure 45), all as short as the original million plus, suggesting that a rearrangement limit does not prevent one from finding a hypothetically shorter or more parsimonious tree, but simply decreases the number of equally parsimonious trees found. Since 175 trees can illustrate the lack of phylogenetic signal in this dataset as well as a million can, it was judged to be a realistic trade-off for this study. Also to this end, when multiple trees were found, those pictured in this chapter are those that, on brief review of the possibilities, illustrated a general form that other trees varied from by a matter of a few branches, as was often the case.

The big three sites were apparently so affected by their different resolution of data, they might have been causing things to be related primarily by data resolution. I also performed analyses without them and without those sites with only one or two specimens. The Neighbor-Joining method (Figure 46) did not show many clades that reoccurred, suggesting they were correct, when bootstrapped (Figure 47) except for a few pairs of sites. This lack of phylogenetic signal as shown by the bootstrapping fits, because while nearby sites could have different ages, it seems strange that at least some of the very geographically close clusters of sites such as the Quilomene sites aren't more related in the illustrated tree.

The Maximum Parsimony method for the reduced set of sites produced only seventeen trees (Figure 48). The relationships the tree illustrates do make some sense—45FR53 and 54 are both the only Snake River sites in the group, but the Quilomene sites

Figure 45. One of 175 possible trees created using Maximum parsimony, arbitrarily rooted for reading ease.

Figure 46. Tree created using the Neighbor-Joining method on those sites with more than 3 specimens excluding McGregor, Porcupine and Squirt Caves, arbitrarily rooted for reading ease.

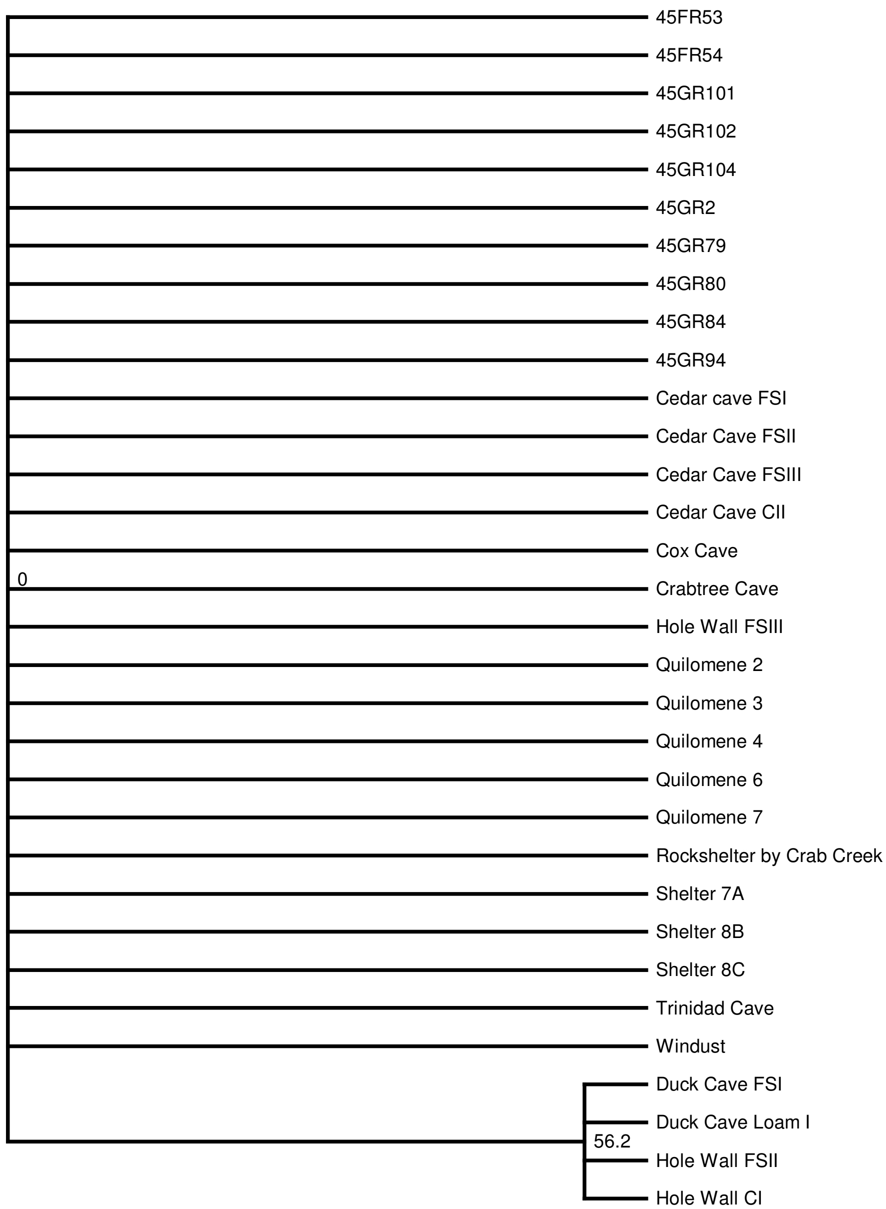

Figure 47. Bootstrap analysis for the tree in Figure 46. Numbers indicate the percent of times the indicated clades reoccurred in 1,000 replications.

Figure 48. One of 17 possible trees created using the Maximum Parsimony method on those sites with more than 3 specimens excluding McGregor, Porcupine and Squirt Caves, arbitrarily rooted for reading ease.

are still widely separated and the Vantage sites sometimes relate most closely to other phases in the same site and sometimes most closely to similar phases from other sites, so it is hard to know what is going on.

It seemed possible that cordage, mats, and baskets might have separate textile traditions, and so lumping them together might be camouflaging a signal in one or different signals in each. I had too little basketry data to calculate a tree based on that alone, but separate trees for cordage and mat traits, without the big three sites, were calculated using Maximum Parsimony. The cordage traits produced 142 possible trees (Figure 49) with very little branching signal, as is clear in the bootstrap (Figure 50). The mat traits produced 3552 trees (Figure 51) with the same bootstrapping result (Figure 52). This suggested that both mat and cordage information was needed together to be able to differentiate the sites.

Given the data from the radiocarbon dates, I did my best to create a set of only the sites that were roughly contemporaneous with each other. Sites with only one or two specimens and McGregor and Squirt were discarded for their temporal mixing. Only the Cayuse phases of the Vantage sites were included. Using all of the possible textile traits again, thirty thousand or so trees were created using Maximum Parsimony. When rearrangements were limited, 3101 trees were created (Figure 53).

Finally, I experimented with using an outgroup to produce rooted trees for my analyses. In this case, I used the site of Ozette, from the Northwest Coast (Croes 1977), since it would be more distantly related to a given site than other Plateau sites. It did not particularly clarify the Plateau sites' relationships, either for the entire data set (Figure 54), or the contemporaneous one (Figure 55).

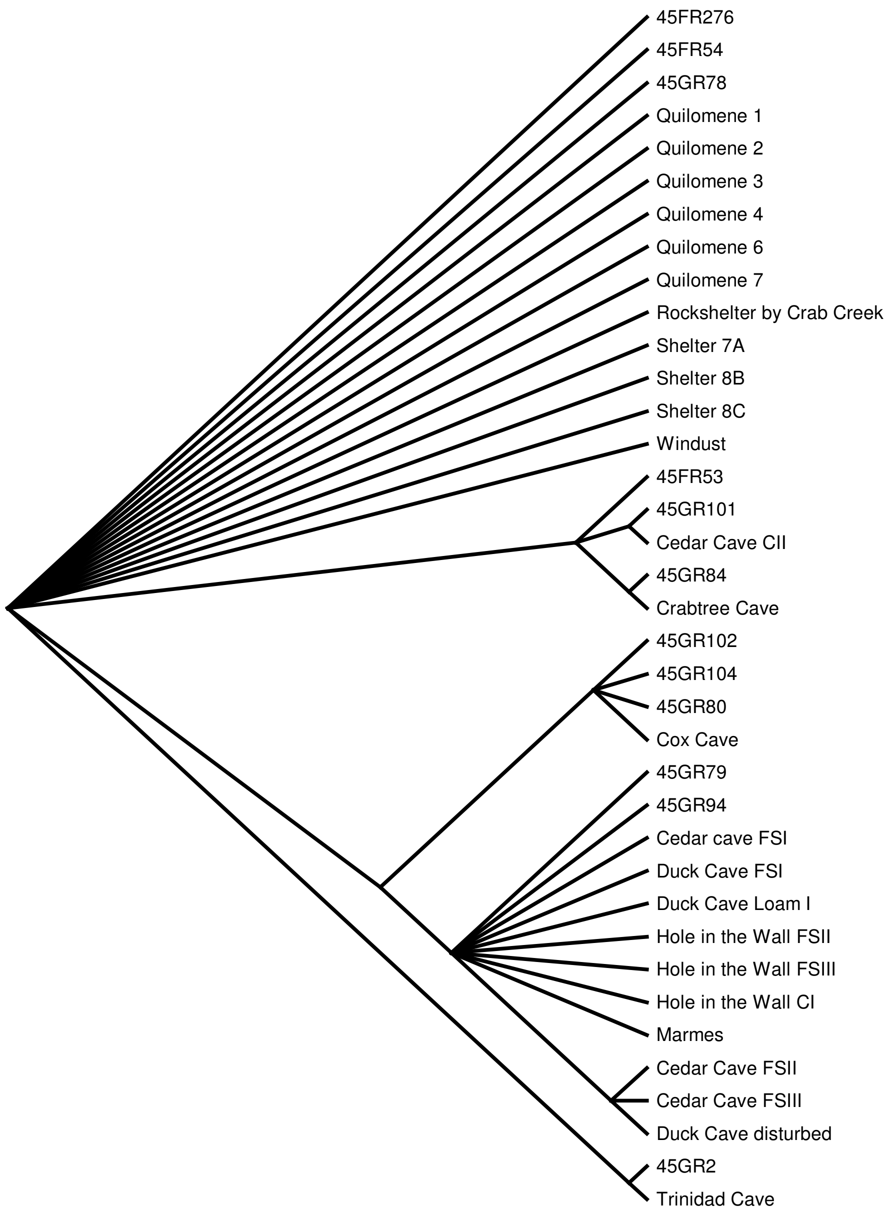

Figure 49. One of 142 possible trees based on cordage variables only, without the biggest three sites. Arbitrarily rooted for reading ease.

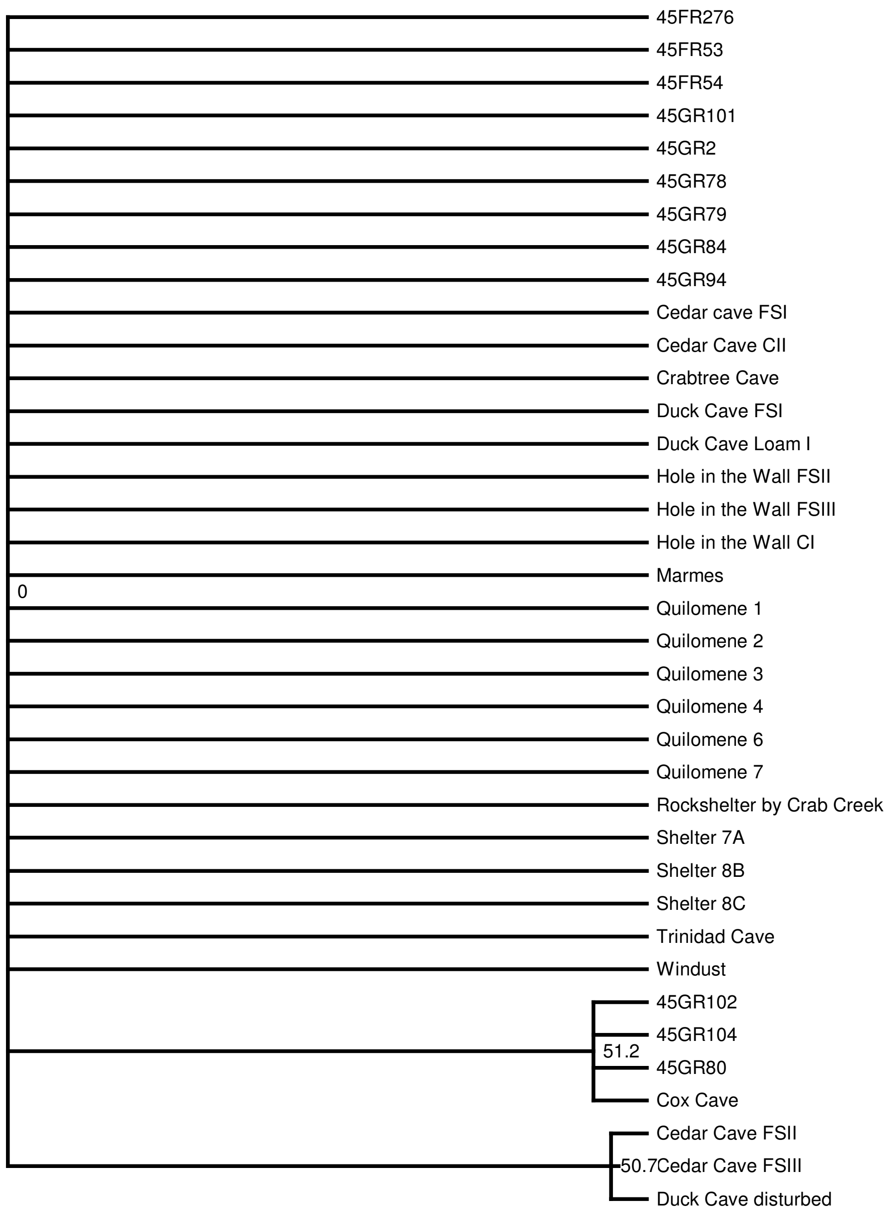

Figure 50. Bootstrap of tree in Figure 49. Numbers of the percent of times the indicated clades reoccurred in 1,000 replicates.

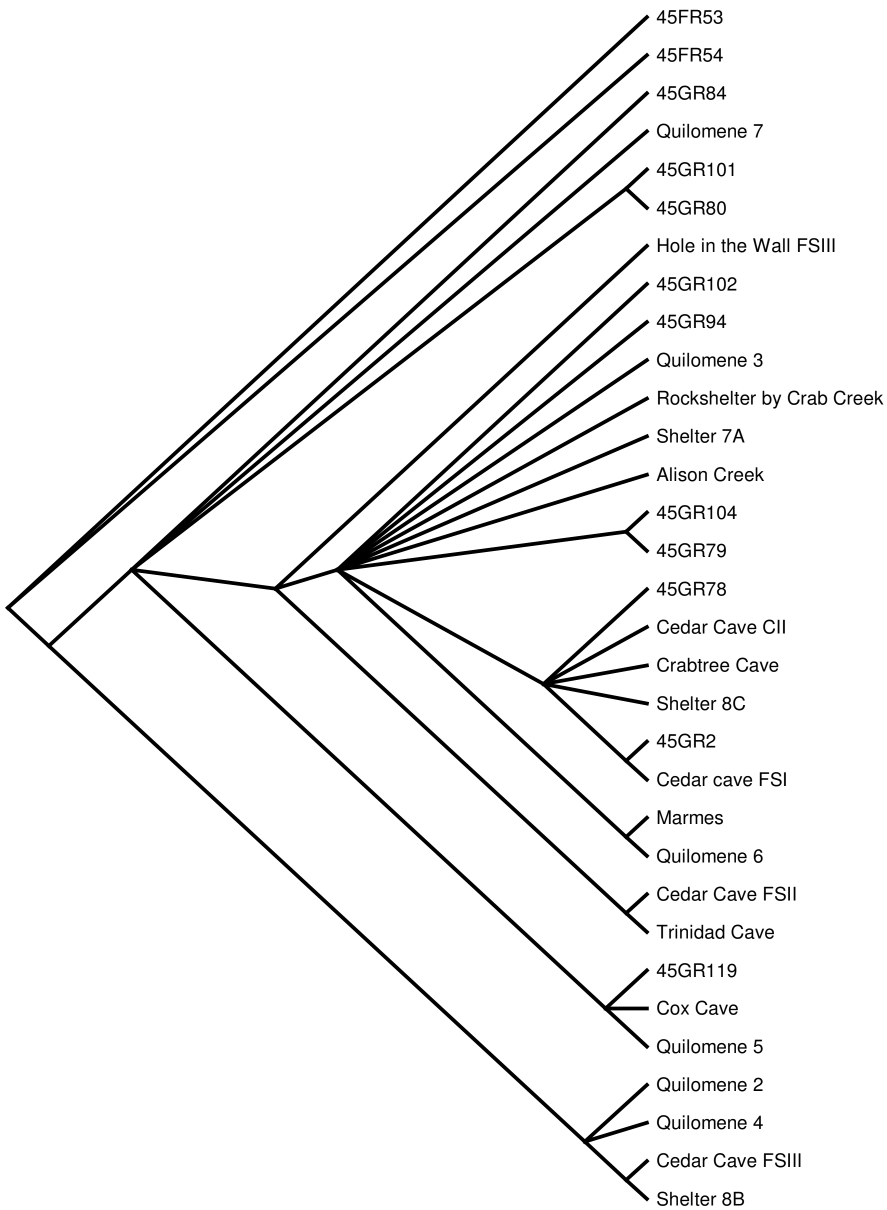

Figure 51. One of 3552 possible trees based on mat variables only, without the biggest three sites. Arbitrarily rooted for reading ease.

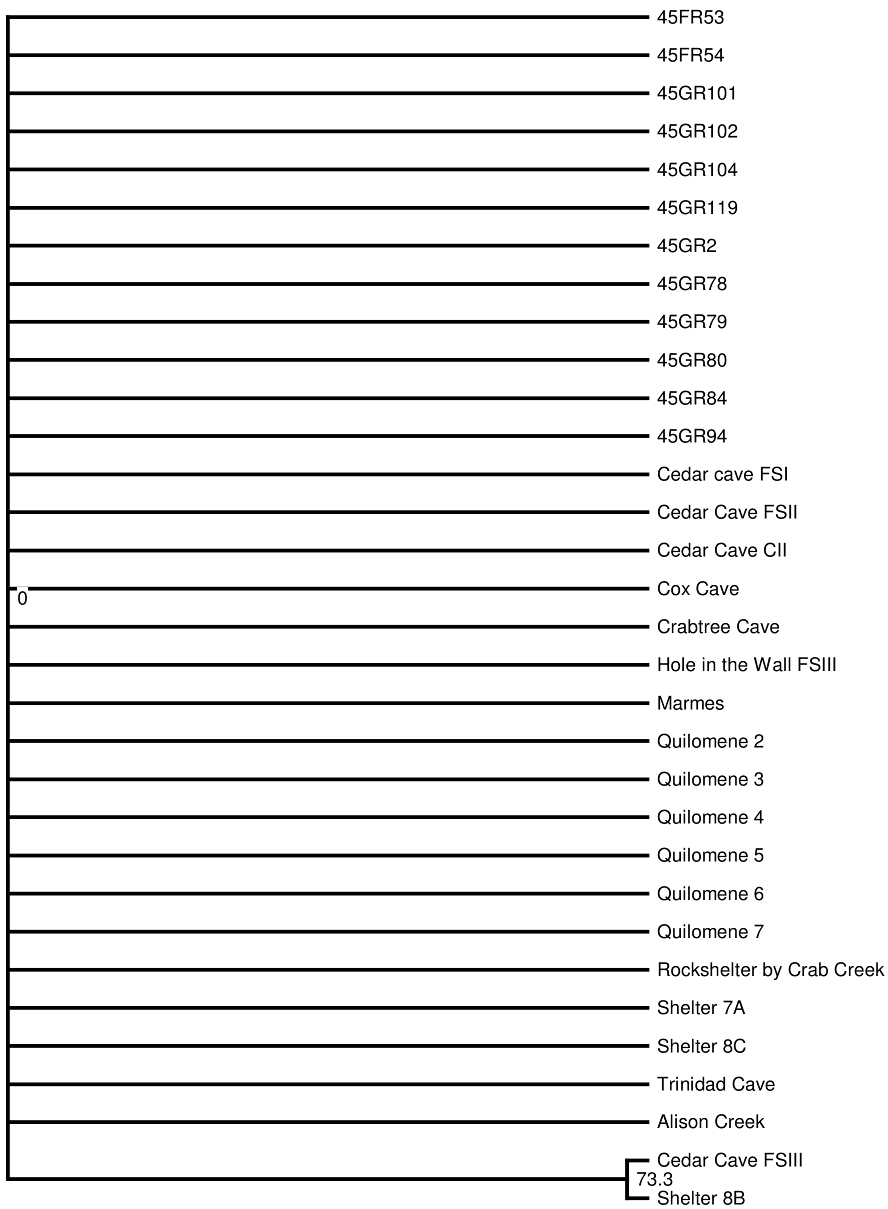

Figure 52. Bootstrap of tree in Figure 51. Numbers of the percent of times the indicated clades reoccurred in 1,000 replicates.

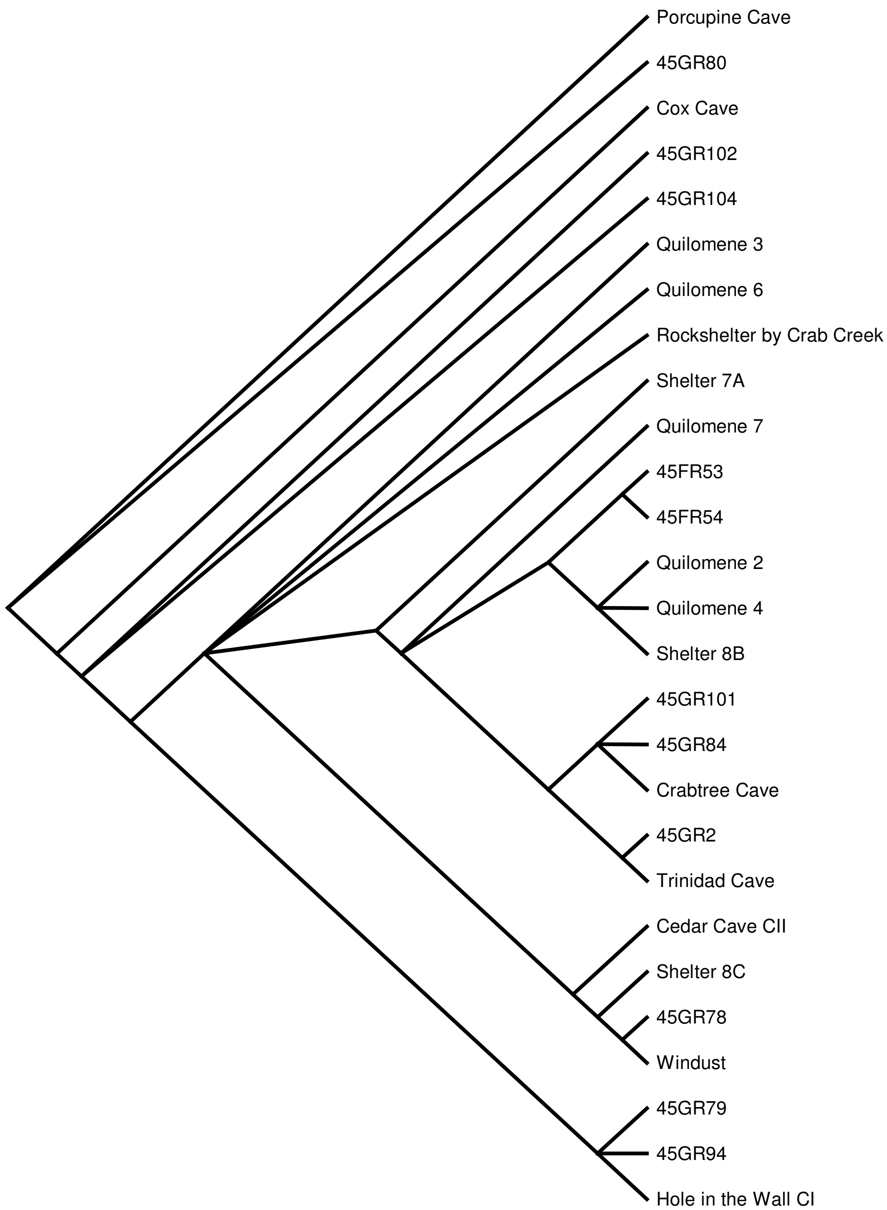

Figure 53. One of 3101 possible trees created using the Maximum Parsimony method on sites chosen to be the most likely to be contemporaneous, arbitrarily rooted for reading ease.

Figure 54. One of 119 possible trees created using Maximum Parsimony, rooted using Ozette as an outgroup.

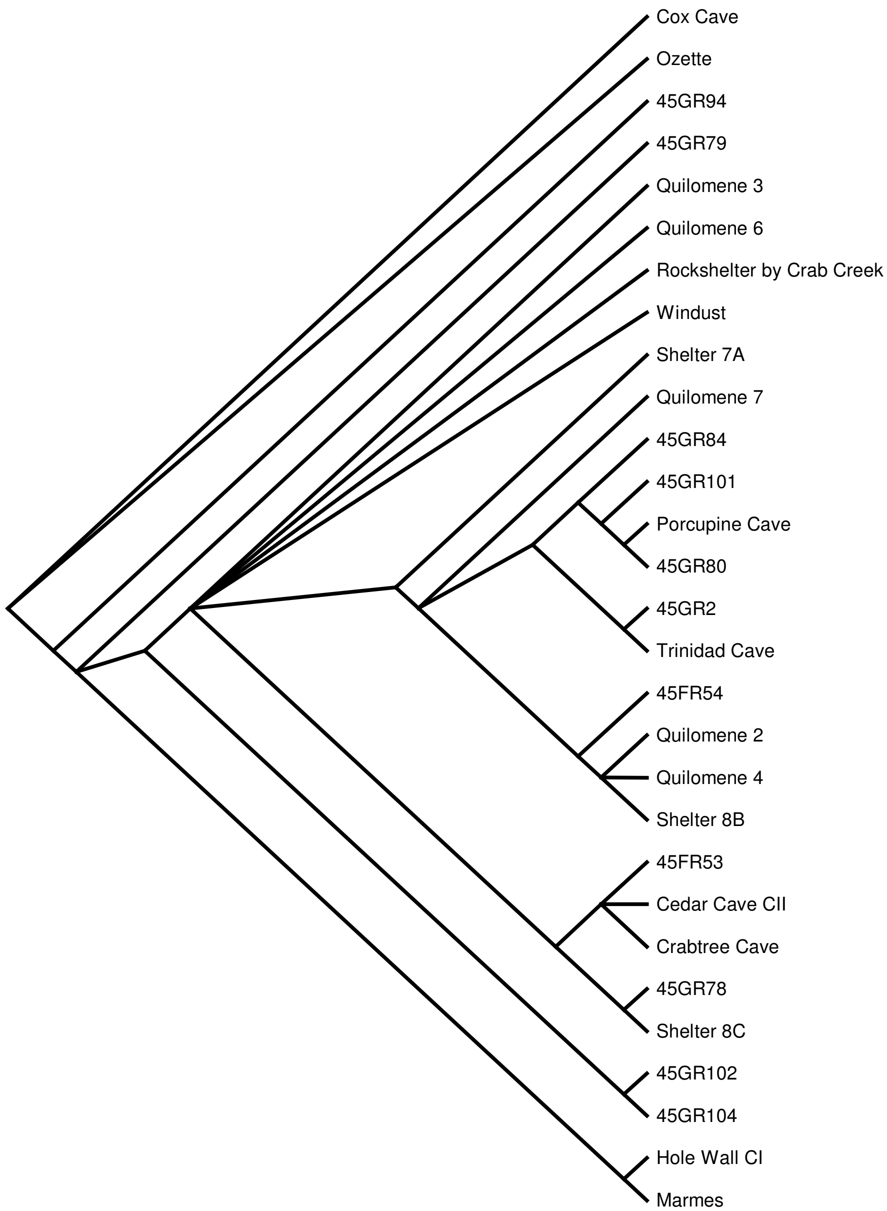

Figure 55. One of 2538 possible trees created using Maximum Parsimony on the data set of contemporaneous sites, rooted using Ozette as an outgroup.

Since the contemporaneous set was the one most likely to show a phylogenetic signal, it was the only one on which a permutation tail probability, or PTP, test was performed. In the PTP test, the variables are randomly shuffled, and new parsimonious trees for each new set are calculated. On 1000 repetitions, if the original data tree is shorter than 95% of the randomly created trees, then a phylogenetic signal is considered to be present. I calculated the PTP based on tree data with a rearrangement limit. Three of the thousand were as short or shorter than the original tree, giving a significance value of .006 that there was a phylogenetic signal.

In the end, it is clear that these data do not really fit or are not appropriate for a bifurcating phylogenetic model, the high significance for the presence of a phylogenetic signal suggested by the PTP test score aside. The reasons for this are important. Are the analyses demonstrating an extreme lack of phylogenetic signal in the data, meaning that there was a lot of horizontal transmission and therefore blending of traits in the groups, or simply the unsuitability of the data for this kind of analysis? It is likely a combination of both—the weaknesses of the data shown by so many trees being created, for example, and also the fact that textile attributes may have been horizontally transmitted on the Plateau at this time.

CHAPTER 5

CONCLUSIONS

Textiles on the Columbia Plateau show a number of patterns that direct dating has shown may be temporally distinct. The current study has shown that textiles on the Plateau are older than previously demonstrated. Unlike most types of material culture, textile artifacts can be directly dated, and so can be used to draw conclusions about the movement of people or changes in resource strategies. More sequences of archaeological textiles need to be directly dated in situations where known or at least generally agreed upon changes are occurring so that the marks of those changes in the textile sequences can be identified and compared to other areas.

In the case of my dated specimens on the southern Plateau, there seems to be a switch around 1200 BP from tule twining and plaiting to grass twining and sewing, at least in Snake River sites. This switch could be related in some way to the switch to the Winter Village pattern around 2000 or 2500 BP, whether it is might be associated with changes in subsistence or storage patterns or changes in housing.

In stratigraphically dated phases in the Vantage sites, there was a statistically significant change from Z to S twist in cordage, though whether it was gradual or not is hard to tell without knowing the length of the phases. If it was not gradual, it could suggest a localized population replacement, since there appears to be no change in material over the same time period. The question in either case is where the S twist tradition came from, since Northwest Coast and Great Basin groups both tended towards Z twist.

Other atemporal patterns discovered include that most of the Plateau sites studied here are unusual in that they had nearly equal percentages of S and Z twist in their two-ply cordage, which some have suggested is a sign of either population mixing, or the transmission of a new material or technique that was transmitted as a package with a differing twist type.

This data set bears out the idea mentioned in previous work on the Plateau and Northwest Coast that twist, diameter, and material hold some relationship for two-ply cordage. The partial relationship between diameter and material is obvious, making it hard to determine whether the choice of twist is more influenced by the material or the diameter. A likely reason for the link in some sites between smaller diameter and S twist and larger diameter and Z twist, probably relates to the introduction of a new material or technique. This was apparently not a Plateau-wide occurrence, as the Vantage sites did not show the same link.

The patterns visible in the materials used for cordage and twined mats were harder to explain since it is hard to disentangle the effects of variations in local materials and actual choices about which to use. Those sites recorded as having similar local environments did not vary significantly in their use of different materials, but that could also be because the same group used all of the nearby rockshelters. It does seem likely, however, that previous assertions about the importance of grass as a textile fiber on the Plateau should be more localized to the Snake River drainage, for some, as yet unknown.

In the multivariate analyses, the lack of clear clustering shown in the hierarchal clustering and correspondence analysis could have been caused by a number of factors—it could be that the limitations of a small and fragmentary dataset simply camouflaged any pattern that might otherwise have been found. Or it could be the data do not cluster since textile traditions are not totally continuous through this period since several sites are a mixture of the different periods and types of textiles. Finally, it could be that horizontal transmission blended textile traits together throughout the region studied, so that there were no true differentiated traditions for the multivariate analyses to find.

The phylogenetic analyses showed little phylogenetic signal, for cordage and mat traits separately, together, or for various combinations of sites. This could be because of horizontal transmission at work in the data, or it could be because of the weaknesses of the data. The limitations of this data set for phylogenetic analysis are that so many of the sites had small sample sizes, and that artifact attributes couldn't be recorded to the same standard for all of them, since not all collections could be accessed. Also, in contrast to dealing with complete ethnographic specimens, the remains were often fragmentary. Finally, the poor chronological control for many of the sites turned out to be a problem given the changes in textiles during this period.

In the Columbia Plateau, sometime between the earliest set of dated textiles at around 3000-1200 BP and the later set dated between 350 BP to contact, there seems to have been a reduction in plaiting, diagonal twining using tule, and open twined basketry, and an increase in grass twining and sewing. This change in textiles is present at least on the Snake and Mid-Columbia, but may possibly be a Plateau-wide pattern. This change could be related to subsistence changes including the intensive use of storage that occurs on the Plateau as early as 3000 or 2600 BP, which may be linked to the start of the Winter Village pattern at around 2500 or 2000 BP. Storage uses a greater number of all types of mats for protecting the food, and the Winter Village pattern is associated with an increase in dwellings and eventually a switch from pithouses to mat lodges that might have needed more sewn mats to cover them.

Around this time period, depending on what dates one accepts for Vantage phases, a probably more localized event is the switch from primarily Z to primarily S twist cordage that may reflect the transfer of control of the Vantage sites from one ethnic group to another. The origins of the S twist tradition are unclear.

The origins of sewing as a weaving technique on the Plateau are also unclear since the earliest examples on the Plateau are in a period preceding 2000 BP and the earliest examples on the Northwest Coast are in a site dating to 3000-2000 BP, though the use of sewing in the northern Great Basin is only recorded in ethnographic times.

Further phylogenetic research on archaeological textiles from regions were preservation and temporal control are better would be valuable to truly determine the utility of phylogenetic methods for archaeological collections. Other studies of ethnographic textiles would also be valuable to learn more about whether textiles are more affected by vertical or horizontal transmission. Finally, for the Plateau and elsewhere, more direct dating of textiles is important, to link textile changes with other cultural changes and group movements and to shed more light on the textile changes discovered by this study and their relationship to the Winter Village pattern.

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APPENDIX

WSU COLLECTIONS

Table 1. Twined baskets, part 1.1

Site	Spec#	Portion of basket	Weaving type	Weaving subtype	Warp/weft types	Selvage	Decoration type
45FR201	370*		open twining	simple, z-slant	flexible		
45FR201	424		open twining	simple, z-slant	same, flexible		
45FR201	Unk 10		close twining	simple, z-slant	flexible		
45FR201	349**	rim	close twining	simple, z-slant	same, flexible	simple, looped back into row	
45FR202	Unk 27***	one warp with weft fragments	close twining	z-slant	warp s-lay		
45GR94	50?	one row twining	close? twining	z-slant	weft z-lay		false embroidery
45GR94			close twining	simple, z-slant	warp z-lay		
45GR94			close twining	simple, z-slant	warp z-lay		
45WW25	224		close twining	simple, z-slant	flexible; warp s-lay?		
45WW25	267	rim	close twining	simple, z-slant	semi-flexible		
45WW25	222		close twining	simple, z-slant	flexible		
45WW25	89		close twining	simple, z-slant	flexible, warp s-lay		wrapped twined overlay
45WW25	128		close twining	simple, z-slant	flexible, warp s-lay		

*AA71076: 1253 ± 63 BP
**AA71078: 3103 ± 46 BP
***AA71069: 174 ± 42 BP

Table 1. Twined baskets, part 1.2

Spec#	Size	Diameter warp	Diameter weft	Row spacing	Warps/cm	Wefts/cm	Material
370	L 13 cm, W 4.5 cm	6 mm	2 mm	6- 9 mm	2		cedar bark
424	L 10 cm, W 7 cm	4 mm	2 mm	5-6 mm	2		cedar bark
Unk 10	L 38 mm, W 34 mm	4 mm	3 mm		3	3.5	sagebrush bark warps, grass wefts
349	L 9 cm, W 2 cm	3-5 mm	4-5 mm		2	2	tule
Unk 27	L 6 cm; W 1.5 cm	3 mm	4 mm				sagebrush bark
50?	L 4 cm; W .5 cm	5-6 mm	3-4 mm			2	grass, decoration grass?
	L 6 cm; W 6 cm	3-4 mm	4 mm		2.5	2.5	?
	L 4.5 cm; W 3 cm	3 mm	3 mm		3	3.5	?
224	L 5 cm; W 3.5 cm	4 mm	3 mm		3	4	grass
267	L 4.5 cm; W 6.5 cm	4 mm	3 mm		3	4	sagebrush bark warps, grass wefts
222	L 9 cm; W 8.5 cm	3 mm	2-3 mm		3	4	grass
89	L 8 cm; W 2.5 cm	3-4 mm	3 mm		3	4	sagebrush bark warps, grass wefts; flat grass for decoration
128	L 3 cm; W 1.5 cm	3 mm	3 mm		3	4?	sagebrush bark warps, grass wefts

Table 2. Coiled baskets, part 1.1

Site	Spec#	Portion of basket	Weaving type	Weaving subtype	Work direction	Foundation type	Selvage
45GR101	27		close coiling	noninterlocking, split on both surfaces?	left to right	bundle	
45GR101	50		close coiling	noninterlocking, split on both surfaces		bundle	
45GR104	228		close coiling	noninterlocking, split on both surfaces	left to right	bundle	
45GR79	24	rim?	close coiling	wrapped around rim	left to right	bundle	self, wrapped
45GR80	68	rim	close coiling	noninterlocking, split on one surface? wrapped on	left to right	bundle	self, wrapped
45GR80	28 a & b	rim	close coiling	noninterlocking, split on both surfaces? wrapped on	left to right	bundle	self, wrapped
45GR94	55 (59?)		close coiling	noninterlocking, split on work surface only?	left to right	bundle	

Table 2. Coiled baskets, part 1.2

Spec#	Size	Diameter of coils	Coils/cm	Diameter weft	Wefts/cm	Notes
27	L 4 cm; W 1.5 cm	7-8 mm	1.5	4 mm	3	
50	L 1.5 cm; W 1.5 cm	9 mm		4 mm		
228	L 2.5 cm; W 4.5 cm	5-6 mm	2	3-4 mm	3	
24	L 1.5 cm; W .5 cm	6 mm		3 mm		
68	L 3.5 cm; W 1 cm	4-5 mm		3 mm	3.5	missing part of bundle, coil diameter based on remaining stitches
28 a & b	a: L 4 cm; W 1 cm b: 3.5 cm; W 1 cm	5 mm		3 mm	4	
55 (59?)	L 8.5 cm; W 2.5 cm	7-8 mm	1.5	4 mm	3	

Table 3. Mats, part 1.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201		end edge	L 41 cm; W 38 cm	sewing	sewing cord s-lay, twining cord z-slant, s-lay
45FR201		end selvage?	L 31 cm; longest sewing cord 58 cm	sewing	sewin cord s-lay twining cord s-lay
45FR201		side selvage	L 24 cm; W 10 cm	open twining	z-slant
45FR201	?		L 45 cm; W 63 cm	sewing	sewing cord s-lay
45FR201	? F7/2, 3 or 4	row of twining with warps	L 8 cm; W 5 cm	open twining	
45FR201	100		longest weft: 85 cm	open twining	simple, z-slant
45FR201	106	one length sewing with warp	L 15 cm; sewing cord 7 cm	sewing	sewing cord s-lay
45FR201	107	one row twining? selvage row?	Length of weft 10.5 cm	twining	z-slant
45FR201	112	one length sewing with warps	L 20 cm; sewing cord (bunched together, can't measure)	sewing	sewing cord z-lay
45FR201	118e	one row twining, with warp fragments	weft: 9 cm	open? twining	z-slant
45FR201	131		L 38 cm; W 43 cm	sewing	sewing cord s-lay
45FR201	137	one length sewing with warps	L 17.5 cm; sewing cord 20 cm	sewing	sewing cord s-lay
45FR201	156	one length sewing with warps	L 15 cm; sewing cord 21.5 cm	sewing	sewing cord s-lay
45FR201	161	one row twining with warp fragments	L 7 cm; longest weft 16 cm	twining	z-slant
45FR201	164?	side edge	L 15 cm; longest weft 13 cm	open twining	simple, z-slant
45FR201	167		L 41 cm, longest weft 45 cm	open twining	simple, z-slant
45FR201	171	one row twining with fragmentary warps	L 6.5 cm; W 3 cm	open twining	z-slant?
45FR201	18	fragmentary warps and twined row	L 8 cm; W 6 cm	open? twining	z-slant

Table 3. Mats, part 1.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
	simple, 'braided', one row of twining below	1.5	sewing cord: 9-12 mm, twining cord 3 mm	73-102 mm	tule, sewing cord: grass, twining cord: sagebrush bark?	
	row of twining setting off plaiting?		sewing cord: 6-8 mm, twining cord 3 mm	74-82 mm	tule, sewing cord sagebrush bark, twining cord sagebrush bark?	
	continuous side selvage, cordage twists between	1	13-14 mm		grass	another cord knotted onto wefts where become cordage for side selvage, cord from last row wefts?
?		1	sewing cord: 3-4 mm	130-140 mm	tule, sewing cord: sagebrush bark?	
? F7/2, 3 or 4					grass	
100	none	1	9 mm		cedar bark? (or sage?)	AA71077: 86 ± 26 BP loop at about 60 cm point of longest weft
106			5-6 mm		tule, sewing cord: grass	
107	simple, looped back into row?				grass	
112			3-4 mm		tule, sewing cord: ?	two ends of the sewing cord tied to make warps into a bunch
118e	none	2	7 mm		tule	
131			sewing cord: 3 mm	100 mm	tule, cord: grass	two pieces of grass cord tied on last warp, diameter 6 mm; 7mm
137			4 mm		tule, sewing cord: grass	end of two warps charred
156		1	4-5 mm		tule, sewing cord grass	
161		1	8 mm		grass	
164?	continuous side selvage, cordage twists between	1	18-19 mm	75-77 mm	grass	
167	none	1	6-9 mm	40-45 mm	grass	
171					grass	
18			9-10 mm		grass	

Table 3. Mats, part 2.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	183		L 29 cm; longest sewing cord 50 cm	sewing	sewing cord s-lay
45FR201	192	one length sewing with warps	L 13.5 cm; sewing cord 15 cm	sewing	sewing cord s-lay
45FR201	201		L 10 cm; W 11 cm	plaiting	twill 2/3?
45FR201	201	has bottom/top edge?	L 27.5 cm; W 41 cm	sewning, open twining	sewing cord s-lay, twining cord z-lay? one ply?; twining z-slant
45FR201	203	one length sewing with warps	L 5.5 cm; 23 cm	sewing	sewing cord z-lay
45FR201	206	one length sewing with warp	L 5 cm; sewing cord ~ 47 cm	sewing	sewing cord z-lay
45FR201	215	side selvage?	L 23 cm; longest weft 12 cm	open twining	z-slant
45FR201	216	section of center	L 45.5 cm, W 28 cm (along longest dimensions)	open twining, sewing, plaiting	twined: simple, z-slant, wefts are s-lay 2-ply cord; sewing: with s-lay 2-ply; plaiting: twill 3/3 changes direction for decoration
45FR201	229	one length sewing with warps	L 22 cm; sewing cord 25 cm	sewing	sewing cord s-lay
45FR201	234	one row twining, warp fragments	L 3.5 cm, longest weft 4 cm	open twining	z-slant
45FR201	237	one row twining with warps	L 27 cm; longest weft 33 cm	open twining	z-slant
45FR201	238	one row twining with warps, side selvage	L 8 cm; longest weft 17 cm	open? twining	z-slant
45FR201	241	one row twining, with warp fragments	L 5 cm, longest weft 21 cm	open twining	z-slant
45FR201	26	one row twining with warp fragments	L 7 cm; longest weft 5 cm	open twining	z-slant
45FR201	262	one row twining, warp fragments	L 6 cm, longest weft 5.5 cm	open twining	simple?, z-slant
45FR201	263	one length sewing with warps	L 6 cm; sewing cord ~55 cm	sewing	sewing cord s-lay
45FR201	266	has side edge	L 44 cm; W 10 cm	open twining, plaiting	twining cord s-lay; twining warps, plaiting elements are separate, joined at twinin, cut ends at back; twill 3/3
45FR201	280	one length sewing with warp	L 7.5 cm; sewing cord ~29 cm	sewing	sewing cord s-lay
45FR201	289	end edge	L 6 cm; W 3 cm	sewing or twining	z-slant; twining cord z-lay
45FR201	294	one length sewing with warp	L 21 cm; sewing cord 10.5 cm	sewing	sewing cord s-lay

Table 3. Mats, part 2.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
183			3-4 mm	11 mm	tule, sewing cord: grass	AA71072: 285 ± 27 BP
192			4 mm		tule, sewing cord: sagebrush bark	cord makes a loop on one side of the warps, recombined into 2 plies inside the warps
201					tule	
201	last row of twining acting as clipped selvage?	2	twining cord: 2-3 mm; se	100 mm	tule, cord: indian hemp?	
203			6 mm		tule, sewing cord: sagebrush bark	
206			2-3 mm		tule, sewing cord indian hemp?	
215	wefts knotted on outside of last warp		9-10 mm	78 mm	grass	
216	none	2	3-4 mm (twined)	43 mm	tule, sewing cord: grass? twining cord: grass, sagebrush bark?	one row sewning, one row twining, plaited center
229			3-4 mm		tule, sewing cord sagebrush bark?	
234	none	2	5 mm		tule	
237		1	12-16 mm		grass	
238	continuous side?		8-9 mm		grass	
241	none	2	6 mm		tule	
26		1	10-11 mm		grass?	
262	none	2	6 mm	28 mm	tule	
263			2 mm		tule, sewing cord: indian hemp?	
266	plaited self		twining cord:2 mm; plaiti		tule, cord: indian hemp?, other cords: grass	
280			4-5 mm		tule, sewing cord: grass	ends twisted around warp twice, then loosely tied
289	simple, looped back into row		3 mm		tule, twining cord: sagebrush bark?	
294	end of warp crimped from twining?		7-8 mm		tule, sewing cord: grass	AA71071: 340 ± 40 BP

Table 3. Mats, part 3.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	301	one length sewing with warps	L 8 cm; sewing cord 7 cm	sewing	sewing cord s-lay
45FR201	305	one length sewing with warps	L 13.5 cm; sewing cord 22.5 cm	sewing	sewing cord s-lay
45FR201	316	one row twining, with warp fragments	L 5.5 cm, longest weft 18 cm	open twining	simple?, z-slant
45FR201	323		L 18.5 cm; W 15 cm	plaiting	twill 3/3
45FR201	330	one row twining, fragmentary warps	L 11 cm, longest weft 5 cm	open twining	simple?, z-slant
45FR201	331	one side edge	L 6.5 cm, W 5 cm	open twining	simple, z-slant
45FR201	334		L 10.5 cm (along weft), W 5 cm	open twining	simple, z-slant
45FR201	344		broken, L 5 cm, W 5.5 cm reconstructed	open twining	simple, z-slant
45FR201	348	end selvage	L 30 cm, W 3 cm	open? twining	simple, z-slant
45FR201	355	one side edge	L 28.5 cm, longest weft 33 cm	open twining	simple, z-slant
45FR201	414		L 46 cm; longest weft 44 cm	open twining	diagonal, z-slant
45FR201	415	side selvage	L 19 cm; W 9.5 cm	plaiting	twill 3/3
45FR201	416	section of one side edge	L 31 cm; W 60 cm (min. - mat rumpled)	open twining, plaiting	twined: simple, z-slant, wefts are s-lay 2-ply cord; plaiting: twill 3/3 changes direction for decoration
45FR201	417	one side edge	L 31 cm; W 34 cm	plaiting, twining, sewing	twining: z-slant, s-lay cord; sewing s-lay cord; plaiting twill 3/3 and 3/2
45FR201	418	side selvage	L 12 cm; W 7.5 cm	plaiting	twill 3/3
45FR201	419	has side edge	L 12.5 cm; 7.5 cm	plaiting	twill 3/3
45FR201	420		L 14 cm; W 11 cm	plaiting	twill 3/3

Table 3. Mats, part 3.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
301			4 mm		tule, sewing cord: sagebrush bark	
305			5 mm		tule, sewing cord: sagebrush bark?	
316	none	2	4-5 mm	29 mm	tule	
323					tule	AA71075: 2296 ± 36 BP
330	none	2	6 mm	27-30 mm	tule	
331	continuous side selvage, cordage twists between	2	6-8 mm		tule	
334	none	2	5-6 mm	30-35 mm	tule	
344	none	2.5	3 mm	4-5 mm	tule?	
348	braid or simple, looped back into row	.5	30 mm (part of selvage, probably big)		grass	
355	continuous side selvage, cordage twists between	2	5-6 mm	25-26 mm	tule	
414	none	2	7-9 mm	31-48 mm	tule	
415	plaited self				tule	AA71074: 1916 ± 42 BP
416	plaited self		3 mm	30-32 mm	tule, twining cord: indian hemp?	twill plaiting one direction, switch direction, band of twining, twill plaiting different direction
417	plaited self		sewing cord: 5-9 mm, twining cord 2 mm		tule, sewing cord: sagebrush bark, twining cord: sagebrush bark?	pattern is block of twill 3/2, joined (cut ends of both sets of warps to back) to side by side blocks of twill 3/3 and sewing below it by twining, second row twining at bottom of those blocks; sewing cord plaited into twill beside it
418	plaited self				tule	
419	plaited self		plaiting element: 5-6 mm		tule	
420					tule	

Table 3. Mats, part 4.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	422	end selvage and row of twining	L 8 cm, W 26 cm	open twining	simple, z-slant
45FR201	423	end selvage	L 5 cm; W 16 cm	sewing?	
45FR201	426		L 11 cm; longest weft 19 cm	open twining	diagonal, z-slant
45FR201	454	one row twining with fragmentary warps	L 3 cm; W 13 cm	twining	z-slant
45FR201	49	one row twining, one warp frag. and holes for others	weft: 23 cm	open? twining	z-slant
45FR201	54	one row twining with fragmentary warps	L 5 cm; longest weft 9.5 cm	open? twining	z-slant
45FR201	640	one length sewing with warps	L 17 cm; sewing cord 23 cm	sewing	sewing cord s-lay
45FR201	66	one row twining with warp fragments	L 6 cm; longest weft 19 cm	open twining	z-slant
45FR201	71	end selvage	L 13 cm; W 13 cm	open twining	simple, z-slant
45FR201	73		L 37 cm; longest weft 11 cm	open? twining	simple, z-slant
45FR201	85		weft: 9 cm, warp: 11 cm	open twining	simple, z-slant
45FR201	91		L 45 cm, longest weft 34 cm; L 18 cm longest weft 13.5 cm	open twining	simple, z-slant
45FR201	97	one side edge	L 14 cm, W 27 cm	open twining	simple, z-slant
45FR201	F1/116 or F2/1	top/bottom edge	L 16 cm; longest weft 48 cm	sewing	twined: z-slant, cord z-lay; sewing cord: s-lay
45FR201	F1/21	end selvage	L 4.5 cm; longest weft 35 cm	open? twining	z-slant
45FR201	F1/24	end edge	L 4 cm; W 9 cm	open twining	z-slant
45FR201	F1/28	one length sewing with warp	L 7 cm; sewing cord broken	sewing	sewing cord s-lay
45FR201	F1/50	one row twining, with warps	L 26 cm; longest weft 29 cm	open twining	z-slant
45FR201	F1/62	one length sewing with warps	L 15 cm; sewing cord 29 cm	sewing	sewing cord s-lay
45FR201	F1/63	one length sewing with warp	L 10 cm; sewing cord 8 cm	sewing	sewing cord s-lay
45FR201	F1/69	one row twining with warp fragments	L 5.5 cm; longest weft 19 cm	open twining	z-slant
45FR201	F1/89	one length sewing with warps	L 16 cm; sewing cord (twisted too tight to measure)	sewing	sewing cord s-lay

Table 3. Mats, part 4.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
422	braid or simple, looped back into row	1	10-11 mm	19 mm	grass	
423	simple, ends looped back into row of twining				tule	
426	none	2	6-7 mm	10 mm	tule	AA71079: 1575 ± 49 BP
454			8-9 mm		grass	
49	none	1.5	12 mm		tule	
54		1	8-10 mm		grass	
640			3-4 mm		tule, sewing cord: ?	
66		1	10-11 mm		grass	
71	simple, looped back into row	1	11-12 mm	63 mm	grass	
73	none	1	8 mm	18-24 mm	grass	
85	none	1	9 mm		tule	
91	none	1	10-12 mm	37-49 mm		two fragments
97	continuous side selvage, cordage twists between	1.5	6 mm	23-30 mm	tule	
F1/116 or F2/1	row of twining acting as clipped selvage	2	twining cord: 3 mm; sewing cord 5 mm		tule, twining cord: sagebrush bark; sewing cord: grass	
F1/21	simple, looped back into row	1	11-12 mm		grass	
F1/24	simple, looped back into row	1	13 mm		grass	
F1/28			4 mm		tule, sewing cord: grass?	
F1/50		.5	17 mm		grass	
F1/62			12 mm		tule, sewing cord: grass	
F1/63			7 mm		tule, sewing cord: grass	
F1/69		1	14 mm		grass	
F1/89			5 mm		tule, sewing cord: sagebrush bark	cord wrapped around warps many times, too tight to measure

Table 3. Mats, part 5.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	F1/90	end selvage	L 4 cm; longest weft 26.5 cm	close? twining	simple, z-slant
45FR201	F1/91	one length sewing with warps	L 25 cm; sewing cord (twisted too tight to measure)	sewing	sewing cord s-lay
45FR201	F1/92	one length sewing with warps	L 27 cm; W 12 cm	sewing	sewing cord s-lay
45FR201	F1/93	one row twining with warps	L 12 cm; 10.5 cm	open twining	z-slant
45FR201	F1/94	one row twining with warps, side selvage	L 13 cm; longest weft 20 cm	open twining	z-slant
45FR201	F10/120	one row twining with warp fragments	L 10 cm; longest weft 15 cm	open twining	z-slant
45FR201	F10/23	end selvage	L 9 cm; longest weft 22 cm	sewing?	twining: z-slant cord s-lay
45FR201	F10/23	end selvage	L 14 cm; W 11 cm	sewing?	twining cord z-lay
45FR201	F10/24	end edge	L 5 cm; W 6 cm	sewing or twining	z-slant
45FR201	F10/25	one length sewing with warp	L 7 cm, sewing cord (twisted too tight to measure)	sewing	sewing cord s-lay
45FR201	F10/26	warps with sewing holes and twined selvage	L 18 cm; twining cord 13 cm	sewing	twining: z-slant, cord s-lay
45FR201	F10/27	end selvage	L 28 cm; W 4.5 cm	sewing	twining cord s-lay
45FR201	F10/28	end selvage	L 5.5 cm; W 5 cm	sewing or twining	z-slant; twining cord z-lay
45FR201	F10/29	section of selvage and twined row, warp fragment	Length of twined/selvage cord: 9 cm	twining	z-slant
45FR201	F10/30	one row twining with warp fragments	L 9.5 cm; longest weft 19 cm	open twining	z-slant
45FR201	F10/34	section of twined selvage	L 3 cm, W 5.5 cm	twining	z-slant
45FR201	F10/84		L 24 cm; longest weft 22 cm	open twining	simple, z-slant
45FR201	F10/86	one row twining with warp fragments	L 16 cm; longest weft 17 cm	open twining	z-slant
45FR201	F10/95	one row twining with warps	L 16 cm; longest weft 25 cm	open twining	z-slant

Table 3. Mats, part 5.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
F1/90	simple, warps bent back in complex pattern (Mallory calls 'braided')	1	13 mm		grass	
F1/91			4-5 mm		tule, sewing cord: sagebrush bark	
F1/92	end cinched like for row of twining		sewing 3 mm		tule, sewing cord indian hemp?	
F1/93		1	12-15 mm		grass	
F1/94	continuous side?	1.5	9-10 mm		grass	
F10/120		1	12 mm		grass	
F10/23	clipped finished with row of twining		twining cord 4 mm		tule, twining cord: sagebrush bark?	twining cord knotted to 7 mm diameter grass cord piece
F10/23	simple, ends looped back into row of twining		twining cord 2 mm		tule, twining cord: ?	
F10/24	simple, looped back into row		3 mm		tule, twining cord: sage or willow bark?	
F10/25			4-5 mm		tule, sewing cord: sagebrush bark	sewing cord twisted around warp several times, can't measure
F10/26	clipped, with row of twining		twining cord: 3 mm		tule, twining cord: sagebrush bark	one end of one twining weft charred
F10/27	clipped after row of twining		4 mm		tule, twining cord grass	
F10/28	simple, looped back into row		2 mm		tule, twining cord: ?	
F10/29	continuous side selvage, cordage twists between		6 mm		tule	
F10/30		1	12 mm		grass	
F10/34	simple, looped back into row	1	13 mm		tule	
F10/84		1	11-13 mm	47-49 mm	grass	
F10/86		1	12 mm		grass	end of one warp, one end of weft charred
F10/95		1	11-13 mm		grass	

Table 3. Mats, part 6.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	F10/97		L 19 cm; longest weft 10 cm	open twining	simple, z-slant
45FR201	F11/2	end selvage	L 22 cm; W 19 cm	sewing	sewing cord s-lay, twining cord s-lay
45FR201	F11/3	end selvage	L 20 cm; W 6 cm	sewing	sewing cord s-lay, twining cord s-lay
45FR201	F11/5	end selvage	L 18 cm; W 3.5 cm	sewing	sewing cord s-lay; twining cord 3 mm
45FR201	F13/1	end edge	L 10.5 cm; W 11.5 cm	open twining	z-slant
45FR201	F14/1	one length sewing with warps	L 23 cm; sewing cord 14 cm	sewing	sewing cord s-lay
45FR201	F2/107	one length sewing with warps	L 22.5 cm; sewing cord ~15 cm	sewing	sewing cord s-lay
45FR201	F2/109	one row twining, with warps	L 8 cm; longest weft 16 cm	open twining	z-slant
45FR201	F2/129	one row twining, with warp fragments	L 3 cm; longest weft 11 cm	open twining	z-slant
45FR201	F2/184	one length sewing with warps	L 11 cm; sewing cord 66 cm	sewing	sewing cord s-lay
45FR201	F2/2		L 44 cm; W 61 cm	open twining	simple, z-slant
45FR201	F2/3	one row twining with warp fragments	L 4.5 cm; longest weft 26 cm	open twining	z-slant
45FR201	F2/46	one row twining with very fragmentary warps	Length of weft 22 cm	twining	z-slant
45FR201	F2/53	one row twining, with warps	L 10 cm; longest weft 23 cm	twining? sewing?	z-slant, twining cord s-lay
45FR201	F2/59	end selvage?	L 22 cm; W 2.5 cm	twining	
45FR201	F2/98	one row twining with very fragmentary warps	Length of weft 10 cm	twining	z-slant
45FR201	F3/33	one row twining with fragmentary warps	L 5 cm; longest weft 26 cm	open? twining	z-slant
45FR201	F4/10 (2)		L 22.5 cm; longest sewing cord 25 cm	sewing	sewing cord s-lay
45FR201	F4/10 (b)	one length sewing with warps	L 14.5 cm; sewing cord 11 cm	sewing	sewing cord s-lay
45FR201	F4/11	end selvage	L 13 cm; W 39 cm	sewing?	twining cord s-lay
45FR201	F4/6	end selvage	L 6 cm; W 19 cm	close? twining	z-slant
45FR201	F4/8	one length sewing with warps	L 27 cm; sewing cord 25 cm	sewing	sewing cord s-lay

Table 3. Mats, part 6.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
F10/97		1.5	10 mm		grass	
F11/2	clipped after row of twining	2	sewing cord 7 mm; twining cord 3 mm	91 mm	tule, sewing cord grass, twining cord: ?	
F11/3	clipped after row of twining	2	sewing 6 mm; twining 3 mm		tule, sewing cord grass, twining cord ?	
F11/5	clipped after row of twining		6 mm	75 mm	tule, sewing cord grass?, twining cord: ?	
F11/5	clipped after row of twining		6 mm	75 mm	tule, sewing cord grass?, twining cord: ?	
F13/1	simple, looped back into row	1	7-9 mm	58 mm	grass?	
F14/1			10-13 mm		tule, sewing cord grass	
F2/107			4 mm		tule, sewing cord: indian hemp?	
F2/109		1	10 mm		grass	
F2/129		2	8-10 mm		tule	
F2/184			4-5 mm		tule, sewing cord: sagebrush bark	
F2/2		1	10-13 mm	160-177 mm	grass	
F2/3		1	11-13 mm		grass	
F2/46		1	10-12 mm		grass	
F2/53	row of twining acting as clipped selvage?	2	3 mm		tule, cord: indian hemp	
F2/59	simple, 'braided' selvage?				grass	
F2/98		1	10-13 mm		grass	
F3/33		1	13-14 mm		grass	
F4/10 (2)			9 mm		tule, sewing cord: ?	
F4/10 (b)			9 mm		tule, sewing cord: grass?	
F4/11	simple, warps bent back in complex pattern (Mallory calls 'braided')	1	twining cord: 3 mm		tule, twining cord indian hemp? willow bark?	
F4/6 p	simple? or just cut off?	1	12 mm		grass	
F4/8			8-9 mm		tule, sewing cord: grass	sewing cord wrapped around warp once

Table 3. Mats, part 7.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	F4/9	one length sewing with warp	L 18 cm; sewing cord 6 cm	sewing	sewing cord s-lay
45FR201	F7/12		L 9 cm; W 6.5 cm; L 12.5 cm, W 4 cm	open twining	z-slant
45FR201	F7/13	one row twining with warps	L 13 cm; W 4 cm	open twining	z-slant
45FR201	F7/15		L 35 cm; W 30 cm	open twining	simple, z-slant
45FR201	F7/16		L 12 cm; W 3 cm	open twining	diagonal, z-slant
45FR201	F7/17		L 10 cm; W 4 cm	open twining	diagonal? z-slant
45FR201	F7/18		L 10 cm; W 7.5 cm	open twining	simple, z-slant, weft s-lay cord
45FR201	F7/185	end selvage	L 21 cm; W 33 cm	sewing	sewin cord s-lay twining cord s-lay
45FR201	F7/19		L 7 cm; W 5 cm	open twining	simple, z-slant
45FR201	F7/20	one row twining with warps	L 10 cm; W 3 cm	open twining	z-slant
45FR201	F7/21		L 13 cm; W 4 cm	open twining	simple, z-slant
45FR201	F7/22		L 7 cm; W 4 cm	open twining	diagonal, z-slant
45FR201	F7/23		L 29 cm; W 9.5 cm	open twining	simple, z-slant
45FR201	F7/24	one row twining with warps	L 11 cm; W2.5 cm	open twining	z-slant
45FR201	F7/25		L 54 cm; W 18 cm	open twining	simple, z-slant
45FR201	F7/26		L 53 cm; longest weft 23 cm	open twining	simple, z-slant
45FR201	F7/28		L 30 cm; W 7 cm	open twining	simple, z-slant
45FR201	F7/29		L 36 cm; W 24 cm	open twining	diagonal, z-slant
45FR201	F7/30		L 13 cm; W 12 cm	open twining	diagonal, z-slant
45FR201	F7/31		L 27 cm; W 18 cm	open twining	simple, z-slant
45FR201	F7/32	side edge	L 45 cm; W 12 cm	open twining	simple, z-slant
45FR201	F7/33	side selvage	L 21 cm; W 4 cm	open twining	simple, z-slant
45FR201	F7/34	one row twining with warps	L 25 cm; W 36 cm	open twining	z-slant
45FR201	F7/39	side edge	L 36 cm; W 25	open twining	simple, z-slant
45FR201	F7/40		L 62 cm; 37 cm	open twining	simple, z-slant
45FR201	F7/48	end selvage	L 4.5 cm; W 7 cm	open twining	z-slant

Table 3. Mats, part 7.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
F4/9	end cinched like for row of twining		4-6 mm		tule, sewing cord sagebrush bark	
F7/12					grass	
F7/13					grass	
F7/15		1	8-11 mm	44-53 mm	grass	
F7/16		2	7 mm	15-16 mm	grass?	
F7/17		2	6-7 mm	16-17 mm	grass?	
F7/18		3	3-4 mm	8-11 mm	sagebrush bark	
F7/185	simple, 'braided', one row of twining below	1	sewing cord: 8 mm, twining cord 3 mm	80 mm	tule, sewing cord grass; twining cord: ?	
F7/19		2	7 mm	16 mm	grass?	
F7/20		1	13 mm		grass	
F7/21		1	10-11 mm	62 mm	grass	
F7/22		2	7 mm	14-15 mm	grass?	
F7/23		1	12-15 mm	71 mm	grass	
F7/24		1	13 mm		?	
F7/25		1	8-11 mm	60-72 mm	grass	
F7/26		1	9-11 mm	50-63 mm	grass	
F7/28		1	10-13 mm	59-67 mm	grass	
F7/29		2	6-7 mm	13-19 mm	grass	
F7/30		2	6-7 mm	12-15 mm	grass	
F7/31		1	9-11 mm	62-68 mm	grass	
F7/32	continuous side selvage, cordage twists between	.5	15-20 mm	85-100 mm	grass	
F7/33		1	13-16 mm	62 mm	grass	
F7/34		.5	20 mm		grass	
F7/39	continuous side selvage, cordage twists between	.5	15-17 mm	51-72 mm	warp: grass? weft: grass	
F7/40		1	12-15 mm	49-62 mm	grass	charred in two places on the sides
F7/48		1	10 mm		grass?	one end charred

Table 3. Mats, part 8.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR201	F7/5?	side selvage	L 19 cm; W longest weft 10 cm	open twining	simple, z-slant
45FR201	F7/55	one twist twining with warp, side?	L 33 cm; W 7.5 cm	open twining	z-slant
45FR201	F7/6	one row twining with warps	L 9 cm; W 3 cm	open twining	z-slant
45FR201	F7/77		L 17 cm; W 6 cm	open twining	simple, z-slant
45FR201	F7/78	one row twining with warp fragments	L 4.5 cm; longest weft 6 cm	open twining	z-slant
45FR201	F7/84	one length sewing with warps	L 18 cm; sewing cord 24 cm	sewing	sewing cord s-lay
45FR201	F7/85	end selvage	L 7.5 cm; W 23.5 cm	sewing?	twining cord s-lay
45FR201	F7/86	end selvage?	L 10 cm; longest weft 14 cm	close? twining	z-slant
45FR201	F9/12	end and side edge	L18 cm; W 8.5 cm	sewing	twining: z-slant, s-lay cord; sewing cord: s-lay; cordage along edge: s-lay
45FR201	F9/13	one row twined selvage with warps	L 9 cm; W 51 cm	open twining	z-slant
45FR201	F9/14		L 28 cm; longest weft 29 cm	open twining	simple, z-slant
45FR201	F9/15	one length sewing with warps	L 5.5 cm; sewing cord (twisted too tight to measure)	sewing	sewing cord s-lay
45FR201	F9/16	one length sewing with warp?	L 9 cm; sewing cord 24 cm	sewing?	cord s-lay
45FR201	no number	edge	L 20 cm; longest weft 79 cm	plaiting, twining, sewing	plaiting: twill 3/3; twining: z-slant, cord s-lay; sewing: s-lay cord
45FR201	Unk 1		L 20 cm; W 8 cm	open twining	diagonal, z-slant
45FR202	100	one row with warp fragment	L 2.5 cm; W 6 cm	twining	z-slant
45FR202	104	one row with fragmentary warps	L 3.5 cm; W 8 cm	open? twining	z-slant
45FR202	135	side edge?	L 18 cm; W 6 cm	open twining	

Table 3. Mats, part 8.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
F7/5?	continuous side selvage, cordage twists between	1	12-16 mm	72 mm	grass	
F7/55	one strand doubled around to become 2 wefts	.5	18 mm		grass	
F7/6					grass	
F7/77		1	8-10 mm	52 mm	grass	
F7/78		2	5-7 mm		tule	
F7/84			8-10 mm		tule, sewing cord grass	
F7/85	simple, warps bent back in complex pattern (Mallory calls 'braided')	2	twining cord: 3 mm		tule, twining cord indian hemp? willow bark?	
F7/86	simple, looped back into row?		17 mm		grass	
F9/12	row of twining acting as clipped selvage; side: sewing cord continuous with next row, through plies of side cord	2	twining cord: 3 mm, sewing cord: 5 mm, side cord: 9 mm	50-52 mm	tule, twining cord: indian hemp? side cord: sagebrush bark; sewing cord: grass; mend to twining: leather?	side cord attached to the side with the mended twining, sewn into with the sewing cord going from row to row
F9/13	simple, looped back into row	.5	17-21 mm		grass	
F9/14		1	10-14 mm	54-58 mm	grass	
F9/15			2-3 mm		tule, sewing cord: ??	
F9/16			3 mm		tule, cord: ?	
	plaited self	2	sewing cord: 11 mm, twining cord: 3 mm		tule, twining cord: indian hemp? sewing cord: sagebrush bark and grass	plaiting elements and warps not continuous, twining joins them, cut ends on the back
Unk 1		1	9-10 mm	47-53 mm	tule	
100		1	11 mm		grass	
104		1	10 mm		grass	
135	one weft doubled around to form other weft?				grass	

Table 3. Mats, part 9.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR202	136	one row with fragmentary warps	L 5 cm; W 16 cm	open? twining	z-slant
45FR202	137	end selvage row?	L 14 cm; W 4 cm	twining?	
45FR202	138	end selvage	L 5 cm; W 34 cm	open twining	z-slant
45FR202	139	end selvage	L 6 cm; W 39 cm	open twining	z-slant
45FR202	143	one row with fragmentary warps	L 8 cm; W 4 cm	open? twining	z-slant
45FR202	144	one row with fragmentary warps	L 3 cm; W 6 cm	open? twining	z-slant
45FR202	38	sewing cord with warps	L 17 cm; sewing cord 9.5 cm; 21 cm	sewing	sewing cord s-lay, made of 2 z-lays
45FR202	39	end selvage	L 16.5 cm; W 11 cm	sewing	sewing cord 4 ply, s-lay of 2 z-lays; twining cord s-lay
45FR202	51	one row with fragmentary warps	L 6.5 cm; W 11.5 cm	open twining	z-slant
45FR202	75	sewing cord with warp	L 17.5 cm; sewing cord 16 cm	sewing	sewing cord s-lay
45FR202	87, 89, 90			open twining	z-slant
45FR202	92	warp fragment	L 12 cm	sewing?	
45FR202	F1/1	end selvage	L 5 cm; W 42 cm	open twining	z-slant
45FR202	F1/12	end selvage	L 28 cm; W 59 cm	open twining	simple?, z-slant
45FR202	F1/13		L 38 cm; W 15 cm	open twining	simple, z-slant
45FR202	F1/14		L 44 cm; W 20 cm	open twining	simple, z-slant
45FR202	F1/15		L 42 cm, W 56 cm	open twining	simple, z-slant
45FR202	F1/18	one row twining with warps	L 3.5 cm; W 5.5 cm	open? twining	z-slant
45FR202	F1/19	end selvage row	L 21 cm; W 4 cm	twining	z-slant?
45FR202	F1/2		L 47 cm; W 33 cm	open twining	simple, z-slant
45FR202	F1/2		L 11 cm; W 4 cm	open twining	simple, z-slant

Table 3. Mats, part 9.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
136		1	10-11 mm		grass? tule?	
137	simple, 'braided' selvage?				grass	
138	simple, looped back into row	1.5	8-9 mm		grass	
139	simple, looped back into row	1.5	10 mm		grass	
143		1.5	9 mm		grass? tule?	
144		1	7 mm		grass	
38			5 mm		tule, cord grass	
39	clipped after final row of twining	1.5	4 mm		tule, cords grass	
51		1.5	10-12 mm		tule?	
75	end crimped from twined selvage		5 mm		tule, sewing cord grass	
87, 89, 90		1	14 mm		grass	first two falling apart, can't measure effectively, measurements from 90
92					tule	
F1/1	simple, 'braided' selvage	1.5	8-10 mm		grass	warps joined into much larger ones for selvage
F1/12	simple, looped back into row	1	11-13 mm	72-78 mm	grass	
F1/13		1	11-13 mm	44-50 mm	grass	one side charred
F1/14	possible continuous side, with cordage between	1	11-13 mm	63-65 mm	grass (more reed-like)	
F1/15		1	8-15 mm	36-40 mm	grass	
F1/18		1	12 mm		grass	
F1/19	simple, looped back into row				grass	charred along one end?
F1/2		1	10-13 mm	57-63 mm	grass	
F1/2		1	8-10 mm	52-53 mm	grass	

Table 3. Mats, part 10.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45FR202	F1/20		L 16 cm; W 9 cm	open twining	simple?, z-slant
45FR202	F1/21	one row with fragmentary warps	L 3 cm; W 7 cm	open? twining	z-slant
45FR202	F1/22	end and side selvage	L 8 cm; W 26 cm	open twining	z-slant
45FR202	F1/24		L 20 cm; W 7 cm	open twining	diagonal? z-slant
45FR202	F1/3	side selvage	L 15 cm; W 7 cm	open twining	simple, z-slant
45FR202	F1/35	one row twining with warp fragments	L 2.5 cm; W 29.5 cm	twining	z-slant
45FR202	F1/4	end selvage? side selvage?	L 6 cm; W 7 cm	open twining	z-slant
45FR202	F1/6	one row twining with warps	L 7 cm; W 12 cm	open twining	z-slant
45FR202	F1/7	end selvage	L 5.5 cm; longest weft 46 cm	open twining	z-slant
45FR202	F1/8	one row twining with warps	L 3 cm; W 6 cm	open? twining	z-slant
45FR202	F1/9		L 60 cm	open twining	z-slant
45FR202	Unk 14		L 12 cm; W 9 cm	open twining	simple, z-slant
45FR202	Unk 15	one row twining with warps	L 9 cm; W 5 cm	open twining	z-slant
45FR202	Unk 16		L 17.5 cm; W 7 cm	open twining	simple, z-slant
45FR202	Unk 17	one row twining with warps	L 11 cm; W 4.5 cm	open twining	simple, z-slant
45FR202	Unk 18	one row twining with warps	L 10.5 cm; W 6.5 cm	open twining	z-slant
45FR202	Unk 19	one row twining with warps	L 5.5 cm; W 15.5 cm	open twining	z-slant
45FR202	Unk 20		L 14 cm; W 10 cm	open twining	simple, z-slant
45FR202	Unk 21		L 15 cm; W 3 cm	open twining	z-slant
45FR202	Unk 22		L 16 cm; W 18.5 cm	open twining	simple, z-slant
45FR202	Unk 23		L 29; W 7.5 cm	open twining	simple, z-slant
45FR202	Unk 24	warp fragment	L 13 cm	open twining	
45FR202	Unk 25	warp fragment	L 9 cm	sewing	
45FR202	Unk 26	side selvage and twining row; twining rows fragmentary warps	L 25 cm; L 11 cm, W 6 cm	open twining	z-slant

Table 3. Mats, 10.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
F1/20		1.5	12 mm		grass	
F1/21		1	9-10 mm		grass	
F1/22	simple, 'braided' selvage, continuous side selvage	1	11-14 mm		grass	
F1/24		1	11-15 mm	56-57 mm	grass	
F1/3	continous side, with cordage inbetween	1	11-12 mm	57-60 mm	grass	AA71070: 192 ± 32 BP
F1/35		1	11-13 mm		grass	
F1/4	natural ends of grass stems as end selvage? beginning of continuous side selvage?	1	11-16 mm		grass	
F1/6		1.5	9-12 mm		grass	
F1/7	simple, 'braided' selvage	2	8-11 mm		grass	warps joined into much larger ones for selvage
F1/8		1	9 mm		grass	
F1/9					grass	warps bunched together, and wefts unraveling
Unk 14		1	10-12 mm	44 mm	grass	
Unk 15		1	11 mm		grass (more reed-like)	
Unk 16		1	10-11 mm	42-43 mm	grass	
Unk 17		1	10 mm	45 mm	grass	
Unk 18		1	11-16 mm		grass	
Unk 19		1	9-12 mm		grass	
Unk 20		1	11-12 mm	33 mm	grass	
Unk 21		1.5			grass	
Unk 22		1	14-16 mm	36-39 mm	grass	
Unk 23		1	11-12 mm	56-58 mm	grass (more reed-like)	
Unk 24				42 mm	grass	
Unk 25					tule	
Unk 26	cordage twists from continuous side	.5; 1	11 mm; 10-11 mm		grass; grass	two separate fragments in bag

Table 3. Mats, part 11.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45GR101	39	sewing cord with warps	L 16 cm; sewing cord 19.5 cm	sewing	sewing cord s-lay
45GR101	44	one row twining with warps	L 4 cm; W 12 cm	twining	z-slant
45GR101	54	one row twining with warps	L 5 cm; W 11.5 cm	open twining	z-slant
45GR101	61	warp fragments	L 5 cm	sewing?	
45GR101	69	row of twining and warp fragments		open twining	z-slant
45GR101	75	warp fragment	L 9.5 cm	sewing	
45GR101	77	one row twining with warp	L 1.5 cm; W 2.5 cm	twining	
45GR101	91	sewing cord with warps	L 26 cm; sewing cord 16.5 cm	sewing	sewing cord s-lay
45GR102	2	warp fragments	L 17.5 cm	twining?	
45GR102	4	one row twining with warp	L 4.5 cm; W 4 cm	open twining	z-slant
45GR102	7	warp fragment	L 9 cm		
45GR104	150	warp fragment	L 6.5 cm		
45GR104	214	warp fragment	L 9 cm		
45GR104	219	warp fragment	L 6.5 cm		
45GR104	221	warp fragments	L 9.5 cm		
45GR119	0		L 29.5 cm; sewing cord 71 cm	sewing	sewing cord s-lay
45GR79	?	one row twining with warps	L 10.5 cm; longest weft 43 cm	open twining	simple? z-slant
45GR79	1	one row twining with warps	L 7.5 cm; W 24 cm	open twining	z-slant
45GR79	10	one row twining with warps	L 4.5 cm; W 10 cm	open twining	z-slant
45GR79	16	one row twining with warps	L 9.5 cm; W 7 cm	open twining	simple? z-slant
45GR79	18	one row twining with warp fragments	L 1.5 cm; W 20 cm	twining	z-slant
45GR79	2	one row twining with warp fragments	L 3 cm; W 13 cm	twining	z-slant
45GR79	20	warp fragment	L 18.5 cm	sewing	
45GR79	21		L 8 cm; 7 cm	open twining	simple, z-slant
45GR79	27	one row twining with warps	L 5 cm; W 19 cm	open twining	z-slant
45GR79	4	one row twining with warps	L 3 cm; W 9 cm	open twining	z-slant
45GR79	8	one row twining with warps	L 8.5 cm; W 4 cm	open twining	z-slant
45GR79	9	side selvage	L 8.5 cm; 2.5 cm	open twining	simple, z-slant
45GR80	53	end selvage	L 39 cm; longest weft 17 cm; L 34 cm; longest weft 15 cm	sewing	sewing cord s-lay; twining z-slant, wefts s-lay cordage
45GR84	32	one row twining with warps	L 11 cm; W 13 cm	open twining	z-slant
45GR94				open twining	simple, z-slant

Table 3. Mats, 11.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
39			3 mm		tule, cord: indian hemp?	AA71080: 156 ± 34 BP
44		1	13-15 mm		tule	
54		1	8-9 mm		tule	
61	twining row (crimping)				tule	
69					tule	
75					tule	
77		4	3 mm		sagebrush bark warp, ?grass weft	
91			2 mm		tule, cord: indian hemp	
2				82 mm	tule	three fragments, longest has twining crimping in two places
4			7 mm		tule	
7					tule	
150					tule	
214					tule	charred at one end?
219					tule	
221					tule	
0			1-2 mm	95 mm	tule, sewing cord: indian hemp	
?			6 mm		tule?	
1		1	8-9 mm		tule? weft grass	
10			8 mm		bark? willow?	
16		2	5-6 mm	45 mm	tule?	interweft measured to impressions
18			9-11 mm		tule?	
2			6-8 mm		bark? willow?	
20	twining row (crimping)				tule	
21		1.5	6 mm	20-21 mm	bark? willow?	
27		1.5	7-8 mm		bark? willow?	
4		1.5	6-7 mm		bark? willow?	
8			7 mm		tule	
9	continous side, with cordage in between		4-5 mm	34 mm	tule warp, weft bark? willow?	
53	clipped after row of twining		4-5 mm	160 mm	tule?, sewing cord indian hemp, twining cord grass?	two pieces of same mat, not measured continuously
32			13 mm		tule?	
		1.5	7-9 mm	11-14 mm	sagebrush bark	mat too folded and falling apart to measure full size

Table 3. Mats, part 12.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45WW25	205		L 30 cm; sewing cord 20 cm	sewing	sewing cord s-lay
45WW25	216	end selvage	L 7 cm; W 8.5 cm	twining	z-slant
45WW25	218	length of sewing with warps	L 18 cm; sewing cord 14 cm	sewing	sewing cord s-lay
45WW25	219	rows of twining with warps	L 5 cm; W 2 cm; L 2 cm; W 2 cm	open? twining	z-slant
45WW25	225	one row twining with warps	L 3 cm; W 2 cm	open twining	simple, z-slant
45WW25	227		L 5 cm; W 3.5 cm	open twining	simple, z-slant
45WW25	231	possible warps	L 18.5 cm	sewing?	
45WW25	236	one row twining with fragmentary warps	L 10 cm; longest weft 77 cm	open? twining	z-slant
45WW25	238		L 4 cm; longest weft 8.5 cm	open? twining	z-slant
45WW25	299	length of sewing with warp	L 14 cm; sewing cord 3.5 cm	sewing	sewing cord s-lay
45WW25	309	sewing cord with warp	L 9 cm; sewing cord 11 cm	sewing	sewing cord s-lay
45WW25	312	sewing cord with warp	L 15 cm; sewing cord 33 cm	sewing	sewing cord z-lay
45WW25	327	sewing cord with warp	L 13 cm; sewing cord 9 cm	sewing	sewing cord s-lay
45WW25	328	sewing cord with warps	L 12.5 cm; sewing cord 42 cm	sewing	sewing cord s-lay
45WW25	337	sewing cord with warp	L 12.5 cm; sewing cord 19 cm	sewing	sewing cord s-lay
45WW25	340	one row twining with fragmentary warps	L 4 cm; longest weft 9cm	twining	z-slant
45WW25	342	one row twining with fragmentary warps	L 16 cm; longest weft 9 cm	twining	z-slant
45WW25	346		L 27 cm; longest weft 21 cm	sewing	sewing cord s-lay
45WW25	354?	one row twining with warps	L 9.5 cm; longest weft 18 cm	open twining	z-slant
45WW25	359	sewing cord with warps	L 11.5 cm; sewing cord 19 cm	sewing	sewing cord s-lay
45WW25	361	one row twining with fragmentary warps	L 6 cm; longest weft 62 cm	twining	z-slant
45WW25	362	crimped warps	L 23 cm	sewing	
45WW25	364	sewing cord with warp	L 33 cm; sewing cord 23 cm	sewing	sewing cord s-lay
45WW25	368	warp fragments		sewing	
45WW25	372		L 12.5 cm; longest weft 14 cm	open twining	simple, z-slant; one set of warps s-lay, rest s-twist

Table 3. Mats, part 12.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
205			6 mm	61 mm	tule, sewing cord grass	
216	simple		7 mm		tule	
218			9 mm		tule, sewing cord grass	loop on one end of cord, fibers combined into main cord after first warp
219		3	5 mm	9 mm	grass?	two unattached pieces
225		3	3-4 mm	7 mm	grass?	
227		3	4 mm	5-7 mm	grass?	
231	ends crimped from last row of twining				tule	
236		1	12-14 mm		grass	
238		1	7-8 mm		tule? grass?	
299			7 mm		tule, sewing cord grass	cord not actually attached to warp
309			5-6 mm		tule, sewing cord grass	
312			3-4 mm		tule, sewing cord grass	
327			7 mm		tule, sewing cord grass	
328			2-3 mm		tule, sewing cord: indian hemp?	
337	ends crimped from last row of twining	1	2-3 mm		tule, sewing cord: indian hemp?	
340			10-11 mm		grass	two pieces of weft measured continuously
342					tule	plies of weft coming apart
346			8-9 mm	56-64 mm	tule, sewing cord grass	
354?		1	12 mm		tule	
359			2-3 mm		tule, sewing cord: indian hemp?	
361		1	13 mm		grass?	
362	ends crimped from last row of twining				tule	sewing holes also visible on warps
364			5-6 mm		tule, sewing cord grass	
368	ends crimped from last row of twining				tule	probable sewing holes and end crimping
372		2.5	4 mm	9-11 mm	sagebrush bark	
398		2.5	4 mm	5 mm	grass?	
408	plaited self				tule	

Table 3. Mats, part 13.1

Site	Spec #	Mat portion	Size	Weaving type	Weaving subtype
45WW25	398		L 6 cm; W 4.5 cm	open twining	simple, z-slant
45WW25	408	side selvage	L 11 cm; 6 cm	plaiting	twill 3/3
45WW25	411		L 7 cm; W 4 cm	open twining	simple, z-slant
45WW25	421?	end selvage	L 43.5 cm; longest weft 34 cm	sewing	sewing cord s-lay
45WW25	440	one row twining with warps	L 1.5 cm; W 4 cm	open? twining	z-slant
45WW25	450	one row twining with warps	L 2.5 cm; W 4 cm	open? twining	z-slant
45WW25	489	one row twining with warps	L 1 cm; W 3 cm	open? twining	z-slant
45WW25	490	end selvage	L 2.5 cm; W 3 cm	open twining	diagonal, z-slant
45WW25	495	one row twining with warps	L 17 cm; W 9 cm	open twining	z-slant
45WW25	499	end selvage?	L 6 cm; W 7 cm	open twining	z-slant
45WW25	504	sewing cord with warps	L 21 cm; sewing cord 31 cm	sewing	sewing cord z-lay
45WW25	507		L 4 cm; W 2 cm	open twining	z-slant
45WW25	509		L 11 cm; W 12 cm	open twining	simple, z-slant
45WW25	517	one row twining with warps	L 2.5 cm; W 3.5 cm	open? twining	z-slant
45WW25	548	end selvage	L 28 cm; W 27 cm	sewing	sewing cord s-lay
45WW25	549	one row twining with warps	L 10.5 cm; longest weft 10 cm	open? twining	z-slant
45WW25	561	warp fragments			
45WW25	595	warp fragments			
45WW25	619	warp fragments			
45WW25	648	warp fragments			
45WW25	670	warp fragments			
45WW25	698	warp fragments?			
45WW25	720	warp fragments			
45WW25	728	warp fragments			
45WW25	732	warp fragments			
45WW25	741	warp fragments			
45WW25	754	warp fragments			

Table 3. Mats, part 13.2

Spec #	Selvage	Warps/cm	Weft diameter	Interweft distance	Material	Notes
411		2	7-8 mm	17 mm	sagebrush bark?	
421?	ends crimped from last row of twining	3	6-7 mm	47-51 mm	tule, sewing cord grass	flatter warps alternate with rounder ones, flat twist around round ones to be engaged by weft on opposite sideds of round one each weft
440		3	4 mm		grass	
450		3	4 mm		grass	
489		3	4 mm		grass	
490	simple, looped back into row	3	4 mm	5 mm	grass	
495			16 mm		grass	
499	simple, or warps doubled back to become next warp?	1.5	10 mm		grass	
504			5-7 mm		tule, sewing cord grass	
507			4 mm	5-6 mm	grass?	diagonal twining, or expanding number of warps?
509		1	7-10 mm	29-36 mm	grass	
517		3	3-4 mm		grass	
548	ends crimped from last row of twining	2	3-5 mm	38-40 mm	tule, sagebrush bark wefts	
549			7 mm		grass	
561					tule	bag of tule fragments
595					tule	bag of tule fragments
619					tule	bag of tule fragments
648					tule	bag of tule fragments
670					tule	bag of tule fragments
698					tule, grass, sagebrush bark	bunches of fibers
720					tule	bag of tule fragments
728					tule	bag of tule fragments
732					tule	bag of tule fragments
741					tule	bag of tule fragments, at least one with: crimping, sewing holes
754					tule	bag of tule fragments, with crimping

Table 4. Cordage

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	10	2	s	17.5 cm	11-13 mm	grass	one end finished with knot
45FR201	101	2	z	56 cm	8-11 mm	grass	
45FR201	102	2	s	27.5 cm	6-8 mm	grass	one end is charred
45FR201	103	2	s	41 cm	3-4 mm	grass	
45FR201	104	2	z	19 cm	3-4 mm	willow bark	
45FR201	105	2	z	24.5 cm	8 mm	grass	
45FR201	109	2	s	16.5 cm; 16 cm	5-6 mm; 4-6 mm	grass	two unattached pieces, one end of each is charred
45FR201	11	2	z	8.5 cm	14-15 mm	grass	one strand doubled over to make 2 plies
45FR201	111	2	z	40 cm	7-9 mm	grass	
45FR201	113	2	z	11 cm	12-14 mm	grass	
45FR201	114	2	z	17.5 cm	19 mm	retted? grass	
45FR201	115	2	z	23 cm	5-6 mm	grass	one end finished with knot
45FR201	116	2	z	108 cm	8-15 mm	grass	one end finished with knot, diameter increases from there
45FR201	117	2	z	24 cm	4-9 mm	grass	
45FR201	118 b	2	z; s	33 cm; 10 cm	12 mm; 8 mm	grass	two pieces in one knot, lengths are minimums
45FR201	118 c	2	s	25.5 cm	6-9 mm	grass	
45FR201	118 d	2	z	27 cm	7-8 mm	retted? grass	
45FR201	118 e	2	s	23 cm	5-6 mm	grass	
45FR201	12	2	s	17.5 cm	4-5 mm	grass	
45FR201	120	2	z	28 cm	8-15 mm	grass	narrows steadily to one end finished in knot
45FR201	121	2	s	51.5 cm	4-5 mm	sagebrush bark	
45FR201	122					grass, bark, tumpline	just a knot
45FR201	123	2	s	70 cm	3-5 mm	grass	two pieces knotted together, measured as continuous
45FR201	124	2	s	31 cm	4-5 mm	grass	
45FR201	125	2	z	29 cm	8 mm	grass	
45FR201	126	2	z	18 cm	7-11 mm	grass	
45FR201	127	2	z	26 cm	8-9 mm	grass	
45FR201	128	2	z	27 cm	7-10 mm	grass	
45FR201	129	2	z	53 cm	11-17 mm	grass	
45FR201	13	2	s	6.5 cm	17-18 mm	grass	
45FR201	130	2	z	41 cm	6-13 mm	grass	narrows steadily to end
45FR201	132	2	z	15 cm	7-9 mm	grass	
45FR201	133	2	z	28 cm	7-9 mm	grass	end finished in knot
45FR201	134	2	s	13.5 cm	5-6 mm	sagebrush bark	
45FR201	136	2	s	22 cm	10-12 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	137	2	s	21.5 cm; 8 cm	6 mm; 6 mm	grass	two unattached pieces, larger with knot in the middle, smaller with a knot finishing one end
45FR201	138 a	2	z	81 cm	6-9 mm	grass	
45FR201	138 b	2	s	50 cm	6-7 mm	sagebrush bark	knot near one end
45FR201	14	2	z	30 cm	12-14 mm	grass	
45FR201	140	2	s	17 cm	4-5 mm	grass	
45FR201	141	2; 4	s	31 cm	6 mm	sagebrush bark and grass	another strand added halfway, doubled over to make 4 ply at end of cord
45FR201	142	2	z	6 cm	10 mm	grass	
45FR201	144	2	z	9 cm	13-15 mm	grass?	
45FR201	145		z			grass	one big knot, but of twisted cord
45FR201	146	2	s	23 cm	7-8 mm	sagebrush bark and grass	
45FR201	146a	2	z	28 cm	6-8 mm	grass	
45FR201	147		z	6 cm		grass	fibers with residual twist, can't tell number of plies
45FR201	148	2	z	14 cm	6 mm	grass	one end finished in knot
45FR201	149	2	z	19 cm	9-11 mm	grass	
45FR201	15	2	z	14.5 cm	13-14 mm	grass	
45FR201	150	2	s	27.5 cm; 23.5 cm	5-10 mm; 5-6 mm	grass	two lengths, larger knotted to smaller, one end of larger piece is one ply doubled over to make the two
45FR201	151	2	s	28 cm	10-13 mm	grass	
45FR201	152	2	z	16.5 cm	9-11 mm	grass	
45FR201	153	2	s	16 cm	2-4 mm	sagebrush bark	
45FR201	155					bark	just a knot, no twisting
45FR201	157	2	s	39 cm	5-7 mm, 9-12 mm	grass	one end is one ply doubled over, larger diameter piece seems joined with a smaller diameter piece
45FR201	159	2	z	27.5 cm	12-15 mm	retted? grass	
45FR201	16	2	s	16.5 cm	6 mm	sagebrush bark	
45FR201	160	2	z	33 cm	19-21 mm	bark	rigid twisted twigs
45FR201	163	2	s	77 cm	9-12 mm	grass	
45FR201	164	2	s	47 cm	3-4 mm	sagebrush bark	length unsure: two pieces knotted, or one piece looped?
45FR201	165	2	s	51 cm	6-9 mm	grass	one end finished in knot, diameter steadily increases from that point
45FR201	166	2	z	16.5 cm	10-13 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	168 a	2	s	54 cm; 22.5 cm	5-10 mm; 4-5 mm	grass	one piece knotted in a circle to the other
45FR201	168b	2	z	70 cm	13-24 mm	grass	
45FR201	169 d	2	z		15 mm	grass	can't measure length: one big knot
45FR201	17	2	z	9.5 cm	14 mm	grass	
45FR201	170	2	s	38.5 cm	4-5 mm	grass	longest piece knotted around fibers, length measured to either side of knot
45FR201	172	2	z	19 cm	4-5 mm	sagebrush bark	specimen now in two pieces, measured continuously
45FR201	174	2	s	27.5 cm	5-7 mm	grass	
45FR201	175	2	s	18 cm	8 mm	grass	length unsure: two pieces knotted, or one piece looped?
45FR201	176	2	z	17.5 cm	10-12 mm	grass	
45FR201	177	2	z	13 cm	12-13 mm	grass	
45FR201	180	2	z	17 cm	4-5 mm	sagebrush bark	
45FR201	182	2	z	21 cm	4-5 mm	sagebrush bark	
45FR201	184	2	s	35 cm	7-9 mm	grass	one end finished in knot
45FR201	185	2	z	17 cm	12-14 mm	grass	
45FR201	186					bark	just a knot, no twisting
45FR201	187	2	z	58 cm	6-9 mm	grass	one end finished in knot, flattening near either end from being tied to something?
45FR201	188	2	z	40 cm	14-15 mm	grass	
45FR201	189	2	z	21.5 cm	12-14 mm	grass	
45FR201	19	2?	z	9 cm		grass	missing second ply
45FR201	190	2	z	81 cm	11-15 mm	grass	knot finishing end
45FR201	191	2	z	56 cm	7-9 mm	grass	narrows towards one end
45FR201	193	2	s	21 cm	10-11 mm	grass	
45FR201	194	2	z	25 cm	6-8 mm	grass	
45FR201	195	2	s	8.5 cm	4 mm	grass	one end finished in knot
45FR201	196	2	s	36 cm	8-12 mm	grass	
45FR201	197	2	z	16 cm	7-12 mm	grass	
45FR201	199	2	z	17 cm	11 mm	grass	
45FR201	2	2	s	11.5 cm	7-8 mm	grass	knot in middle
45FR201	20	2	s	55.5 cm	4-5 mm	sagebrush bark	
45FR201	200					bark	knot
45FR201	201	2	z	8.5 cm	4 mm	tule	
45FR201	202	2	z	15 cm	7 mm	sagebrush bark	
45FR201	203	2	z	11.5 cm	8 mm	twigs	rigid length of twisted bark
45FR201	204	2	s	22 cm	10 mm	grass	
45FR201	207	2	z	16.5 cm; 7 cm	9 mm; 4 mm	grass	smaller knotted to the larger

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	208	2	z	41.5 cm	9-10 mm	grass	one end finished in knot
45FR201	209	2	z	7.5 cm	7-8 mm	grass	one end finished in knot
45FR201	21	2	z	32 cm	12-14 mm	grass	
45FR201	210					grass	knot
45FR201	211 b	2	s	37 cm	4-5 mm	grass	
45FR201	211a	2	z	22 cm	10-13 mm	grass	one strand doubled over to make 2 plies
45FR201	212	2	z	10.5 cm		grass	one strand doubled to make two plies coming apart?
45FR201	213	2	z	3 cm	7 mm	grass	finishing knot from end of cordage?
45FR201	214	2	z	22 cm	13 mm	grass	
45FR201	217	2	z	24 cm	10-13 mm	grass	
45FR201	218	2	z	57 cm	6-10 mm	sagebrush bark	
45FR201	219	1?	z	21.5 cm	6-8 mm	grass	twisted fibers, one end charred
45FR201	220	2	z	18 cm	10-12 mm	grass	
45FR201	221	2	z	17 cm	14-16 mm	grass	
45FR201	222	2	z	19 cm	12-13 mm	grass	one end charred
45FR201	223	2	z	17 cm	14 mm	bark and twigs	rigid length of twisted bark
45FR201	224	2	z	24 cm	13-15 mm	grass	
45FR201	225	2	z	18 cm	9-12 mm	grass	
45FR201	226	2	z	18.5 cm	12-13 mm	grass	
45FR201	227	2	s	20.5 cm	3-4 mm	Indian hemp	
45FR201	228	2	s	9 cm	4-5 mm	grass	
45FR201	23	2	s	49 cm	3-4 mm	sagebrush bark	tied around the top of a 16 cm stick
45FR201	230	2	z	16 cm	10-12 mm	grass	
45FR201	231	2	z	22 cm	12-13 mm	grass	
45FR201	232	2	z	17 cm	8-9 mm	grass	
45FR201	233	2	s	20 cm	8-10 mm	grass	
45FR201	235	2	s	13 cm	7 mm	sagebrush bark	knotted around bunch of grass fibers
45FR201	236	2	z	15 cm	11-13 mm	grass	
45FR201	237	2	z	7 cm	12 mm	grass	one end finished in knot, other end very slightly charred
45FR201	239	2	z	17 cm	10-12 mm	grass	
45FR201	24	2	z	14 cm	11 mm	grass	
45FR201	240	2	z	43 cm	9-11 mm	grass	tied in a big knot with another piece of cordage?
45FR201	242	2	z	11.5 cm	2-3 mm	Indian hemp	tied through hole in piece of leather
45FR201	243	2	z	24 cm	9-10 mm	sagebrush bark	one end finished with knot
45FR201	244	2	z	9.5 cm	6 mm	grass	one end finished with knot

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	245	2	z	14.5 cm	12 mm	grass	one strand doubled over to make two plies
45FR201	246	2	z	23 cm	13-15 mm	grass	
45FR201	247	2	z	22 cm	11-13 mm	grass	first 6 cm is a loop, combined into fibers of main cord
45FR201	248	2	s	16 cm; 9 cm	7-8 mm; 6 mm	grass	two unattached pieces
45FR201	249	2	s	28.5 cm	7-8 mm	grass	one end charred
45FR201	25	2	z	33 cm	15 mm	grass	one strand doubled over to make 2 plies
45FR201	250	2	z	41.5 cm	9-12 mm	grass	one end finished in knot
45FR201	251	2	z	16 cm	13 mm	grass	
45FR201	252	2	z	30.5 cm	9-10 mm	grass	
45FR201	253	2	z	25 cm	17 mm	retted? grass	
45FR201	254	2	z	29 cm	10-13 mm	grass	
45FR201	256	2	z	16 cm	8-9 mm	grass	
45FR201	257	2	s	14 cm	4-5 mm	grass	
45FR201	260	3?	braid	17.5 cm	23 mm	grass	selvage from twined mat?
45FR201	261	2	z	16.5 cm	3-6 mm	grass	one end finished in knot
45FR201	264					grass	twisted fibers, no discernable plies
45FR201	265	2	z	11 cm	9 mm	grass	
45FR201	266	2	s	37 cm; 22 cm; 32 cm; 17 cm	5 mm; 5-7 mm; 5-6 mm; 4 mm	first 2: grass, second 2: sagebrush bark	included with mat, two pieces unattached, two pieces tied into loop with two knots of larger diameter on either end of smaller diameter
45FR201	267	2	s	12 cm; 7.5 cm	3 mm; 2-3 mm	grass	one piece knotted to to the other
45FR201	268	2	z	27 cm	4 mm	Indian hemp	
45FR201	269	2	z	28 cm	11-12 mm	grass	
45FR201	27			10 cm		grass	twisted fibers, no discernable plies
45FR201	270	2	s	14 cm	6 mm	grass	
45FR201	271	2	s	17.5 cm	5-7 mm	grass	two pieces almost unattached, measured continuously
45FR201	273	2	z	11 cm	11 mm	tule	
45FR201	274	2	s	4.5 cm	1 mm	sagebrush bark and grass	
45FR201	276	2	z	16 cm	10 mm	grass	in a big knot, hard to measure
45FR201	277	2	s	18.5 cm	9-11 mm	grass	
45FR201	278	2	s	17 cm	10-12 mm	grass	
45FR201	28		z?	14.5 cm		grass	twisted fibers, no discernable plies
45FR201	281	2	s	11.5 cm	5-7 mm	grass	
45FR201	282	2	s	33 cm	6 mm	grass	one end charred
45FR201	283	2	z	37 cm	8-10 mm	grass	end finished in knot

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	284	2	z	41 cm	7-10 mm	grass	
45FR201	285					grass	fibers in knot
45FR201	286	2	z	13 cm	9 mm	grass	
45FR201	29 a	2	z	14 cm	8-10 mm	grass	
45FR201	290	2	z	24 cm	3 mm	Indian hemp	
45FR201	291	2	z	18 cm	8 mm	tule	
45FR201	292	2	z	41 cm	6-10 mm	tule	diameter increases steadily from one end
45FR201	293	2	z	15 cm	5 mm	willow bark	
45FR201	295	2	s	23.5 cm	6-8 mm	sagebrush bark and grass	
45FR201	296	2	z	16 cm	4-5 mm	grass	one end finished in knot
45FR201	297					bark	knot
45FR201	298	2	z	17 cm	12-13 mm	grass	
45FR201	299					bark	knot
45FR201	3	2	s	6.5 cm	2 mm	sagebrush bark and grass	
45FR201	30	2	z	12 cm	8 mm	grass	
45FR201	300					grass, bark tumpline	one piece knotted to another
45FR201	302	2	s	31 cm	4-5 mm	grass	
45FR201	303	2	s	5 cm	4 mm	sagebrush bark and grass	tied around something, impressions left in cordage
45FR201	304	2		12 cm		tule	twisted fibers, no discernable plies
45FR201	306	2	z	24 cm	10-12 mm	grass	
45FR201	307	2	s	23.5 cm	6-7 mm	grass	
45FR201	308	2	z	21 cm	10-11 mm	retted? grass	
45FR201	309	2	z	14 cm	12-13 mm	grass	
45FR201	31	2	z	8 cm	8-9 mm	grass	
45FR201	310	3	braided	113 cm	21-24 mm	grass	loop at one end doubled back and joined into main cord
45FR201	311	2	z	15 cm	11-12 mm	grass	
45FR201	312		s			grass	twisted fibers coming out of a knot, or just stored in a circle?
45FR201	314	2	s	23 cm	2 mm	Indian hemp	
45FR201	315	2	z	27 cm	13-14 mm	sagebrush bark	
45FR201	318	2	s	21 cm	2-3 mm	Indian hemp	
45FR201	32	2	s	30 cm	17-20 mm	grass	
45FR201	320	2	z	13 cm	11-15 mm	grass	
45FR201	322	2	z	8 cm	12-16 mm	grass	
45FR201	324			16 cm		grass	twisted fibers, no discernable plies, one end charred

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	326	2	z	24 cm	6-7 mm	sagebrush bark	
45FR201	327	2	z	9 cm	4 mm	grass	
45FR201	328	2	z	7 cm		sagebrush bark	plies have come apart
45FR201	329	2	z	9 cm	8 mm	retted? grass	
45FR201	33					bark	one knot in a long length of bark
45FR201	332	2	z	38 cm	7-10 mm	grass	
45FR201	333	2	z	15 cm	7 mm	grass	
45FR201	335 a	2	s	20 cm	12-16 mm	grass	end is knotted into a mess, hard to measure length
45FR201	336	2	z	6 cm	9 mm	grass	
45FR201	337	2	s	24 cm	4-5 mm	grass	
45FR201	338	2	s	32.5 cm	3-5 mm	grass	
45FR201	339	2	z	13 cm	11 mm	grass	
45FR201	34	2?	z	9 cm		grass	second ply impressions?
45FR201	341	2	s	11 cm	7-8 mm	grass	
45FR201	342	2	s	13.5 cm	4-5 mm	grass	
45FR201	343	2	z	18 cm	7 mm	grass	end finished in knot
45FR201	345	2	s	25 cm	7-9 mm	grass	
45FR201	346	2	z	18 cm	9-12 mm	grass	end finished in knot
45FR201	347	2	s	9 cm	4-5 mm	grass	
45FR201	35	2	s	46 cm	4-5 mm	sagebrush bark and grass	two materials gives a contrasting colors effect
45FR201	354			12 cm		grass	twisted fibers, no discernable plies
45FR201	356	2	s	5 cm	4 mm	Indian hemp	
45FR201	358	2	z	10 cm	14 mm	grass	charred on both ends
45FR201	359	2	z	16 cm	14-16 mm	grass	one end charred
45FR201	36 a	2	s	39 cm	3-4 mm	sagebrush bark	
45FR201	366	2	z	7 cm	4-5 mm	grass	one end finished in knot
45FR201	366 b	2	s	20 cm	8-10 mm	grass	
45FR201	366c	2	s	9 cm	8-9 mm	grass	
45FR201	367	2	z	7.5 cm	4-5 mm	tule	
45FR201	368	2	z	35.5 cm	4-5 mm	willow bark	
45FR201	369	2	z	3.5 cm	3 mm	grass	
45FR201	37	2	s	13.5 cm	4-5 mm	sagebrush bark and grass	two materials gives a contrasting colors effect
45FR201	371	2	s	6 cm	5-6 mm	Indian hemp	
45FR201	372	2	s	9.5 cm	3-4 mm	grass	
45FR201	374	2				bark	knot in length of bark
45FR201	38	2	z	4.5 cm	10 mm	grass	
45FR201	381	2	s	9.5 cm	3 mm	Indian hemp	
45FR201	382	2	z	2.5 cm	4 mm	tule	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	39	2	z	11 cm	11-12 mm	grass	
45FR201	396	2	z	10 cm	4-5 mm	sagebrush bark	
45FR201	397	2	z	16 cm	12-13 mm	grass	
45FR201	4	2	z	28 cm	10-12 mm	grass	
45FR201	40			6 cm		grass	twisted fibers, no discernable plies
45FR201	404					bark	just twisted bark
45FR201	405	2	z	5.5 cm	4 mm	willow bark	
45FR201	41	2	z	5 cm	10 mm	grass	
45FR201	427	2	s	31.5 cm	9-10 mm	grass	one end finished in knot
45FR201	428	2	z	14.5 cm	5-6 mm	grass	
45FR201	43	2	s	16.5 cm	3 mm	sagebrush bark	
45FR201	436	2	s	6.5 cm	5 mm	grass	
45FR201	44	2	z	13 cm	4 mm	grass	two pieces, measured contiuously
45FR201	442	2	z	9.5 cm	9 mm	grass	
45FR201	443	2	z	10 cm	13 mm	grass	
45FR201	444	2	z	14 cm	13 mm	grass	
45FR201	445	2	z	15 cm	7 mm	grass	
45FR201	449					bark	length of bark wrapping two twigs together
45FR201	45	2	s	26 cm	3-4 mm	sagebrush bark	
45FR201	453	2	s	12 cm	13-14 mm	grass	
45FR201	46	2?	s	6.5 cm	4 mm?	grass	plies separating, hard to count
45FR201	469	2	z	15 cm	9-10 mm	grass	one end charred
45FR201	47	2	z	10 cm	14 mm	grass	
45FR201	470	2	s	27.5 cm	2 mm	Indian hemp	
45FR201	474	2	s	9.5 cm	5-6 mm	grass	
45FR201	48	2	z	5.5 cm	10 mm	grass	
45FR201	482	2	z	7 cm	6 mm	grass	one end charred
45FR201	484	2	z	26 cm	7 mm	grass	
45FR201	488	2	z	9 cm	7-8 mm	grass	
45FR201	491	2	s	8 cm	7 mm	Indian hemp	
45FR201	5	2	z	17 cm	21-22 mm	grass	one strand doubled over to become two plies
45FR201	502	2	s	14.5 cm	6 mm	grass	
45FR201	503	2	z	20.5 cm	11-12 mm	grass	
45FR201	506	2	z	8 cm	20 mm	bark	one strand doubled over to make 2 plies, one end charred
45FR201	511	2	z	12 cm	14-15 mm	grass	
45FR201	518	2	z	10 cm	5 mm	grass	
45FR201	519	2	z	12 cm	7-8 mm	sagebrush bark	
45FR201	52	2	z	9 cm	11 mm	grass	
45FR201	527	2	z	3 cm	5 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	532	2	z	22 cm	8-9 mm	grass	
45FR201	540	2	s	17.5 cm	3-4 mm	grass, bark, tumpline	
45FR201	543	2	z	27 cm	8-11 mm	sagebrush bark	
45FR201	544	2	z	6 cm	13 mm	grass	
45FR201	55	2	z	38 cm	10-15 mm	grass	bunch of grass fibers through plies in two places to make loop in the middle of the piece
45FR201	553					sagebrush bark?	bunch of unused fibers
45FR201	556	2	z	21 cm	4-6 mm	grass	one end finished with knot
45FR201	56		z	17 cm		bark	rigid twisted bark and twigs
45FR201	59	2	z	26 cm	21-29 mm	bark	rigid length of twisted bark
45FR201	6	2	s	12.5 cm	5 mm	grass	
45FR201	60	2	z	26 cm	5-9 mm	grass	one end finished with knot
45FR201	61	2	s	15 cm; 15 cm; 15 cm	6-7 mm, 4 mm, 6-7 mm	sagebrush bark and grass	three unattached pieces, 4 mm piece one end is one strand doubled over to make the 2 plies
45FR201	63	2	z	29 cm	9-13 mm	grass	
45FR201	637		z	19 cm		bark and twigs	rigid length of twisted bark, hard to discern plies
45FR201	64	2	z	31 cm	18-19 mm	grass	probable mat twining fragment, holes for warps
45FR201	644		z	21 cm		bark	rigid twisted bark and twigs
45FR201	645					grass, bark, tumpline	bunch of unused fibers
45FR201	65	2	s	24.5 cm	3-4 mm	sagebrush bark	
45FR201	67	2	z	11.5 cm	11 mm	grass	
45FR201	68	2	z	13 cm	14-15 mm	grass	possible mat twining? hard to tell if ends are warp fragments or spliced ends
45FR201	7	2	s	35 cm	3-4 mm	sagebrush bark	
45FR201	70	2	s	11 cm, 8 cm	5-7 mm; 4-6 mm	grass	
45FR201	72	2	z	23.5 cm	14 mm	grass	
45FR201	74	2	z	14 cm	11 mm	grass	
45FR201	75	2	z	17 cm	11-13 mm	grass	
45FR201	76	2	z; s	23 cm; 14.5 cm	2-7 mm; 5 mm	grass	two pieces knotted together at centers. one end of smaller finished in knot, one end of larger charred
45FR201	78	2	z	14.5 cm	13-14 mm	grass	
45FR201	8	2	z	6 cm	5 mm	grass	one end finished with knot
45FR201	80			4 cm		grass	twisted fibers, no discernable plies

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	81	2	z	6 cm; 5 cm	9 mm; 8 mm	grass	two unattached pieces
45FR201	83	2	z	74 cm	9-12 mm	sagebrush bark	two pieces knotted together, measured continuously, one end finished with knot
45FR201	84	2	s	5 cm	8 mm	grass	knot on end
45FR201	86	1?	s	10.5 cm	10 mm	sagebrush bark	twisted fibers, no discernable plies
45FR201	88	2	z	4 cm	6 mm	willow bark	
45FR201	89		s	13 cm		grass	plies separating, hard to count
45FR201	9	2	s	19 cm	3-4 mm	sagebrush bark	
45FR201	90	2	z	9 cm	5-9 mm	grass	diameter slowly increases from one end to the other
45FR201	93	2	z	16 cm	9-10 mm	grass	
45FR201	94	2	z	29 cm	18-19 mm	grass	
45FR201	96	2	z	18 cm	10-12 mm	grass	
45FR201	97	2	z	47 cm	13-15 mm	grass	
45FR201	98	2	z	10 cm	9 mm	tule	mat twining row fragment? possible holes from warps
45FR201	99	2	z	37 cm	10-13 mm	grass	
45FR201	F/25	2?	z	13.5 cm		bark	rigid one ply of twisted bark
45FR201	F1/10	2	z			grass	big knot, plies separating
45FR201	F1/100					grass	knot of twisted fibers
45FR201	F1/101					grass	twisted fibers, looks like disintegrated cordage
45FR201	F1/102	2	z	14 cm		grass	plies separating
45FR201	F1/109	2	s	38.5 cm	4-5 mm	sagebrush bark	
45FR201	F1/11	2	s	15 cm	3-4 mm	grass	
45FR201	F1/110	2	s	28 cm	6-7 mm	sagebrush bark	
45FR201	F1/111	2	z	20 cm	12-15 mm	grass	
45FR201	F1/113	2	z	15 cm	10 mm	grass	
45FR201	F1/114	2	s	30 cm	9-11 mm	grass	
45FR201	F1/115	2	z	103 cm	12 mm	grass	
45FR201	F1/12	2?	s	9 cm		grass	second ply impressions?
45FR201	F1/12	2	z	13.5 cm	10 mm	grass	
45FR201	F1/13	2	s	10.5 cm	4 mm	grass	
45FR201	F1/14	2	s	26 cm	3-4 mm	grass	
45FR201	F1/15	2	z	22 cm	15-18 mm	grass	
45FR201	F1/16	2	z	29 cm	11-13 mm	grass	length of fibers between two plies in middle of piece
45FR201	F1/17	2?	z	27 cm		grass	second fiber impressions?
45FR201	F1/19	2	s	11 cm	7-8 mm	grass	
45FR201	F1/20	2		5 cm		grass	plies separating
45FR201	F1/25	2	s	52 cm	4-5 mm	grass	
45FR201	F1/26	2	s	22 cm	4 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F1/27	2	s	31 cm	4 mm	grass	
45FR201	F1/29	2	z	16 cm	12-14 mm	grass	
45FR201	F1/30					grass	bunch of twisted fibers
45FR201	F1/37	2	s	10.5 cm	5 mm	grass	
45FR201	F1/38	2	z	18.5 cm	10 mm	grass	
45FR201	F1/4	2	s	26.5 cm	4-7 mm	grass	end finished with knot, diameter decreases steadily to that end
45FR201	F1/40	2	z	26 cm	12-14 mm	grass	
45FR201	F1/41	2	z	15 cm	16 mm	grass	
45FR201	F1/42	2	z	47 cm	11 mm	grass	
45FR201	F1/43	2	s	16.5 cm	3 mm	grass	
45FR201	F1/44	2	z	26 cm	15-17 mm	grass	
45FR201	F1/45	2	z	18 cm	12-15 mm	grass	one strand doubled over to make 2 plies
45FR201	F1/46	2	z	24 cm	14-15 mm	grass	
45FR201	F1/47	2	z	48 cm	12-15 mm	grass	
45FR201	F1/48	2	s	45 cm	3-5 mm	grass	
45FR201	F1/49	2	s	4 cm		grass	finishing knot
45FR201	F1/5	2	z	55 cm	16-21 mm	grass	
45FR201	F1/51	2	s	11 cm	6 mm		
45FR201	F1/52	2	z	41 cm	12-17 mm	bark and twigs	rigid length of twisted bark
45FR201	F1/54	2	z	13 cm	12-13 mm	tule	
45FR201	F1/56	2	z	18 cm	10-13 mm	grass	
45FR201	F1/58	1?	z	12 cm	5 mm	grass	fibers are twisted, but hard to discern number of plies
45FR201	F1/6	2	z	21 cm	14-16 mm	grass	
45FR201	F1/60	2	s	29 cm	11-14 mm	grass	
45FR201	F1/61	2? 3?	s	30 cm	7-8 mm	grass	2 ply at one end, sort of 3 ply in middle, recombining to different 2 ply at other end?
45FR201	F1/64	2	z	15 cm	16 mm	grass	
45FR201	F1/65	2	z	13 cm	13 mm	grass	
45FR201	F1/7	2	z	14 cm	15 mm	grass	
45FR201	F1/74	2	z	15 cm	9-13 mm	grass	
45FR201	F1/75			16.5 cm		grass	twisted fibers, no discernable plies
45FR201	F1/76	2	z	46 cm	13-15 mm	grass	
45FR201	F1/77	2	s	27 cm	3-4 mm	native bunch grass	
45FR201	F1/78	2	z	14 cm	8 mm	grass	
45FR201	F1/79	2	z	11.5 cm	12 mm	grass	
45FR201	F1/8	2	z	10 cm		grass	plies separating
45FR201	F1/80	2	s	11 cm	6-7 mm	grass	
45FR201	F1/81	2	z	6 cm	6 mm	grass	end finishing knot

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F1/82	2	s	38 cm	3-4 mm	sagebrush bark	
45FR201	F1/84	2	s	26 cm	6-7 mm	grass	one ply doubled over to become the second, other end knotted
45FR201	F1/85	2	s	10 cm	5 mm	grass	
45FR201	F1/86	2	z	28 cm	11 mm	grass	
45FR201	F1/87	2	z	30 cm	9-12 mm	grass	
45FR201	F1/88	2	s	31.5 cm	4 mm	grass	
45FR201	F1/9	2	s	10 cm	4 mm	grass	
45FR201	F1/95	2	s	85 cm	6-10 mm	grass	series of eight loops
45FR201	F1/96	2	z	14 cm	10 mm	grass	
45FR201	F1/97	2	s	22 cm	4 mm	grass	
45FR201	F1/98					grass	knot, probably finishing knot from cordage
45FR201	F1/99	2	z	9 cm	11 mm	grass	
45FR201	F10/10	2	s, z	55.5 cm; 9 cm	4-5 mm; 3 mm	sagebrush bark; Indian hemp?	short length knotted onto 42.5 cm stick, longer length tied to stick by that knot; length of untwisted indian hemp fibers wrapped around center
45FR201	F10/100	2	s	34 cm	4 mm	grass	
45FR201	F10/101	2	s	18 cm	4 mm	sagebrush bark	
45FR201	F10/102	2	z	13 cm	13 mm	grass	very big knot
45FR201	F10/103	2	z	21 cm	7 mm	grass	
45FR201	F10/104	2	z	14 cm	4-5 mm	grass	one end finished in knot
45FR201	F10/105	2	z	6 cm	14 mm	grass	
45FR201	F10/106	2?	z	7.5 cm		grass	second ply impressions
45FR201	F10/107	2	z	14 cm	14 mm	grass	
45FR201	F10/108	2	z	12 cm	12-13 mm	grass	
45FR201	F10/109	2	z	9 cm	16 mm	grass	
45FR201	F10/11	2	z	18 cm	11-27 mm	bark and twigs	rigid length of twisted bark
45FR201	F10/11	2	z	17 cm	13-15 mm	grass	
45FR201	F10/111	2	z	17 cm		grass	part of mat twining? size of twist impressions suggest holes for warps
45FR201	F10/112	2	z	18 cm		grass	plies coming apart
45FR201	F10/113	2	z	13 cm	17 mm	retted? grass	
45FR201	F10/114	2	z	36 cm	11-12 mm	grass	one strand doubled over to become two plies, other end tied off with smaller fibers
45FR201	F10/115	2	z	9 cm	23-24 mm	grass	
45FR201	F10/116	2	z	11 cm	13-14 mm	grass	
45FR201	F10/117	2	z	29 cm	12-14 mm	grass	
45FR201	F10/118	2	s	36 cm		grass	plies coming apart

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F10/119	2	z	11 cm	11 mm	grass	possible mat twining, holes for warps
45FR201	F10/12			9 cm		bark	curl of bark, used to be wrapped around something?
45FR201	F10/121	2	s	13 cm	11 mm	sagebrush bark and grass	end finished in knot
45FR201	F10/122	2	z	11 cm	11 mm	grass	
45FR201	F10/125	2	z	18 cm	13-14 mm	grass	
45FR201	F10/126	2	z	28 cm	6-8 mm	grass	knot finishing one end, two other knots along length
45FR201	F10/127	2	z	12 cm; 10.5 cm	9-10 mm; 10 mm	grass	one unattached pieces, one end of each charred
45FR201	F10/13					grass	bunch of twisted fibers
45FR201	F10/14					grass	bunch of twisted fibers
45FR201	F10/15			15 cm		grass	finishing knot and remains of one ply of the cord
45FR201	F10/16					grass	knot
45FR201	F10/17					bark	knots tied in piece of bark, edges charred
45FR201	F10/18	2?	z	7.5 cm		grass	second ply missing by impressions
45FR201	F10/19					grass	bunch of twisted fibers
45FR201	F10/20					grass	knot, finishing knot from end of cordage?
45FR201	F10/21					tule?	knot tied in length of ?tule
45FR201	F10/22					grass	piece of grass tied around bunch of untwisted lengths
45FR201	F10/24	2	z	20 cm	11-13 mm	grass	one end charred
45FR201	F10/31	2	s	5 cm	3 mm	grass	
45FR201	F10/34	2	s	14.5 cm	5 mm	grass	one end finished in knot
45FR201	F10/35	2	s	20 cm	3-4 mm	grass	
45FR201	F10/36	2	s	12 cm	6 mm	grass	one end finished in knot
45FR201	F10/37	2	s	21 cm	4-5 mm	grass	
45FR201	F10/38	2	s	12 cm		grass	plies coming apart
45FR201	F10/39	2	s	20 cm	5-6 mm	grass	
45FR201	F10/40	2	s	14 cm	6-8 mm	grass	
45FR201	F10/41	2	z	15 cm	12 mm	grass	
45FR201	F10/42	2	s	18 cm	8-11 mm	grass	
45FR201	F10/43	2	s	9 cm	4-5 mm	grass	one end finished in knot
45FR201	F10/44	2	s	17 cm	8-9 mm	grass	
45FR201	F10/45	2	s	24 cm	3 mm	sagebrush bark?	
45FR201	F10/46	2	s	29 cm	8 mm	sagebrush bark	
45FR201	F10/47	2	s	8 cm	5-6 mm	grass	
45FR201	F10/48	2	s	8 cm	6 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F10/49	2	s	7 cm	16 mm	grass	
45FR201	F10/50	2	z	13 cm	10 cm	grass	knot tied to make loop 6 cm from end
45FR201	F10/51	2	z	39 cm	8-9 mm	grass	tied into a loop, two ends knotted to each other
45FR201	F10/52	2	z	9 cm	6 mm	grass	
45FR201	F10/53	2	z	13 cm	10-11 mm	grass	
45FR201	F10/54	2	z	32 cm	7-9 mm	grass	
45FR201	F10/55	2	z	7 cm	18 mm	grass	
45FR201	F10/56	2	z	17 cm		grass	piles coming apart
45FR201	F10/57	2	z	18 cm	8-9 mm	grass	
45FR201	F10/58	2	z	12 cm	13-15 mm	retted? grass	
45FR201	F10/59	2	z	37 cm	7-9 mm	willow bark	
45FR201	F10/61	2	z	17 cm	7-8 mm	grass	end finished in knot
45FR201	F10/62	2	z	17 cm	13-14 mm	grass	
45FR201	F10/63	2	z	20 cm	10-11 mm	grass	
45FR201	F10/64	2	z	12 cm	11 mm	grass	
45FR201	F10/65	2	z	19 cm	10-11 mm	grass	
45FR201	F10/66	2	z	9 cm	15-17 mm	grass	one end charred
45FR201	F10/67			14 cm		grass	bunch of twist fibers
45FR201	F10/68	2	z	51 cm	9-12 mm	grass	
45FR201	F10/69	2	z	33 cm	9-16 mm	grass	
45FR201	F10/70	2	z	12 cm	13 mm	grass	
45FR201	F10/71	2	z	17 cm	21 mm	grass	part of mat twining? possible holes for warps
45FR201	F10/72	2	z	10 cm	10 mm	grass	
45FR201	F10/73	2	z	11 cm		grass	plies coming apart
45FR201	F10/74	2	z	10 cm	7-13 mm	grass	both ends charred
45FR201	F10/75	2	z	12.5 cm	8 mm	grass	
45FR201	F10/76	2	z	7.5 cm	4 mm	sagebrush bark	
45FR201	F10/77	2	z	14 cm	11-12 mm	grass	
45FR201	F10/78	2	z	7.5 cm	10 mm	grass	
45FR201	F10/79	2	z	39 cm	5-7 mm	grass	knot making small loop at end
45FR201	F10/80	2	z	16 cm	15 mm	grass	
45FR201	F10/81	2	z	40 cm	11-15 mm	grass	
45FR201	F10/82	2	z	12.5 cm	12-14 mm	grass	
45FR201	F10/88					bark	bark fibers wrapped around two twigs
45FR201	F10/89					bark	one piece knotted to another
45FR201	F10/90	2?	z	13 cm		grass	missing second ply by impressions
45FR201	F10/91	2	z	6 cm		grass	part of mat twining? size of twist impressions suggest holes for warps
45FR201	F10/92					grass	couple of twisted fibers
45FR201	F10/93			13 cm		grass	bunch of twisted fibers

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F10/94	2?	s	8 cm		grass	second ply missing by impressions?
45FR201	F10/95	2	s	16.5 cm	6-9 mm	grass	
45FR201	F10/96	2	s	17.5 cm	4 mm	grass	
45FR201	F10/97	2	s	17.5 cm	6-7 mm	grass	
45FR201	F10/98	2	s	11 cm	4-6 mm	grass	
45FR201	F10/99	2	s	44 cm	4-5 mm	grass	
45FR201	F11/12					grass	knot, probably finishing knot from cordage
45FR201	F11/14	2	s	35 cm	5-8 mm	grass	narrows to one end, finished in knot
45FR201	F11/15	2	s	47 cm	6-9 mm	grass	
45FR201	F11/16	2	s	3 cm	2 mm	sagebrush bark?	
45FR201	F11/18	2	s	2.5 cm	4 mm	grass	
45FR201	F11/20	4?	s (of 2-ply piece)	8.5 cm	3 mm (of 2-ply piece)	fibrous grass	2 ply piece has impressions like there was a second ply, for 4 ply?
45FR201	F11/21	2	s	15 cm	6 mm	grass	
45FR201	F11/22	2	s	6 cm	4-5 mm	grass	
45FR201	F11/23	2	s	23.5 cm	4-5 mm	grass	
45FR201	F11/24	2	s	11.5 cm	4 mm	sagebrush bark and grass	
45FR201	F11/26					sage, cedar, tule bark	bunch of twisted fibers
45FR201	F11/27	2	z	59 cm	4-13 mm	grass	one end finished with knot, diameter increases steadily from that end
45FR201	F11/28	2	z	18 cm	10-12 mm	grass	
45FR201	F11/29	2	z	6 cm	7-8 mm	grass?	
45FR201	F11/30	2	z	7 cm		grass	plies are separating
45FR201	F13/13					grass	couple of twisted fibers
45FR201	F13/14					grass	bunch of twisted fibers
45FR201	F13/15	2?		13 cm		bark	rigid one ply of twisted bark
45FR201	F13/16		z?	16 cm		bark	rigid twisted bark and twigs
45FR201	F13/17 p	2	z	28 cm	24-29 mm	willow?	rigid twist of twigs
45FR201	F13/18	2	z	41 cm	17-19 mm	twigs/ bark	rigid twist of bark and twigs
45FR201	F13/20	2	z	8 cm	11-12 mm	bark?	possible mat fragment, holes for warps
45FR201	F13/20	2	z	18 cm	9 mm	grass	
45FR201	F13/21	2	s	40 cm	10-12 mm	grass	
45FR201	F13/23			9 cm		grass	knot, probably finishing knot
45FR201	F13/24					grass	knot, probably finishing knot
45FR201	F13/25	2	z	18 cm	12 mm	grass	one end finished with knot
45FR201	F13/26		s			grass	bunch of twisted fibers, making up one ply?
45FR201	F13/27	2	z	10 cm	11 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F13/28	2	z	17 cm	16 mm	grass	
45FR201	F13/29	2	z	21 cm	11-12 mm	grass	
45FR201	F13/31	2	z	11 cm	12 mm	grass	
45FR201	F13/32	2	z	10 cm	9 mm	grass	
45FR201	F13/33	2	z	26 cm	10-11 mm	grass	
45FR201	F14/2	2	z	13 cm	8 mm	tule	
45FR201	F14/3	2?	z	8 cm		tule	two unattached pieces of tule, two plies?
45FR201	F2/100	2	s	17 cm	8-9 mm	grass	one end finished in knot
45FR201	F2/101	2	z	26 cm	11-14 mm	grass	one ply doubled over at one end to become second
45FR201	F2/102	2	z	27 cm	13-18 mm	grass	
45FR201	F2/103	2	z	18 cm	10-11 mm	grass	one end finished in knot, loose knot in middle
45FR201	F2/104	2	z	74 cm	15-20 m	grass	one end has a loop created by splicing end into plies of main cord
45FR201	F2/105	2	s	10 cm	6-7 mm	grass	
45FR201	F2/106	2	z	13 cm	9 mm	grass	
45FR201	F2/108	2	s	24 cm	6-8 mm	grass	
45FR201	F2/110	2	s	19 cm	9-10 mm	grass	
45FR201	F2/111	2	z	39 cm	12-16 mm	grass	
45FR201	F2/113	2	z	11 cm	12-13 mm	grass	
45FR201	F2/114	2	s	80 cm	6-10 mm	sagebrush bark	
45FR201	F2/115	2	s	31 cm	9-10 mm	grass	
45FR201	F2/117	2	z	10 cm	5-6 mm	grass	one end finished in knot
45FR201	F2/118	2?		30 cm		bark	rigid one ply of twisted bark
45FR201	F2/119	2	s	59 cm	6-10 mm	grass	
45FR201	F2/120					grass	fibers in knot
45FR201	F2/121					grass?	fibers in knot
45FR201	F2/122	2	s	7 cm	4-5 mm	grass	one end finished in knot
45FR201	F2/124		z?	17 cm		bark	rigid twisted bark and twigs
45FR201	F2/125		z?	15 cm		bark	rigid twisted bark and twigs
45FR201	F2/128	2	s	15 cm	4 mm	sagebrush bark	one end finished in knot with length of fibers beyond, other end ends in knot, but looks broken after; length of fibers tied to middle
45FR201	F2/130	2	z	5.5 cm	13 mm	grass	
45FR201	F2/132	2	s	8 cm	4-6 mm	grass	
45FR201	F2/149	2	z	42 cm	11-14 mm	grass	
45FR201	F2/150	2?	z	7.5 cm		tule	a few twisted pieces, can't tell plies
45FR201	F2/151	2	s	23.5 cm	6-7 mm	grass	
45FR201	F2/152	2	z	35 cm	8-10 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F2/153	2	s	132 cm	3-4 mm	sagebrush bark	
45FR201	F2/154					grass	fibers in knot
45FR201	F2/155	2?	z	17 cm	6 mm	sagebrush bark	twisted fibers, second ply impressions?
45FR201	F2/155					bark	fibers, no twist
45FR201	F2/156	2	z	34 cm	12-15 mm	grass	
45FR201	F2/157	2	z	45 cm	15-20 cm	grass	
45FR201	F2/158	2	z	13 cm	12 mm	grass	
45FR201	F2/159	2	s	15 cm	4 mm	grass	
45FR201	F2/160	2	z	54 cm	5-8 mm	grass	
45FR201	F2/161	2	z	14 cm	11-12 mm	grass	
45FR201	F2/162	2	z		7 mm	grass	can't measure length, one big knot, end charred
45FR201	F2/163					bark	one piece of bark knotted to another
45FR201	F2/164					sagebrush bark?	fibers in knot
45FR201	F2/165					grass	fibers in knot
45FR201	F2/166	2	z	20.5 cm	8-9 mm	grass	
45FR201	F2/167	2	z	30 cm; 7 cm	9-14 mm	grass	one piece attached between plies of the longer one
45FR201	F2/168	2	z	23 cm	12-15 mm	grass	
45FR201	F2/169	2	z	33 cm	17-20 mm	grass	
45FR201	F2/170	2	z	10 cm	8 mm	grass	
45FR201	F2/171	2	z	16 cm	11-13 mm	grass	
45FR201	F2/172	2	z	24 cm	10-11 mm	grass	
45FR201	F2/173	2	z	30 cm	14-15 mm	grass	
45FR201	F2/174	2	z	16 cm	12 mm	grass	
45FR201	F2/175	2	s	16.5 cm	4 mm	grass	
45FR201	F2/176	2	s	15 cm	2-3 mm	grass	
45FR201	F2/177	2	s	59 cm	4-12 mm	grass	diameter decreases steadily towards end
45FR201	F2/178	2	s	48 cm	2-3 mm	sagebrush bark	
45FR201	F2/179	2	s	13 cm	3-4 mm	grass	end finished in knot
45FR201	F2/180					willow bark	just fibers
45FR201	F2/181		z?	35 cm		bark	semi-rigid twist of bark and twigs
45FR201	F2/20	2	z	17 cm	14-16 mm	grass	one ply much larger than the other
45FR201	F2/21					grass	bunch of twisted fibers
45FR201	F2/23	2	z	27 cm	9-10 mm	grass	
45FR201	F2/24					grass	knot, finishing knot from end of cordage?
45FR201	F2/25					grass	finishing knot from end of cordage

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F2/26	1?	z	24 cm	5 mm	grass	
45FR201	F2/27	2	z	49 cm	10-12 mm	grass	one end tied with one fiber from cord to finish?
45FR201	F2/28	2	s	14 cm	12 cm	grass	end knotted twice
45FR201	F2/29	2	z	7 cm	7-8 mm	grass	
45FR201	F2/31	2	s	12 cm	5 mm	grass	one end finished in knot
45FR201	F2/32	2	z	18 cm	11-12 mm	grass	
45FR201	F2/32	2	z	7 cm	9 mm	grass	one end finished in knot
45FR201	F2/33	2	z	22 cm	7-9 mm	grass	
45FR201	F2/34	2	s	17.5 cm	5-6 mm	grass	
45FR201	F2/35	2?	z	16 cm		sagebrush bark	one ply, missing second by impressions?
45FR201	F2/36	2	z	22 cm	10 mm	grass	
45FR201	F2/37	2	s	20 cm	5 mm	grass	knotted halfway along
45FR201	F2/38	2	z	69 cm	8-14 mm	grass	end finished in knot
45FR201	F2/39	2	z	33 cm	5-10 mm	grass	
45FR201	F2/40	2	s	15 cm	14 mm	grass	one ply doubled over at one end to become second
45FR201	F2/41	2	z	16.5 cm	13-14 mm	grass	
45FR201	F2/42	2	s	11 cm	4 mm	grass	one end finished in knot
45FR201	F2/43	2	s	19.5 cm	5-6 mm	grass	
45FR201	F2/44	2	z	38 cm	12-15 mm	grass	
45FR201	F2/45	2	s	35 cm	4-5 mm	sagebrush bark	one end finished in knot, knotted to itself to make a loop
45FR201	F2/47	2	z	25 cm	25 mm	bark and twigs	rigid length of twisted bark
45FR201	F2/48	2	z	50 cm	8-10 mm	grass	
45FR201	F2/49					grass	fibers in knot
45FR201	F2/5	3	braid	18 cm	35 mm	grass	selvage from twined mat?
45FR201	F2/50	2	z	15 cm	5 mm	grass	
45FR201	F2/51	2	s	12 cm	5-6 mm	grass	
45FR201	F2/52	2	s	29.5 cm	2 mm	Indian hemp?	
45FR201	F2/53	2	z	17 cm	7-9 mm	grass	
45FR201	F2/54	2	z	14 cm	20 mm	bark	rigid length of twisted bark
45FR201	F2/56	2	z	17.5 cm	11-13 mm	grass	
45FR201	F2/57	2	s	37 cm	9-11 mm	grass	
45FR201	F2/58	2	z	18 cm	10-11 mm	grass	one strand doubled over to make two plies
45FR201	F2/60	2	s	20 cm; 84 cm	10-12 mm; 8-12 mm	grass	shorter piece through loop tied in longer piece; one end of longer finished in knot, end charred?
45FR201	F2/61	2	z	9 cm	11-12 mm	grass	possible mat twining? holes for warps
45FR201	F2/62	2	z	33 cm	10-13 mm	salt grass	
45FR201	F2/63	2	s	9.5 cm	5 mm	grass	one end finished in knot

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F2/64	2	s	50 cm	3-4 mm	sagebrush bark	
45FR201	F2/68	2	s	30 cm	4-8 mm	grass	one end finished in knot, diameter increases steadily from there, knotted all together
45FR201	F2/86	2	s	4.5 cm		grass	finishing knot from end of cordage?
45FR201	F2/87	2	s	30 cm	4-5 mm	grass	
45FR201	F2/88	2	s	20 cm	7-9 mm	grass	one end has a loop created by splicing end into plies of main cord
45FR201	F2/89		z	14 cm		grass	fibers coming apart, but still have recognizable twist
45FR201	F2/90	2	z	24 cm	10-14 mm	grass	
45FR201	F2/91			11 cm		grass	twisted fibers, no discernable plies
45FR201	F2/92	2	z	10 cm	11-12 mm	grass	
45FR201	F2/93	2	s	8.5 cm	5 mm	grass	
45FR201	F2/94	2	s	18 cm	8-10 mm	grass	
45FR201	F2/95	2	z	9 cm	8-9 mm	grass	
45FR201	F2/96					bark	knot tied at end of length of bark
45FR201	F2/97	2	s	56.5 cm	7-12 mm	grass	diameter decreases steadily towards end finished with knot
45FR201	F2/99	2	z	10 cm	5 mm	grass	
45FR201	F4/113	2	z	41 cm	7-11 mm	grass	
45FR201	F4/12	2	s	6 cm	6 mm	grass	one end finished in knot
45FR201	F4/14	2	z	17.5 cm	10 mm	sagebrush bark	
45FR201	F4/15	2	z	17 cm	6-9 mm	grass	
45FR201	F4/16	2	z	38.5 cm	7-14 mm	grass	narrows towards one end
45FR201	F4/17	2	z	17 cm	10-13 mm	grass	one end made into loop, end incorporated into plies of main strand
45FR201	F4/18	2	s	16 cm	5-6 mm	grass	one end finished in knot
45FR201	F4/19	2	s	3.5 cm	5 mm	grass	charred all over
45FR201	F4/20	2	s	17.5 cm	7-11 mm	grass	
45FR201	F4/21	2	s	10 cm	7 mm	grass	
45FR201	F4/22	2	s	16.5 cm	5-7 mm	grass	
45FR201	F4/23	2	s	39 cm	3-4 mm	sagebrush bark and grass	
45FR201	F4/24	2	s	9 cm	7-9 mm	grass	
45FR201	F7/10		z (indiv. plies)	4 cm		grass	three unattached single plies. other ply impressions on each
45FR201	F7/11	2	s	13 cm	7-8 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F7/15	2	z	15.5 cm	10-13 mm	grass	
45FR201	F7/28	2	z	16 cm	12-14 mm	grass	charred all over
45FR201	F7/36	2?	z	17 cm; 15 cm		grass	longer length missing second ply; shorter length untwisted fibers
45FR201	F7/38	1?			6 mm	grass	loop of fibers, no visible plies, into knot
45FR201	F7/41	5?	s	28 cm	3-5 mm	Indian hemp	5 ply? one ply with 2 ply, one with 3 ply; z-twist--z-lay--s-lay
45FR201	F7/49	2	s	7 cm	9 mm	grass	
45FR201	F7/50	2	s	32 cm	6-10 mm	grass	one end charred
45FR201	F7/52	2	z	13 cm	8 mm	grass	
45FR201	F7/53	2	z	12 cm	11 mm	grass	
45FR201	F7/54	2	z	112 cm	4-11 mm	grass	two pieces knotted to make one length, or one length with knot in the middle? narrows, finished on one end with knot
45FR201	F7/55	2	z	18 cm	12-14 mm	grass	
45FR201	F7/56	2	z	39 cm; 11 cm	9-16 mm; 13 mm	grass	longer charred on end, shorter in two places
45FR201	F7/57					grass	bunch of twisted fibers; in circle from coming out of knot?
45FR201	F7/58	2?		9 cm		grass	twisted fibers missing second ply?
45FR201	F7/59	2	z	13 cm	6-7 mm	grass	
45FR201	F7/60	2?	z	10 cm		grass	second ply missing by impressions, both ends charred
45FR201	F7/61	2	z	30 cm	21-22 mm	willow?	rigid twist of twigs
45FR201	F7/63	2	s	12.5 cm	4-5 mm	grass	
45FR201	F7/66	1? 2?	s (indiv plies)	8 cm		bark?	two unattached plies in bag, second ply impressions?
45FR201	F7/67	2?	s	18 cm		sagebrush bark	second ply impressions?
45FR201	F7/7	2	z	6 cm	27 mm	grass	
45FR201	F7/70					tule	tule pieces, broken from mat?
45FR201	F7/71	2	s	15 cm	6-7 mm	willow bark	
45FR201	F7/72	2	s	9 cm	7-8 mm	sagebrush bark	
45FR201	F7/73	2	z	8 cm	5 mm	grass	
45FR201	F7/74	2	z	13 cm	4-5 mm	grass	
45FR201	F7/75	2	z	13 cm	17 mm	retted? grass	
45FR201	F7/76	2	z	11 cm	5 mm	grass	
45FR201	F7/79			10 cm		grass?	twisted fibers, hard to tell if just knotted
45FR201	F7/8	2	z	9 cm	24-27 mm	grass	
45FR201	F7/80	2	z	12. 5 cm	11-12 mm	grass	one end charred

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	F7/87	2	s	42 cm	2-3 mm	Indian hemp	
45FR201	F7/88	1?	z	14 cm	3-4 mm	grass	second ply missing?
45FR201	F7/89	2?	z	9 cm		grass	second ply missing?
45FR201	F7/9	2	z	4 cm	10 mm	grass	end with one ply doubled over to become two?
45FR201	F7/90	4?	z	11 cm	each 2 ply: 3 mm	Indian hemp	2 s-lay plies of 2 plies each. plies not together, but both have second ply impressions
45FR201	F7/91	2	z	26 cm	7-11 mm	grass	
45FR201	F7/92	2	z	14 cm	5-6 mm	sagebrush bark	
45FR201	F7/93	2	z	16 cm	10-11 mm	grass	
45FR201	F7/95	2?	s	4 cm		grass	missing second ply by impressions?
45FR201	F9/10	2?		16 cm		bark	rigid one ply of twisted bark
45FR201	F9/11 a	2	z	~86 cm	9-10 mm	grass	tied/wrapped around the top of a 69 cm stick
45FR201	F9/17		z?	4 cm		grass	bunch of twisted fibers, missing a second ply?
45FR201	F9/18	2	s	80 cm	3 mm	sagebrush bark	
45FR201	F9/19	2	z	53 cm	9-10	grass	
45FR201	F9/20	2	z	34 cm	8-10 mm	grass	knot at end
45FR201	F9/21	2	z	45.5 cm	8-10 mm	grass	one end finished in knot, another knot near that end
45FR201	F9/22	2	z	21 cm	9-11 mm	grass	
45FR201	F9/9		z	24 cm		bark	rigid length of twisted bark, hard to discern plies
45FR201	Unk 10	2	s	22 cm; 29 cm; 28 cm; 28 cm; 20 cm; 22.5 cm; 9 cm	8 mm; 3-4 mm; 6-7 mm; 5 mm; 5 mm; 3-4 mm; 3 mm	sagebrush bark	7 distinct unattached pieces of cordage, 1 w/ finishing knot, knot in middle; 1 w/ finishing knot, charred end; 1 w/ charred end
45FR201	Unk 11	2	s	5 cm		grass	plies coming apart
45FR201	Unk 12	3?	braided	5 cm	10 mm	grass	finishing knot, and rest of the fibers in bigger knot
45FR201	Unk 3	2	z	13 cm		grass	plies coming apart
45FR201	Unk 4	2	s	4 cm; 3 cm	3 mm; 4 mm	grass?	two unattached pieces
45FR201	Unk 5	2	z	3 cm	4 mm	grass	
45FR201	Unk 6	2	s	7 cm	3 mm	sagebrush bark	
45FR201	Unk 7	2	s	21 cm	5 mm	grass	
45FR201	Unk 8	2	z	31 cm	7-8 mm	retted? grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR201	Unk 9	2	s	20 cm; 21 cm; 9 cm; 4 cm, 3 pieces of plies under 3 cm	7-12 mm; 10 mm; 3-4 mm; 4 mm	grass	4 distinct pieces; second with plies coming apart, one end charred; third and fourth, part of same cord with small ply pieces?
45FR202	1	2	s	14 cm; 8 cm	6 mm; 6-7 mm	grass	
45FR202	10	2	s	5 cm	5 mm	grass?	
45FR202	101	2	z	7 cm	12 mm	grass	
45FR202	102	2	z	15 cm	8-9 mm	grass	
45FR202	105	2	z	5 cm		grass	big knot
45FR202	106	2	z	6 cm	17 mm	grass	one end doubled over to become second ply
45FR202	107	2	z	7 cm		grass	missing second ply
45FR202	108	2	s	4 cm	5 mm	grass?	
45FR202	109	2	z	6.5 cm		grass?	missing second ply
45FR202	11	2	z	27 cm; 12 cm	17 mm; 14-16 mm	grass	two unattached pieces, knot on end of longer
45FR202	110	2	z	8 cm	11-12 mm	grass	
45FR202	111	2	z	8 cm		grass	two pieces knotted together
45FR202	112	2	s	18 cm	10 mm	grass	tied into big knot with at least one other piece
45FR202	113			1.5 cm		grass	tiny knot, finishing knot?
45FR202	113	2	z	5 cm		grass	missing second ply
45FR202	114	2	z	20 cm	12-15 mm	grass	
45FR202	116					grass	disintegrated fibers
45FR202	117	2	z	38 cm	9-14 mm	grass	
45FR202	118	2	z	6 cm		grass	is a big knot, or cordage just pressed together?
45FR202	119	2	z	16 cm	9-13 mm	grass	
45FR202	12	2	s	12.5 cm	6-7 mm	grass	
45FR202	120	2	z	9.5 cm	12 mm	grass	one end charred
45FR202	121	2	s	8 cm	3 mm	sagebrush bark	
45FR202	122	2	z	13 cm	12-14 mm	grass	
45FR202	123	2	s	14 cm	12 mm	grass	
45FR202	124	2	z	10 cm	9 mm	grass	
45FR202	125	2	z	5.5 cm	15 mm	grass	one end doubled over to become second ply
45FR202	126	2	z	3.5 cm	10 mm	grass	two pieces pressed together
45FR202	127	2	z	3 cm	12 mm	grass	
45FR202	128	2?	z	11 cm		tule? grass?	missing second ply
45FR202	129					grass	disintegrated fibers
45FR202	130	2	z	8 cm		grass?	possible mat twining row
45FR202	131	2	z	6 cm	11 mm	grass	
45FR202	132					grass	disintegrating fibers
45FR202	133	2	z	12 cm	9-10 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR202	134	2	z	17 cm		grass	plies coming apart when not knotted, big knot in middle, knot on one end
45FR202	14	2	s	5 cm	3 mm	sagebrush bark?	
45FR202	140	2	z	16 cm	10-11 mm	grass	
45FR202	141	2	s	17 cm	5 mm	grass	
45FR202	142	2	s	6.5 cm	5 mm	grass	
45FR202	145	2	z	5 cm	11 mm	grass	
45FR202	146	2	z	3.5 cm		grass?	
45FR202	16					grass	disintegrating fibers
45FR202	17	2	s	15 cm	4 mm	sagebrush bark	
45FR202	18	2	z	12 cm	12 mm	grass	knot in the middle of one piece, or two pieces knotted together, measured continuously
45FR202	19	2	z	9 cm		grass	missing second ply
45FR202	2	2	s	2 cm		grass	curl pressed together
45FR202	22	2	z	24 cm; 7 cm	14-18 mm	grass	two unattached pieces
45FR202	23	2	z	1.5 cm		?	missing second ply
45FR202	25	2	s	9 cm	7 mm	grass	
45FR202	26	2	z	9.5 cm	8-9 mm	grass?	
45FR202	27	2	z	9 cm	11 mm	grass	
45FR202	28	2	z	11 cm; 9 cm	9 mm; 8 mm	sagebrush bark	
45FR202	29	2	z	5 cm	8-10 mm	grass	
45FR202	30	2	s	6 cm		grass	pressed together, hard to measure
45FR202	31	2	z	6 cm	11-12 mm	grass?	two pieces pressed together
45FR202	32	2	z	7.5 cm	12 mm	grass	one end doubled over to become second ply
45FR202	34	2	s	3.5 cm	5 mm	?	
45FR202	35			6 cm		grass	finishing knot on end of one of the plies?
45FR202	36	2	s	5 cm	4-5 mm	grass?	
45FR202	37			9 cm		grass	curl of twisted fibers
45FR202	4	2	s	13.5 cm	4 mm	sagebrush bark	
45FR202	40	2	z	36 cm	13-20 mm	grass	big loose knot in middle
45FR202	41	2	z	23 cm	10-12 mm	grass	
45FR202	42	2? 3?	s	22 cm	4-5 mm	grass?	halfway through, one ply split into 2, making 3 plies?
45FR202	43	2	z	19 cm	11-12 mm	grass	
45FR202	44	2	z	17 cm	17-19 mm	grass	
45FR202	45	2	z	26 cm	17 mm	grass	
45FR202	46	2	z	27 cm	11-15 mm	sagebrush bark	
45FR202	47	2	s	45 cm	4-6 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR202	48	2	z?	17 cm		grass	missing second ply
45FR202	49	2	z			grass	cordage knot
45FR202	5	2	s	10 cm	4-5 mm	sagebrush bark?	
45FR202	50	2	z	15 cm; 27 cm	11-14 mm	grass	
45FR202	52	2	s	10 cm	4-5 mm	grass?	two pieces knotted together
45FR202	53	2	z	11 cm	6-8 mm	grass	
45FR202	54	2	z	16 cm	9-11 mm	grass	one end charred?
45FR202	55	2	s	23.5 cm	7-8 mm	grass	
45FR202	56	2	s	16.5 cm	5-7 mm	grass	
45FR202	57	2	s	10 cm		grass	gets very narrow at ends
45FR202	58	2	s	14.5 cm	6 mm	grass	
45FR202	6	2	s	6 cm; 1.5 cm	4 mm; 3-4 mm	sagebrush bark?	two separate pieces
45FR202	60	2	s	18 cm	4-5 mm	grass	
45FR202	61	2	z	15 cm	12-14 mm	grass	
45FR202	62	2	s	5.5 cm	6-7 mm	grass	
45FR202	63	2	z	4 cm		grass	plies coming apart
45FR202	63	2	s	7.5 cm	3 mm	sagebrush bark	
45FR202	64	2	z	8.5 cm	11 mm	grass	
45FR202	66	2	z	11 cm	12 mm	grass	
45FR202	67	2	s	4.5 cm	6 mm	grass	
45FR202	68	2	s	12.5 cm	4-6 mm	sagebrush bark	
45FR202	69	2	z	7 cm; 4.5 cm	6 mm; 3 mm	grass	two unattached pieces
45FR202	70	2	s	12.5 cm	5 mm	grass	
45FR202	71	2	z	7 cm	9 mm	grass	
45FR202	72	2	z	6 cm	7 mm	grass	
45FR202	73	2	s	4 cm	8 mm	sagebrush bark	
45FR202	76	2	s	3 cm	6-7 mm	grass	
45FR202	77	2	s	5 cm	3 mm	grass	
45FR202	78	2	z?	3 cm		grass	missing second ply
45FR202	79	2	s	4 cm	5 mm	grass	
45FR202	8	2	s	19.5 cm	4-6 mm	sagebrush bark	
45FR202	80	2	s	5 cm	5 mm	grass	
45FR202	81	2	s	5 cm	5-6 mm	grass	
45FR202	82	2	s?	10 cm		grass	pressed into curl or knotted?
45FR202	83	2	s	22 cm	3-4 mm	Indian hemp?	
45FR202	84	4?	z	12 cm	3 mm	Indian hemp? willow bark?	appears to be a continuous loop, made of two s-lay 2-plys

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45FR202	85	2	s?	2 cm; 2 cm	14 mm;	grass	two unattached pieces, coming apart
45FR202	86	2	z	4 cm		grass	missing second ply
45FR202	88	?	z	8.5 cm		?	length of natural root? no discernable plies
45FR202	91	2	s	7 cm	5-6 mm	grass	
45FR202	93	2	z	4 cm	13 mm	grass	
45FR202	94	2	s	2 cm		grass	plies coming apart
45FR202	95	2	z	31 cm	21-25 mm	bark	rigid length of twisted bark
45FR202	96	2	z	13.5 cm	11-14 mm	grass	
45FR202	97	2	z	11 cm	10-13 mm	grass	
45FR202	98	2	z	21 cm	8-10 mm	grass	
45FR202	99	2	z	22 cm	12-13 mm	grass	
45FR202	F1/10	2	z	16 cm	13-15 mm	grass	
45FR202	F1/11	2	z	12 cm	20-25 mm	grass	
45FR202	F1/17	2	z	6.5 cm		grass	missing most of second ply
45FR202	F1/23	2?	z	6 cm		grass	missing second ply
45FR202	F1/26	2	s	20 cm	5-6 mm	grass	
45FR202	F1/27	2	s	18 cm	7-8 mm	sagebrush bark	
45FR202	F1/28	2	z	12 cm	13 mm	grass	
45FR202	F1/30	2	z	14 cm	12-14 mm	grass	
45FR202	F1/31	2	z	10 cm	11 mm	grass	
45FR202	F1/32	2	z	8 cm	11 mm	grass	
45FR202	F1/33	2	z	6.5 cm	11 mm	grass	
45FR202	F1/34	2	z	7 cm		grass	plies coming apart
45FR202	F1/59	2	z	7 cm	19 mm	grass	
45FR202	Unk 13	2	s	19 cm	5 mm	sagebrush bark	
45FR202	Unk 22	2	s	39 cm	12-13 mm	sagebrush bark	two pieces knotted together, measured continuously, second piece missing second ply
45FR202	Unk 28	2	z	6 cm		grass	missing second ply
45FR202	Unk 29	2	z	4 cm		grass	missing second ply
45FR202	Unk 30	2	z?	8 cm		grass	missing second ply
45GR101		2	s	34 cm	8-9 mm	sagebrush bark	
45GR101		2	s	8 cm	9-11 mm	sagebrush bark	
45GR101		2	s	11.5 cm	7 mm	sagebrush bark	
45GR101		2	s	52 cm	7-9 mm	sagebrush bark	
45GR101		2	s	13.5 cm	12-13 mm	sagebrush bark	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45GR101		2	s	50 cm	7-10 mm	sagebrush bark	
45GR101	?	2	s	6 cm	4 mm	Indian hemp	
45GR101	?	2	s	50 cm	5 mm	sagebrush bark	
45GR101	100	2	s	13.5 cm; 13 cm; 25 cm	6 mm; 5-6 mm; 5-6 mm	sagebrush bark	three unattached pieces
45GR101	16	2	s	2.5 cm	4 mm	?	
45GR101	17	2	s	43 cm	5 mm	sagebrush bark	
45GR101	20	3?	braided	11 cm	13-19 mm	tule	hard to tell how many strands used to braid, tule is breaking along length
45GR101	25	2	s	19 cm	6 mm	sagebrush bark	
45GR101	26	2	s	15.5 cm	8-9 mm	sagebrush bark	
45GR101	29	4	z	41.5 cm	4 mm	Indian hemp	4 ply made of 2 s-lay 2 plies
45GR101	30	4	z	31 cm	3-4 mm	Indian hemp?	4 ply made of 2 s-lay 2 plies, ends tied
45GR101	33	2	s	25 cm	5-6 mm	grass	
45GR101	34	2	s	56 cm	3-4 mm	Indian hemp	
45GR101	42	2	s	12 cm	6-7 mm	sagebrush bark	
45GR101	45	2	s	20 cm	5-6 mm	grass	
45GR101	46	2	s	43 cm; 6 cm	6-7 mm	grass	
45GR101	51					sagebrush bark	big knot of fibers
45GR101	54	2	s	53 cm	4-7 mm	sagebrush bark	
45GR101	56	2	s	18 cm	2 mm	Indian hemp	
45GR101	57	2	s	3 cm	2 mm	Indian hemp	
45GR101	57	2	s	7 cm; 25 cm	4 mm, 4-5 mm	sagebrush bark	
45GR101	58	2	z	14 cm		tule?	
45GR101	59	2; 4	s	27 cm; 6.5 cm	3-4 mm	?; sagebrush bark	knot at one end; 4 ply of two s-lay 2 plies
45GR101	60	2	s?	2 cm		sagebrush bark	knot
45GR101	62	2	s	6.5 cm	3 mm	Indian hemp?	
45GR101	70	2	z	4.5 cm	6 mm	tule?	
45GR101	70	2	z	49 cm	7-14 mm	sagebrush bark	
45GR101	73	2	s	24 cm	6-8 mm	sagebrush bark	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45GR101	76	2	z	33 cm	3-5 mm	sagebrush bark?	
45GR101	79	2	s	11 cm	8 mm	grass	
45GR101	80					grass?	big knot of fibers
45GR101	87	2	s		7 mm	sagebrush bark	too bunched to measure length
45GR102	3	2	z	18 cm	4-5 mm	tule	small hole poked through one end
45GR102	5	2	s	6.5 cm	6 mm	sagebrush bark	
45GR102	6	2	z	5 cm		tule	missing second ply
45GR102	8					sagebrush bark	twisted fibers knotted into loop at one end
45GR104	207	2	z	12 cm	21 mm	tule	two complete tule pieces used for each ply
45GR104	225	2	s	4.5 cm; 3.5 cm	4 mm; (missing second ply)	sagebrush bark	shorter length is missing second ply
45GR104	227			33 cm		sagebrush bark	twisted length of fibers
45GR104	234			20 cm		sagebrush bark	knot at end of length of fibers, no discernable plies
45GR79	11	2	z	7 cm	8-9 mm	tule?	
45GR79	12	2	z	13 cm	5 mm	tule?	
45GR79	13	2	z	5 cm	8 mm	bark? willow?	
45GR79	14	2	z	12 cm	7 mm	sagebrush bark	
45GR79	15	2	z	8 cm	8 mm	bark? willow?	
45GR79	17	2	z	15 cm		sagebrush bark	missing second ply
45GR79	19	2	z	26 cm	10 mm	sagebrush bark	
45GR79	22	2?	z	9 cm	12 mm	twigs	rigid twist of twigs
45GR79	23	2	z	5 cm	7 mm	sagebrush bark	
45GR79	25	2	s	2.5 cm	3 mm	grass?	
45GR79	26	2	z	12.5 cm	6 mm	tule	
45GR79	3	2	z	8.5 cm	6 mm	sagebrush bark	
45GR79	38	2	s	7 cm	2 mm	Indian hemp	
45GR79	40	2	z	7 cm	8 mm	bark? willow?	
45GR79	5	2	z	20 cm	5-8 mm	sagebrush bark	
45GR79	6	2	s	3 cm	2 mm	grass?	
45GR79	7	2	z	12.5 cm	9-10 mm	sagebrush bark	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45GR80	2	2	z	15 cm	4 mm	Indian hemp	two pieces knotted together at ends, measured continuously
45GR80	?	2	z	6.5 cm; 16 cm	4 mm; 4-5 mm	grass	
45GR84	21	2	s	6 cm	7-8 mm	sagebrush bark	
45GR84	22	2	s	6.5 cm; 6 cm	8-10 mm; 10 mm	sagebrush bark	
45GR84	24	2?	s?	1.5 cm; 3 cm; 1.5 cm; 1 cm		sagebrush bark	4 one plies
45GR84	26	2	s	6.5 cm; 4 cm	4 mm; (plies separated)	sagebrush bark; grass	2 fragments
45GR84	27	2	z	6 cm	8 mm	sagebrush bark	
45GR84	31	2	z	12 cm	12-15 mm	sagebrush bark	
45GR84	34	2	s	13 cm	7 mm	sagebrush bark and grass	
45GR94		2	z	3 cm	3 mm	tule?	
45GR94		2	z	6 cm	3 mm	tule?	
45GR94		2	z	8.5 cm	4 mm	tule?	
45GR94	12	2	s	4 cm	7 mm	sagebrush bark	finishing knot
45GR94	16?	2	s	4 cm	3 mm	grass?	
45GR94	20	2	z	19 cm	3-4 mm	tule?	
45GR94	21	2	s	6 cm	2 mm	Indian hemp	
45GR94	23						big lump of fibers, charred on the end
45GR94	26	2	z	17.5 cm	10 mm	bark?	
45GR94	37	2	z	39 cm	8-10 mm	sagebrush bark and grass	
45GR94	41	2	z	14 cm	9 mm	sagebrush bark	
45GR94	42	1	z	2.5 cm	2 mm	??	bright pink colored fiber, modern inclusion
45GR94	80	2	z	4 cm	5 mm	sagebrush bark	
45GR94	81	2	s	5 cm	4 mm	Indian hemp?	
45GR94	9	2	z?	22 cm		sagebrush bark	finishing knot; missing most of second ply
45GR94	97	2	z	8 cm	8 mm	grass?	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	446	2	s	23.5 cm; 21.5 cm	4-5 mm; 2 mm	sagebrush bark and ?Indian hemp; Indian hemp?	two unattached pieces
45WW25	405	2	s	32 cm	4-5 mm	sagebrush bark	knotted in middle to make a loop; made up of two pieces?
45WW25	447	3?	z; s	11.5 cm		grass	loosely twisted s-lay 2 ply as one ply in 2 ply z-lay?
45WW25	448	2	z	15 cm	5-6 mm	grass?	
45WW25	439	3?	braid?	6 cm	10 mm	tule?	
45WW25	444	2	s	4 cm; 5 cm; 5 cm	5 mm; 5 mm; 7 mm	sagebrush bark	three unattached pieces
45WW25	402	2	z	25 cm; 16 cm	14 mm; 8-9 mm	grass?	
45WW25	473	2	s	8 cm	10 mm	grass	one end finished in knot
45WW25	406	2	s	26.5 cm	7-9 mm	grass	
45WW25	458	2	s	13 cm; 34 cm; 3.5 cm	2 mm; 2-3 mm; 4 nn	Indian hemp; sagebrush bark?; Indian hemp	three unattached pieces
45WW25	399	2	s	34 cm	4 mm	grass	
45WW25	397	2	s	6 cm	2-3 mm	grass	
45WW25	396	2	z	19.5 cm	10-12 mm	tule?	
45WW25	395	2	s	46 cm	3-4 mm	sagebrush bark	
45WW25	393	2	z	20 cm	8-10 mm	tule	
45WW25	392	2	z	13.5 cm; 6 cm	9-10 mm; (plies coming apart)	tule	plies of shorter piece coming apart
45WW25	404	2	s	18 cm	5-6 mm	grass	
45WW25	453	2	s	12 cm	5-7 mm	grass	
45WW25	434	2	s	6 cm	4-6 mm	sagebrush bark	
45WW25	479	2	s	7.5 cm	3-4 mm	Indian hemp?	
45WW25	461	2	s	15.5 cm	5-6 mm	sagebrush bark	
45WW25	474	2	z	10.5 cm	8 mm	grass	one end finished in knot
45WW25	464	2	s	9 cm	8-9 mm	sagebrush bark	
45WW25	478	2	s	12 cm	3-4 mm	grass	one end finished in knot
45WW25	437	2	s	4.5 cm	3 mm	Indian hemp	
45WW25	452	2	s	9.5 cm	6 mm	grass	one end finished in knot; other end charred
45WW25	446	2	z	4 cm	11 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	454	2	s	12 cm	12 mm	sagebrush bark	
45WW25	471	2	z			grass	cordage in big knot
45WW25	442	2	s	5 cm	8 mm	sagebrush bark and grass	
45WW25	443	2	z	12 cm	17-19 mm	grass	
45WW25	438	2	z	9 cm; 3 cm	3 mm; 2 mm	sagebrush bark	longer length has finishing knot
45WW25	374	2	z	3.5 cm	4 mm	grass?	
45WW25	451	2	z	3 cm		grass	cordage in knot; one end charred
45WW25	420	2	s	9.5 cm	9-10 mm	sagebrush bark	
45WW25	391	2	s	27 cm	3 mm	Indian hemp	length as measured by at least 6 pieces knotted together in the middles
45WW25	385	2	s	17 cm	4 mm	grass	end finished in knot
45WW25	376					bark	length of bark
45WW25	435	2	s	10.5 cm; 10 cm; 18.5 cm; 9 cm; 10 cm	5 mm; 4 mm; 4 mm; 5-6 mm; 5-7 mm	grass	
45WW25	428	2	s	15 cm	5 mm	sagebrush bark	
45WW25	417	2	s	9 cm	2 mm; 1 mm	Indian hemp	length as measured is of three pieces tied together
45WW25	377	2	s	27 cm	7-9 mm	sagebrush bark	loop on one end, plies combined into main cord after 4 cm
45WW25	415	2	s	1.5 cm		grass	plies have come apart
45WW25	380	2	s	5.5 cm; 12.5 cm	5-6 mm; 6 mm	grass	two unattached pieces
45WW25	432	2	s	7 cm	8 mm	grass	
45WW25	422	2	s	4 cm	4-5 mm	grass	
45WW25	430			7 cm		grass	knot, possibly finishing knot in one twisted ply, missing second ply?
45WW25	424	2	s	7 cm	6 mm	grass	
45WW25	431	2	s	8 cm	7-8 mm	grass	
45WW25	427	2	s	13 cm	5-6 mm	grass	
45WW25	413	2	s	7.5 cm	6-7 mm	grass	
45WW25	384	2	z	4 cm	7 mm	tule	
45WW25	476	2	z	22 cm	4 mm	grass	
45WW25	373	2	s	14 cm; 6 cm	10 mm; 7 mm	sagebrush bark	two unattached pieces
45WW25	409	2	s	29 cm; 20 cm; 15 cm; 12 cm	5-6 mm; 5-7 mm; 6 mm; 6 mm	grass	four unattached pieces

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	371	2	z	16 cm	8 mm	grass?	one end finished in knot?
45WW25	370	2	z	14.5 cm	13-15 mm	grass?	
45WW25	369	2	z	7 cm	6-7 mm	grass?	
45WW25	379	2	s	10 cm; 15 cm	10 mm; 3-4 mm	grass	two unattached pieces
45WW25	383	2	z	5 cm	7 mm	tule	
45WW25	375	2	s			sagebrush bark and grass	all bunched together, probably two pieces, one end finished in knot
45WW25	386	2?		2.5 cm	5-6 mm	grass, bark?	cordage wrapped in bark or flat grass
45WW25	390	2-5	s	15 cm	5 mm	grass	starts out 2 ply, plies divide at about halfway until other end has 5 ply
45WW25	389	2	s	14 cm	6-7 mm	grass	
45WW25	388	2	z	11.5 cm	8-10 mm	sagebrush bark	
45WW25	387	2	s	24 cm	5-6 mm	grass	
45WW25	381	2	z	8 cm	5 mm	grass?	
45WW25	382	2	s	31 cm; 3.5 cm; 4 cm	4-5 mm; 5 mm; 5mm	grass	
45WW25	534	2	z	11 cm; 7 cm; 9.5 cm	3-4 mm; 4 mm; 3 mm	grass	
45WW25	527	2	s	20 cm	4-5 mm	sagebrush bark	
45WW25	518	2	z	20 cm; 5.5 cm	3-4 mm; 4-5 mm	grass	two unattached pieces
45WW25	525	2	s	6 cm; 3 cm; 7 cm; 5 cm	5 cm; 5 cm; 5-6 cm; 5 cm	sagebrush bark	four unattached pieces
45WW25	513	2	s	6 cm	4-5 mm	sagebrush bark	two pieces knotted together, measured continuously
45WW25	516	2	s	11.5 cm	4-5 mm	grass	end finished in knot
45WW25	469	2	z	9 cm	3 mm	sagebrush bark?	
45WW25	521	2	s	11 cm	2 mm	Indian hemp	
45WW25	520	2	s	4.5 cm	5-6 mm	grass	
45WW25	535	2	z	8 cm	4 mm	grass	
45WW25	545	2	z	8 cm	3-4 mm	grass	
45WW25	542	2	s	6 cm	5 mm	sagebrush bark	
45WW25	536	2	z	6 cm	4 mm	grass	
45WW25	540	2	s	8 cm	7 mm	sagebrush bark	
45WW25	544	2	s	12 cm; 4 cm	4-5 mm; 4 mm	sagebrush bark	
45WW25	526	2	s	6 cm	8 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	498	2	z	14.5 cm	16-18 mm	sagebrush bark	both ends charred
45WW25	501	2	z?	12 cm		grass	knotted
45WW25	206	2	z	28 cm; 9 cm	16-26 mm; 22-23 mm	grass	two unattached pieces
45WW25	703	2	s	3 cm		Indian hemp; sagebrush bark?	piece measured is strand doubled over, or two ends from a knot?
45WW25	222	2	z	10 cm	10-13 mm	tule	
45WW25	310	2	s	21 cm; 29 cm	5 mm; 5mm	sagebrush bark	two unattached pieces
45WW25	506	2	z	26 cm	10-12 mm	grass	
45WW25	519	2	s	14 cm	5-6 mm	sagebrush bark	
45WW25	500	2				grass? bark?	bunch of twisted fibers
45WW25	522	2	z	3 cm	6-7 mm	grass	
45WW25	508	2	s	25 cm	5-6 mm	sagebrush bark	
45WW25	503	2	z	15.5 cm; 12 cm	4-5 mm; 13-14 mm	grass	both ends of shorter piece charred
45WW25	523	2	s	17.5 cm	10 mm	sagebrush bark	
45WW25	514	2	s	5 cm		grass	likely finishing knot
45WW25	524	2	s	5 cm	10 mm	sagebrush bark	
45WW25	537	2	z	8 cm	4-5 mm	grass	
45WW25	505	2	s	31 cm	5-6 mm	sagebrush bark	
45WW25	470	2	z	8 cm	4-5 mm	sagebrush bark	
45WW25	533	2	s	12 cm	4 mm	sagebrush bark	
45WW25	463	2	z	8 cm	11-12 mm	grass	
45WW25	459	2	s	12.5 cm; 4.5 cm	5-6 mm; 5 mm	sagebrush bark	two unattached pieces
45WW25	462	2	s	8 cm; 9 cm	4-5 mm; 4-5 mm	sagebrush bark	two unattached pieces
45WW25	477	2	z	8 cm	11-12 mm	grass	
45WW25	467	2	z	8 cm	11 mm	grass	
45WW25	494	2		20 cm; 14 cm		grass; sagebrush bark	fibers with knot at end; knotted sagebrush fibers
45WW25	455	4	z	15 cm	4 mm	Indian hemp	4 ply z-lay made of two 2 ply s-lays
45WW25	486	2	z	28 cm	13 mm	grass	
45WW25	480	2	s	6.5 cm	9 mm	grass	cordage in knot

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	475	2	s	4 cm	7 mm	sagebrush bark	
45WW25	472	2	s	7.5 cm	7-8 mm	sagebrush bark	
45WW25	457	2	z	8 cm	11-14 mm	grass	
45WW25	460	2	s	7.5 cm	5-9 mm	sagebrush bark	
45WW25	456	2				grass	two bunches of fibers in knots
45WW25	465	2	z	9.5 cm	10 mm	grass	
45WW25	483	2	z	5 cm	5 mm	grass?	
45WW25	400	2	s	23 cm	5 mm	grass	
45WW25	539	2				grass	knot
45WW25	532	2	s	9 cm	6-7 mm	sagebrush bark	
45WW25	543	2	s	13.5 cm	4-5 mm	grass	
45WW25	511	2	s	17 cm; 32 cm; 49 cm	4-9 mm; 6-8 mm; 5-6 mm	sagebrush bark	
45WW25	512	2				grass	knotted bunch of fibers
45WW25	468	2	z	19 cm	5 mm	grass	
45WW25	538	2	z	4.5 cm	3-4 mm	grass	
45WW25	482	2	s	16 cm	7-8 mm	sagebrush bark	
45WW25	481	2	s	9 cm	4 mm	grass	
45WW25	493	2				grass	knot
45WW25	484	2	z	20 cm	8-16 mm	grass?	
45WW25	492	2	s	17 cm; 15 cm; 10 cm; 6 cm	7-9 mm; 11 mm; (missing ply); 3 mm	sagebrush bark; mixed with grass; only; only	second to last length is missing second ply
45WW25	491	2				bark	bark folded with twist around it
45WW25	995	2	s	12 cm	6 mm	sagebrush bark	
45WW25	254	2	z	40 cm; 42 cm	11-13 mm; 17-18 mm	grass	two unattached pieces, end of longer length finished in big knot
45WW25	271	2	z	26 cm	7-8 mm	grass	
45WW25	253	2	s	34 cm	5-7 mm	sagebrush bark and grass	
45WW25	255	2	z	21 cm; 23.5 cm	6-10 mm; 7-10 mm	grass?	two unattached pieces
45WW25	256	2	s	9 cm	9 mm	sagebrush bark?	finishing knot at end
45WW25	257	2	s	15 cm	8-9 mm	sagebrush bark	knot in the middle, fiber remains of second piece cordage attached?

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	259			4.5 cm		sagebrush bark	big knot
45WW25	251	2	z	30 cm; 15 cm	9-11 mm; 7-11 mm	grass	
45WW25	258	2	z	24 cm; 18 cm	17-21 mm	grass	two unattached pieces
45WW25	292	2?		4 cm		grass?	flatter grass wrapped around outside of cordage piece?
45WW25	277	2	z	12 cm; 9 cm	9-13 mm; 12 mm	grass	both ends of shorter length charred
45WW25	275	2	z	17 cm	9-14 mm	grass	
45WW25	274	2	z	23 cm; 21 cm	6-7 mm; 9-11 mm	grass	two unattached pieces
45WW25	282	2	z	10 cm		grass	plies coming apart
45WW25	284	2	s	11.5 cm	4-5 mm	sagebrush bark and grass	
45WW25	244	2	z	20 cm; 21.5 cm	9-11 mm; 13-18 mm	grass?; grass	two unattached pieces
45WW25	260	2	s	31 cm; 28 cm	12-14 mm	sagebrush bark	two unattached pieces, knot in the middle of one
45WW25	300	2	s	18 cm; 20 cm; 8 cm	(missing ply); 5-6 mm; 4-6 mm	sagebrush bark	three unattached pieces
45WW25	240					grass	knot of twisted fibers
45WW25	239	2	z	44 cm	14-19 mm	grass	
45WW25	289	2	z	20 cm	6 mm	grass	
45WW25	288					grass?	knotted bundle of fibers
45WW25	291	2	z	9 cm; 4 cm; 12 cm; 14 cm	6-7 mm; 6 mm; 6 mm; 5-6 mm	grass	four unattached pieces
45WW25	295	2	s	40.5 cm	4-6 mm	sagebrush bark	
45WW25	252	2	s	28 cm	10-12 mm	grass	
45WW25	297	2	z	12 cm	6-9 mm	grass	one end finished with knot, knot in middle
45WW25	273	2	z	6 cm	5 mm	grass?	
45WW25	286			19 cm		sagebrush bark	twisted fibers, no discernable plies
45WW25	287	2	z	18 cm	13-15 mm	grass	
45WW25	290	2	s	12.5 cm; 11 cm; 4 cm	5-6 mm; 7-8 mm; 6 mm	sagebrush bark?	
45WW25	294	2	z	22 cm	8-12 mm	grass	one end finished in knot
45WW25	296	2	s	32 cm	4 mm	sagebrush bark	
45WW25	293			12.5 cm		grass	knotted grass fibers
45WW25	298	2	s	20 cm; 16 cm; 18 cm	5-6 mm; 5-8 mm; 5-6 mm	sagebrush bark	three unattached pieces

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	223	2	s	7 cm	5 mm	grass	
45WW25	278	2	z	17 cm; 14 cm	5-6 mm; 7 mm	grass	
45WW25	212			9 cm		sagebrush bark	knot in twisted fibers
45WW25	217	2	s	6 cm		sagebrush bark	knot at end
45WW25	220	2	z	33 cm	13-16 mm	grass	
45WW25	229					willow bark	knotted length of bark
45WW25	226	2	z	40 cm	11-14 mm	grass? bark?	
45WW25	214	2	z	42.5 cm; 19 cm	8-10 mm; 14 mm	bark?	
45WW25	232	2? 3?	z; braid?	8 cm; 5 cm		sagebrush bark	z piece missing second ply, other piece is lump of 3 ply braided? selvage?; "storage pit level"
45WW25	215	2	s	66 cm	5-7 mm	sagebrush bark	
45WW25	234	2	s; z	24.5 cm; 23 cm; 8 cm; 8.5 cm (z); 7.5 cm; 8 cm (z)	6-9 mm; 6-8 mm; 6 mm; 7-9 mm;	grass; grass; grass; sagebrush bark; grass; grass? (tule?)	6 unattached pieces; last two plies coming apart too much to measure
45WW25	221		z?	12 cm		grass	twisted fibers no discernable plies
45WW25	235	2	z	4.5 cm	7-8 mm	grass	
45WW25	228	2	z	58 cm; 21.5 cm	7-9 mm; 6-10 mm	grass?; grass	two unattached pieces
45WW25	204	2	z	40 cm; 29 cm; 23 cm	7-11 mm; 8-14 mm	bark?; bark?; grass	three unattached pieces, plies coming apart on last
45WW25	210	2	s	58 cm	4-6 mm	grass	
45WW25	224	2	s	14 cm; 10 cm; 6 cm	5-6 mm; 7-9 mm; 6 mm	grass	three unattached pieces
45WW25	266	2	s	16 cm	7-8 mm	grass	
45WW25	283	2	s	15 cm	4-5 mm	sagebrush bark	
45WW25	279	2	s	33 cm	8-9 mm	sagebrush bark	
45WW25	276	2	s; z	10.5 cm; 3.5 cm (z)	6 mm; 8 mm	grass; tule?	two unattached pieces
45WW25	280	2	z	9.5 cm	15 mm	grass	
45WW25	281	2	s	17 cm; 16 cm	4 mm; 5-6 mm	sagebrush bark	two unattached pieces
45WW25	425	2	s	9 cm	7-9 mm	sagebrush bark and grass	
45WW25	213	2	z	33 cm	14-18 mm	bark?	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	401	2	s	21 cm; 11 cm; 11 cm; 15 cm	12 mm; 8 mm; 10 mm; 7 mm	grass	four unattached pieces
45WW25	270	2	s	24 cm	5-6 mm	grass	one end finished in knot
45WW25	264	2	s	12 cm; 7 cm	6 mm; 5-6 mm	grass	two unattached pieces
45WW25	263	2	s	1.5 cm			
45WW25	265			10 cm		sagebrush bark	big knot in twisted fibers, no discernable plies;
45WW25	262	2	z	23 cm; 19 cm; 19.5 cm	12-16 mm; 6 mm; 9-12 mm	grass	three unattached pieces
45WW25	261	2	s	5.5 cm; 4 cm	3 mm; 3-4 mm	grass	two unattached pieces
45WW25	267	2	s	92 cm	5-8 mm	grass	
45WW25	285	2	z	11 cm	13-14 mm	grass	one end finished in knot
45WW25	355	2	s	19 cm	5-7 cm	grass	
45WW25	339			9 cm		grass	likely cordage finishing knot
45WW25	347	2	z	12.5 cm		tule?	plies coming apart
45WW25	348					grass	piece of flat grass wrapped around twig
45WW25	350	2	s	4.5 cm; 8 cm; 9 cm; 5 cm; 10 cm; 40 cm	9 mm; 6 mm; 5 mm; 8 mm; 7-8 mm	grass	5 unattached pieces
45WW25	351	2	s	19 cm; 28 cm	5-7 mm; 8 mm	grass	two unattached pieces
45WW25	316	2	s	10.5 cm; 14 cm	6-7 mm; 5-7 mm	grass	two unattached pieces
45WW25	353					grass	bunch of knotted fibers
45WW25	341	2	s	18.5 cm; 9 cm	6-7 mm; 5-6 mm	sagebrush bark	two unattached pieces
45WW25	356	2	s	5 cm; 13 cm	5-6 cm; 7-8 cm	grass	two unattached pieces
45WW25	358	6?	z	11 cm	8-10 mm	grass	one strand doubled back and forth to make 6 plies in the cord, ends end up in the middle
45WW25	360					sagebrush bark	bunch of fibers knotted
45WW25	367	2	s	7.5 cm	6 mm	grass	
45WW25	366	2	s	9 cm	8-9 mm	grass	
45WW25	326	4	s	29 cm	5-6 mm	sagebrush bark	4 ply at one end, separating into 2 2plys twisted together midway; 2 plies still s-lay
45WW25	352	2	s	10 cm; 12.5 cm	3-4 mm; 5-7 mm	grass	two unattached pieces
45WW25	343	2	s	34 cm	5-7 mm	grass?	
45WW25	269	2	s	~ 88 cm	3-4 mm	grass	two pieces? four ends coming out of multi-strand knot
45WW25	247	2	s	21.5 cm	4 mm	grass	

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	418	2	s	15 cm	5-8 mm	grass	
45WW25	429	2	z	15 cm; 13 cm	3-4 mm; 3-4 mm	grass	two unattached pieces
45WW25	414	2	s	9 cm	7-8 mm	grass	
45WW25	416	2	s	6 cm	4-5 mm	grass	
45WW25	331	3?	braid?	20 cm	18 mm	sagebrush bark	
45WW25	338					grass	bunch of fibers in knot
45WW25	336					bark	length of folded bark
45WW25	344	2	s	9.5 cm	4-5 mm	grass? tule?	
45WW25	332	2	s	37.5 cm	4-5 mm	grass	
45WW25	333	2	s	6 cm; 15 cm	7 mm; 5 mm	grass	
45WW25	345	2	z	13 cm	10 mm	tule	
45WW25	334	2	s	6.5 cm	9-13 mm	grass	
45WW25	349					bark (willow?)	knotted length of bark
45WW25	335					bark	folded bark with twist around it
45WW25	248	2	s	21 cm; 6 cm	7-10 mm; 8-10 mm	sagebrush bark	smaller piece knotted to larger in middle
45WW25	308	2	s	13 cm; 20 cm	6-7 mm; 8-9 mm	grass	two unattached pieces
45WW25	302	2	z	7.5 cm	10-11 mm	grass? tule?	
45WW25	303	2	s	13 cm	6-8 mm	grass	
45WW25	329	2	s	12.5 cm	8-11 mm	tule?	
45WW25	306	2?	z	10 cm		bark?	plies coming apart
45WW25	357	2	s	36 cm	5-6 mm	tule?	
45WW25	310	2	s	4 cm	4-5 mm	grass?	
45WW25	242					willow bark?	knotted piece of bark
45WW25	304	2	s	59 cm; 13 cm	4-5 mm; 5 mm	grass	two unattached pieces
45WW25	243	2	s	7 cm	7 mm	sagebrush bark	another piece of cordage knotted to middle
45WW25	249	2	z	21 cm; 11 cm; 30 cm	18-22 mm; 12 mm; 13-19 mm	grass	three unattached pieces
45WW25	250	2	s	20 cm	6-7 mm	sagebrush bark	end finished in knot
45WW25	245	2	z	30 cm	12-14 mm	grass	
45WW25	241	2	z	26 cm; 17.5 cm; 9 cm; 6 cm	8-13 mm; 10 mm; 7-8 mm; 7 mm	grass	
45WW25	246	2	z	~38 cm	21 mm	grass	very messy, hard to measure
45WW25	305	2	z	21 cm	16-17 mm	grass	tied at one end
45WW25	330					grass	bunch of fibers knotted

Site	Spec#	Ply	Lay	Length	Diameter	Material	Notes
45WW25	322	2	s	10.5 cm	5-6 mm	grass?	
45WW25	318	2	s	5 cm; 6 cm; 44 cm	6 mm; 6 mm; 7-9 mm	grass	three unattached pieces
45WW25	311	2	s	6 cm	6 mm	grass	
45WW25	325					bark	semi-rigid piece of bark twisted around itself
45WW25	307	2	z	18 cm	7-10 mm	grass?	
45WW25	324	2	s	5 cm	4 mm	grass	
45WW25	426	2	s	12 cm	4-5 mm	grass	
45WW25	421	2	s	3.5 cm	5 mm	grass	
45WW25	313	2	s	11 cm; 17 cm; 19 cm	3-4 mm	grass	three unattached pieces
45WW25	320	2	s	16.5 cm	9-11 mm	grass	
45WW25	315	2	z	33 cm	15 mm	grass	end finished in knot
45WW25	319	2	s	14 cm	4-5 mm	grass	
45WW25	317	2	z	34 cm	10-11 mm	tule	possible mat twining, holes for warps
45WW25	314	2	z	63 cm	12-14 mm	grass	tied into 10 cm long loop at end; another smaller loop?; side of loop charred
45WW25	323	2	s	14 cm; 16 cm	7-9 mm; 8-10 mm	grass	