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BEARSFOOT AND DEER LEGS: ARCHAEOBOTANICAL AND ZOOARCHAEOLOGICAL EVIDENCE OF A SPECIAL-PURPOSE ENCAMPMENT AT THE SANDY SITE, ROANOKE, VIRGINIA

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ABSTRACT.—Analysis of plant and animal data from the Sandy site (44RN220) indicates a short-term seasonal encampment geared toward the collection of medicinal plants and the hunting of deer. The plant assemblage is dominated by medicinal plants, in particular bearsfoot, with relatively fewer remains of the typical staple plant foods, maize and hickory. Small amounts of other plants with medicinal qualities were also identified, including bedstraw, holly, and wax myrtle. The faunal remains consist almost entirely of white-tailed deer skeletal elements; analysis of body part distributions produced a reverse utility curve, an outcome that strongly suggests a short-term butchery/kill site.

Key words: Paleoethnobotany, zooarchaeology, Late Woodland, Virginia, medicinal plants, butchery/kill site.

RESUMEN.—Los análisis de los restos vegetales y animales del yacimiento Sandy (44RN220) indican que se trataba de un campamento provisional de corta duración establecido con el fin de recolectar plantas medicinales y cazar venados. Entre las plantas, predominan las medicinales, sobre todo *Polymnia uvedalia*. Aparecen en cantidades mucho menores plantas comestibles como el maíz o nogales americanos (*Carya* spp.). También se identificaron pequeñas cantidades de otras plantas medicinales pertenecientes a los géneros *Gallium*, *Illex* y *Myrica*. A su vez, casi todos los restos de fauna eran de venado cola blanca. El análisis de la distribución de las partes del cuerpo produjo una curva de utilidad negativa, lo que claramente sugiere que se trataba de un lugar de matanza o descuartizamiento de corta duración.

RÉSUMÉ.—L'analyse des données végétales et animales du site Sandy (44RN220) indique qu'un campement saisonnier de courte durée était utilisé pour la récolte de plantes médicinales et la chasse au chevreuil. Les restes végétaux sont dominés par la présence de plantes médicinales, notamment le *Polymnia uvedalia* (polymnie uvédale), avec en comparaison moins de restes de denrées de bases, comme le maïs ou les noix de caryer. À un degré moindre, d'autres plantes avec des propriétés médicinales ont également été identifiées, soit le gaillet, le houx, et le cirier. De plus, les restes animaux représentent presque entièrement des éléments osseux de chevreuils; l'analyse de la distribution des parties du corps a donné une courbe d'utilité inverse, un résultat qui suggère fortement qu'il s'agit d'un lieu d'abattage de courte durée.

INTRODUCTION

Archaeological plant and animal assemblages are critical for reconstructing ancient foodways. In addition to characterizing basic subsistence practices, these organic assemblages can inform us about a myriad of other issues, including the collection and use of medicines and the organization of regional settlement and mobility strategies, two topics we consider here. Analysis of the archaeobotanical and zooarchaeological remains from the Sandy site (44RN220), a Late Woodland period occupation in the Roanoke River valley of southern Virginia, suggests the site was a short-term encampment geared toward collecting medicinal plants, in particular bearsfoot (*Polymnia uvedalia* L.), and hunting white-tailed deer (*Odocoileus virginianus* L.). Clear patterns in these datasets differ from the typical subsistence pattern found at other contemporaneous sites in the region. While the Sandy site data are skewed toward bearsfoot seeds and deer bones, neighboring sites reveal a broader subsistence pattern focused on maize (*Zea mays* L.), beans (*Phaseolus vulgaris* L.), a variety of nuts, and an array of game animals.

This paper makes two contributions to the study of ancient foodways. The first is methodological. Most treatments of ancient subsistence practices focus on either plant or animal remains; while this narrowed focus is primarily a product of the archaeological specialization, it nevertheless sets up a false dichotomy between interrelated portions of the diet. In this paper we consider the plant and animal datasets together so we can surpass simple site-level subsistence practices and address broader interpretations of site function and seasonality. The second contribution is interpretive in nature and relates to reconstructing regional subsistence and settlement patterns in Late Woodland Virginia. Most regional studies for the Late Woodland period emphasize subsistence at a broad level and look mainly at similarities among sites. Thus, Late Woodland subsistence is often characterized as focused on maize, beans, and squash, supplemented by wild fruits, nuts, and an array of game animals and fishes (Barfield and Barber 1992; Benthall 1969; Brown and Atkins 1998; Clark et al. 2001; Gremillion 1989, 1993b; Inashima 1990:231; Klatka et al. 2002; Klein 1994:86; Ward and Davis 1993; Waselkov 1977; Yarnell and Black 1985). Such sweeping statements, while useful in characterizing broad trends, tend to obscure regional variation in subsistence practices. Because subsistence data are key for understanding site function and seasonality, variation in subsistence patterns would have major impacts on constructions of regional settlement and mobility strategies.

In addressing these issues, we present the independent analyses of the plant and animal assemblages from the Sandy site, followed by a comparative analysis of these data with other Late Woodland sites located in the Roanoke River valley. Before presenting these data, however, we provide some background on the Late Woodland period in southern Virginia, as well as a brief description of the Sandy site and its associated materials. We end with a broader discussion of the utility of integrating different types of subsistence data for modeling ancient human mobility strategies.

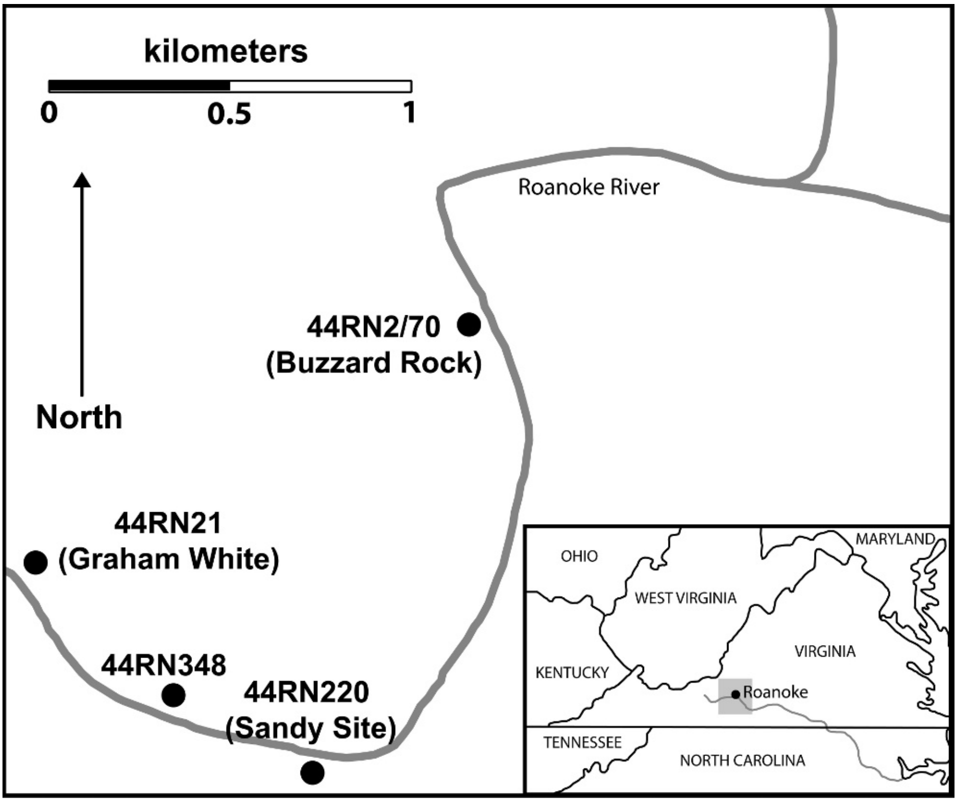

FIGURE 1.—Regional Map with site location.

THE LATE WOODLAND PERIOD IN VIRGINIA

The Late Woodland period marked a time of increasing population size as native groups settled into more permanent villages throughout portions of the southeastern United States. In Virginia and throughout the broader Southeast, these changes corresponded to an increased emphasis on the farming of maize, beans, and squash (*Cucurbita* sp.). The Late Woodland period dates to AD 900–1607 in Virginia and is characterized by settlements focused on the arable floodplains of major streams (Custer et al. 1986; Gallivan 2003; Gardner 1986; Hantman 1990; Holland 1978). During this period, special-activity sites (e.g., hunting camps and quarries) are usually found in upland settings away from the main river channels (Benthall 1969; Bott 1981; Holland 1970). While the beginning of the Late Woodland period was marked by a shift toward the cultivation of domesticates such as maize, beans, and squash, hunting and the collection of wild plants continued in importance (Barfield and Barber 1992; Benthall 1969; Brown and Atkins 1998; Clark et al. 2001; Gremillion 1989, 1993a; Inashima 1990; Klatka et al. 2002; Klein 1994; Ward and Davis 1993; Waselkov 1977; Yarnell and Black 1985).

The Sandy site is located in the floodplains along the southern bank of the Roanoke River, in modern Roanoke, Virginia (Figure 1). An estimated 65% of the

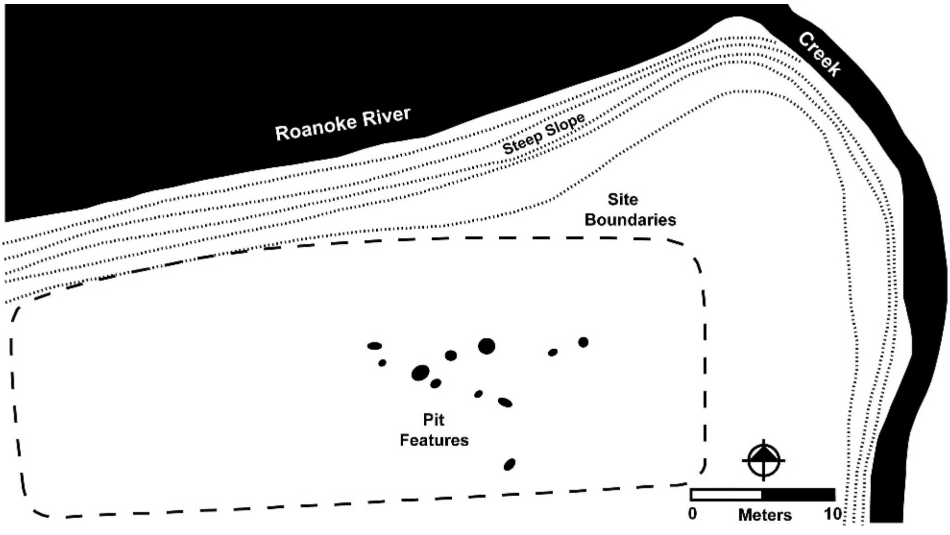

FIGURE 2.—Plan map of the Sandy Site (44RN220).

site was uncovered during excavation. Radiocarbon dates anchor the site's occupation between AD 1040 and AD 1220, well after maize had become a staple crop in the region. While most Late Woodland sites are characterized by a variety of features, such as buildings, pit features, hearths, and postmolds, excavations at the Sandy site uncovered only nine features, which were pits and rock clusters. Stanyard's spatial analysis of the artifacts suggests that the site was partitioned into discrete activity areas within a relatively small area (Figure 2). The radiocarbon dates from the features suggest that these activities took place within a relatively short time frame. Thus, the limited number and arrangement of features, in addition to the spatial analysis of artifacts, suggest a relatively short-term occupation geared toward a specialized set of activities. We argue that the length and nature of the occupation at the Sandy site can be discerned through the analysis of the subsistence data.

THE ARCHAEOBOTANICAL ASSEMBLAGE

Flotation samples were collected in volumes ranging from 4 to 14 liters and both light (0.25 mm) and heavy (0.75 mm) fractions were analyzed. Light fractions were weighed and then sifted through 2.0 mm, 1.4 mm, and 0.7 mm geological sieves. Carbonized plant remains 2 mm in size and larger were completely sorted by VanDerwarker with the aid of a stereoscopic microscope (10–40 ×). Residue smaller than 2.0 mm was scanned for seeds, which were removed and counted; in addition, non-seed taxa encountered in the 1.4 mm sieve, but not in the 2.0 mm sieve were removed, counted, and weighed.

Botanical materials were identified using a seed identification manual (Martin and Barkley 1961) and the first author's comparative collection. While we attempted to identify all specimens to the lowest possible taxonomic level, some plant specimens lacked diagnostic features altogether or were too highly

TABLE 1.—Summary of plant taxa for Sandy site flotation samples.

N of Samples		34	
Total Volume (liters)		345	
Plant Weight (grams)		175.57	
Wood Weight (grams)		174.18	
Common Name	**Taxonomic Name**	**Count (n)**	**Weight (g)**
CROPS			
Maize cupule	*Zea mays*	6	0.00
Maize kernel	*Zea mays*	31	1.16
Maize kernel cf.	*Zea mays* cf.	1	0.00
Sumpweed cf.	*Iva annua* cf.	1	0.00
NUTS			
Hickory	*Carya* sp.	70	1.11
Walnut	*Juglans* sp.	2	0.07
FRUITS			
Hawthorn cf.	*Crataegus* sp. cf.	1	0.00
OTHER SEEDS			
Bearsfoot	*Polymnia uvedalia*	78	
Bedstraw	*Galium* sp.	5	
Chenopod	*Chenopodium* sp.	3	
Grass family	Poaceae	6	
Holly	*Ilex* sp.	1	
Holly cf.	*Ilex* sp. cf.	1	
Knotweed cf.	*Polygonum* sp. cf.	1	
Wax myrtle	*Myrica* sp.	1	
UNIDENTIFIABLE		1	
UNIDENTIFIABLE SEED		3	

fragmented and were classified as ''unidentifiable'' or ''unidentifiable seed.'' In other cases, tentative identifications were made—for example, if a specimen closely resembled a maize kernel, but a clear identification was not possible (for example, the specimen was highly fragmented), then it was recorded as ''maize kernel cf.'' Wood was weighed but not counted or identified. Generally, most of the seeds were too small to weigh and thus were only counted. Although hickory nutshell and maize remains were recovered only as fragments, they were both counted and weighed.

Thirty-four flotation samples from 10 test units and 9 features were collected and analyzed, representing a total of 345 liters of soil and a total plant weight of 175.57 grams. Combined, these samples yielded 12 plant taxa, including maize, hickory, walnut, and several different types of seeds (Table 1). Maize was the only securely identified field cultigen present in the samples, although a possible sumpweed seed (*Iva annua* L.) was also identified. Nutshell recovered from the flotation samples includes hickory (*Carya* sp.) and walnut (*Juglans* sp.). While the nutmeats of walnuts can be easily extracted from the shell, hickory nuts require more extensive processing. Hickory kernels are so tightly enmeshed in the interior shell that picking the nutmeats from the cracked shell casing is a time-consuming task. Instead, hickory nuts were generally pounded into pieces and boiled to extract the oil (Ulmer and Beck 1951; Fritz et al. 2001). The process of boiling the pounded hickory nuts separates the pieces of shell, which sink to the bottom of the pot, from the oil, which rises to the top. The oil can then be skimmed off and used as an added ingredient in soups and stews, as a condiment for vegetables, or as a sauce or beverage (Scarry 2003; Talalay et al. 1984).

The only identified fruit seed was a possible hawthorn seed (*Crataegus* sp. L.). The remaining seeds in the assemblage include of variety of plants, including bearsfoot, bedstraw (*Galium* sp. L.), chenopod (*Chenopodium* sp.), holly (*Ilex* sp. L.), a possible knotweed seed (*Polygonum* sp. L.), wax myrtle (*Myrica* sp. L.), and a few seeds from the grass family (Poaceae). People probably consumed the seeds of chenopod and knotweed, but both plants may also have been eaten as greens or as potherbs (Hedrick 1972; Medsger 1966; Ulmer and Beck 1951). While some of these species may have been food or they may represent weedy contaminants, the majority of them also have documented medicinal uses.

In the assemblage, the most notable plant with medicinal qualities is bearsfoot, a perennial wildflower. Native Americans used bearsfoot in poultices and salves, and as a laxative and stimulant (Chevallier 1970; Grieve 1984; Smyth 1903; Usher 1974). The root can be rendered and taken orally for the treatment of indigestion and liver malfunction (Chevallier 1970; Smith 1914). Bearsfoot root can also be made into a salve for treating burns, cuts, and skin inflammations (Hamel and Chiltoskey 1975; Moerman 1998; Wells 1965). The Cherokee steeped the root to make an herbal ''decoction'' for expelling afterbirth (Hamel and Chiltoskey 1975:42; Taylor 1940); Taylor's (1940) review of native southeastern medicinal plants indicates that this herbal drink is used to induce vomiting, which is supposed to help expel the placenta. While the medicinal uses of bearsfoot are many, it is also important to note that the plant also produces a relatively large, oily seed that is potentially edible.

The holly seed (and possible holly seed) is notable in that it may be yaupon holly (*Ilex vomitoria* Aiton), a natural emetic and primary ritual ingredient in the native Black Drink (Coon 1979; Porcher 1970). Porcher's *Resources of the Southern Field and Forests* indicates, ''[t]he Indians drank it very strong, and in copious draughts, at a certain period of the year, in order to purify themselves'' (Porcher 1970:394; see also Coon 1979). Other species of holly (*Ilex opaca* Aiton and *Ilex cassine* L.) have documented medicinal uses among native southeastern groups. Berries of *I. opaca* were used to treat colic and dyspepsia and the leaves to treat muscle cramps (Hamel and Chiltoskey 1975). *I. cassine* was used as an emetic in ritual contexts in much the same way as *I. vomitoria* (Hamel and Chiltoskey 1975).

Wax myrtle is one of the most widely documented medicinal plants in the assemblage (Coon 1979; Porcher 1970). Also known by the common name bayberry, wax myrtle has astringent properties useful in the treatment of ulcers, diarrhea, dysentery, jaundice, and uterine bleeding; in large doses it can also be used as an emetic (Coon 1979; Porcher 1970). When dried and ground, wax myrtle can be inhaled as snuff for nasal congestion (Coon 1979; Porcher 1970).

While bedstraw, chenopod, and knotweed are well-known for their more mundane uses, they also have medicinal properties. Bedstraw was used as bedding (e.g., stuffing in pillows and mattresses), but it was also used as a diuretic, astringent, antispasmodic, and a treatment for kidney problems (Coffey

TABLE 2.—Seasonality of Sandy site plant taxa in ascending order by bloom.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Holly				X	X							
Wax Myrtle				X	X	X	X	X	X	X		
Bedstraw					X	X	X	X				
Maize							X	X	X			
Bearsfoot							X	X	X			
Chenopod							X	X	X	X	X	
Knotweed							X	X	X	X	X	
Hawthorn									X	X		
Sumpweed									X	X	X	
Hickory										X		
Walnut										X		

1993). Bedstraw may also have been consumed as a tea, and its greens may have been eaten (Coffey 1993; Hedrick 1972; Peterson 1977). In addition to its use as food, chenopod is known as a treatment for worms in children (Coffey 1993) and as an antispasmodic (Coon 1979), so it can also be considered a medicinal plant. Knotweed root has astringent properties and is a natural emetic and purgative; it can be used to treat diarrhea, constipation, dysentery, and uterine bleeding (Porcher 1970). Knotweed leaves can be made into an infusion to stop bleeding in the mouth (Coffey 1993).

These plants ripen and can be collected from April through December, although roots can certainly be dug up throughout the year (Table 2). Maize begins to ripen in mid-summer and continues to be harvested throughout the early fall. Hickories and walnuts begin to ripen in October. The remaining taxa ripen and are available in the late spring and summer. Collectively, this seasonality information points to an occupation sometime during late spring to early fall; the faunal data below suggest a more fall-centered occupation. Of course, the majority of these plants (e.g., seeds, nuts, etc.) can be stored for use during other seasons.

To determine the importance of different plants in the assemblage, we used ubiquity analysis and relative percentages. Ubiquity analysis measures the relative presence of a taxon at the site by measuring its frequency of occurrence in a group of samples or features (Popper 1988). In our analysis, we used individual samples as the level of aggregation for determining ubiquity values. For example, wood was identified in all 34 flotation samples, resulting in a ubiquity value of 100% (Table 3). After wood, bearsfoot is most ubiquitous, followed by maize, hickory, and bedstraw. All other taxa have ubiquity values less than ten percent.

This pattern contrasts with contemporaneous sites in the Roanoke River valley where maize and hickory overwhelmingly dominate the assemblages (Table 4). Table 4 lists the five most ubiquitous plants (excluding wood) for the Sandy site, Graham-White (analyzed and reported by Gremillion 1993b), Buzzard Rock II, and 44RN348 (VanDerwarker 2005, 2006; see also VanDerwarker and Idol 2008). The three comparative sites are very similar, with maize and hickory most ubiquitous, followed by walnut and acorn in variable orders. The Sandy site contrasts with these sites; although maize and hickory are ranked

TABLE 3.—Ubiquity values in descending order for plants identified at Sandy site.

Common Name	Samples Present	Ubiquity Value
Wood	34	100%
Bearsfoot	22	65%
Maize	14	41%
Hickory	12	35%
Bedstraw	4	12%
Chenopod	3	9%
Walnut	2	6%
Holly	2	6%
Hawthorn cf.	1	3%
Knotweed	1	3%
Sumpweed	1	3%
Wax Myrtle	1	3%

within the top five resources, bearsfoot is ranked higher than either of these staple foods.

We calculated relative percentages of the plant remains using raw counts (e.g., counts of each taxon divided by total site counts). Table 5 shows that in addition to being the most ubiquitous plant at the Sandy site, bearsfoot is also the most abundant. Hickory and maize are ranked second and third in terms of relative percentages, the reverse of their ubiquity values. As with the ubiquity analysis, comparing the top five ranked plant resources (in terms of relative percentages) among the comparative sites also highlights the disparity between them and the Sandy site (Table 6).

Quantitative measures of ubiquity and relative percentages highlight the uniqueness of the Sandy site plant assemblage with its wide distribution and abundance of bearsfoot. While these results suggest a focus on the collection of a key medicinal resource, they do not speak to issues of settlement permanence and mobility. To address these aspects of occupation, we use indications of maize processing as a proxy measure for assessing how involved (if at all) the site's residents were in agricultural production. The lower ubiquity values for maize at the Sandy site (41%) as opposed to other sites in the region (88–90%) indicate that maize may have been a less prevalent resource. Ubiquity values alone, however, yield little information on the intensity of maize processing. To determine relative levels of maize processing (and thus production), we compare ratios of maize kernels to maize cupules. If maize was grown nearby and processed at the site, we would expect to see processing waste associated with maize shelling.

TABLE 4.—Top five ranked plant foods calculated as ubiquity values from comparative Late Woodland sites in the Roanoke Valley.

Sandy Site		Graham White		Buzzard Rock II		44RN348	
Bearsfoot	65%	Maize	92%	Hickory	88%	Hickory	92%
Maize	41%	Hickory	76%	Maize	82%	Maize	86%
Hickory	35%	Walnut	62%	Acorn	28%	Walnut	51%
Bedstraw	12%	Acorn	26%	Chenopod	22%	Acorn	47%
Chenopod	9%	Bean	20%	Walnut	15%	Grape	17%

TABLE 5.—Relative percentages in descending order for plants identified at Sandy site.

Common Name	Percentage
Bearsfoot	36.8%
Hickory	33.0%
Maize	17.4%
Grass family	2.8%
Bedstraw	2.4%
Chenopod	1.4%
Walnut	0.9%
Hawthorn cf.	0.5%
Holly	0.5%
Holly cf.	0.5%
Knotweed cf.	0.5%
Sumpweed cf.	0.5%
Wax myrtle	0.5%

Before maize can be ground into flour, the kernels must be removed from the cob, leaving the cobs and cupules as byproducts. Because kernels represent the part of the maize plant meant for consumption and cupules represent processing discard, a lower proportion of kernels to cupules would indicate greater levels of maize processing (Scarry and Steponaitis 1997:117). Thus, a site that is heavily involved in maize production would yield a relatively low maize kernel/cupule ratio. Conversely, a site that is only minimally involved in maize production (if at all) would yield a much higher maize kernel/cupule ratio.

Comparing maize kernel/cupule ratios for the Sandy site, Graham White, Buzzard Rock II[1], and 44RN348 shows that the Sandy site has a much higher kernel/cupule ratio than the others, a difference that is statistically significant (chi-square = 879.8, $p < 0.001$; Figure 3). These results suggest that very little maize was processed at the Sandy site itself, since the majority of maize fragments are the edible kernels. This pattern leads to two possible scenarios: 1) maize production occurred in a very limited capacity at the Sandy side, or 2) maize was produced elsewhere and brought to the site in shelled form, perhaps by basketload. Either scenario would support the interpretation that activities at the Sandy site were geared less toward the production and processing of maize than at other sites in the region.

The patterns in the plant data strongly suggest a focus on the collection of wild resources that have significant medicinal qualities, particularly bearsfoot. While it's possible that bearsfoot served the dual purpose of food (rendering the

TABLE 6.—Top five ranked plant foods calculated as relative percentages for comparative Late Woodland sites in the Roanoke Valley.

Sandy Site		Graham White		Buzzard Rock II		44RN348	
Bearsfoot	36.8%	Maize	63.6%	Acorn	43.5%	Hickory	46.9%
Hickory	33.0%	Hickory	25.5%	Hickory	31.1%	Maize	26.8%
Maize	17.4%	Walnut	5.8%	Maize	21.1%	Acorn	8.1%
Grass family	2.8%	Acorn	0.9%	Chenopod	0.9%	Hazelnut	5.7%
Bedstraw	2.4%	Bean	0.6%	Walnut	0.7%	Walnut	2.3%

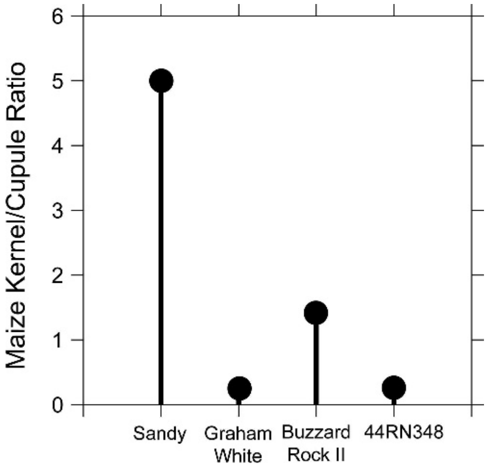

FIGURE 3.—Maize kernel/cupule ratios for comparative Late Woodland sites in the Roanoke Valley (chi square = 879.8, $p < 0.001$).

seed for oil) and medicine (rendering the root, and use of the oily seed in salves), we have not come across any reference to the use of bearsfoot as food in our literature search on this species. The low levels of maize processing indicate that maize production was probably not taking place at the Sandy site, but rather maize was brought to the site in consumable form. Collectively, these plant data may point to a short-term occupation of the site, which functioned, at least partially, as a base for the collection and processing of bearsfoot for medicinal purposes. Of course, it is entirely possible that the medicinal plants were transported to the site in the same manner as the maize. To further assess site function, we now turn to the zooarchaeological data.

THE ZOOARCHAEOLOGICAL ASSEMBLAGE

The faunal assemblage was recovered by screening through ¼-inch mesh (6.35 mm) and yielded 5,578 bone specimens weighing 1,673 grams. Screened bone specimens were sorted by VanDerwarker to the lowest possible taxonomic category and identified with reference to the first author's comparative collection. Each specimen was assigned to the appropriate animal class whenever possible (e.g., mammal, bird, etc.). The anatomical element was recorded when identified; otherwise it was placed in an unidentified category.

Three taxonomic classes, reptiles, birds, and mammals, were identified (Table 7). Reptiles in the assemblage consist of unidentified turtle and unidentified snake specimens. Only one bird specimen was encountered, but was not identifiable beyond class. Over 90% of the animal bones that could be identified were classified as mammals. VanDerwarker identified one opossum (*Didelphis virginianus* Gray) and four raccoon (*Procyon lotor* L.) bones. Opossums prefer disturbed habitats, including areas along forest edges, secondary growth, and weedy areas (Reid 1997:43–44, 192). Raccoons are also highly adapted to disturbed habitats (Reid 1997:258). White-tailed deer (*Odocoileus virginianus* L.)

TABLE 7.—Summary of animals from screened samples.

Common Name	Taxonomic Name	NISP	MNI	Weight
REPTILES				
UID snake		18		0.11
UID turtle		4		0.74
BIRDS				
UID Bird		1		0.05
MAMMALS				
Opossum	*Didelphis virginianus*	1	1	0.16
Human	*Homo sapiens*	1	1	2.28
UID Rodent	Rodentia	5		0.04
Raccoon	*Procyon lotor*	4	1	0.99
White-tailed deer	*Odocoileus virginianus*	1238	5	1163.68
Large Mammal		3164		474.35
UID Mammal		619		18.85
UNIDENTIFIED		523		11.71
TOTAL		**5578**	**8**	**1672.96**

compose the bulk of the identified assemblage. In addition, over 3,000 specimens were identified as ''large mammal.'' While some of these large mammal specimens could be black bear (*Ursus americanus* Pallus), the majority are probably white-tailed deer. Deer inhabit a variety of different ecozones, including forests, forest edges, grasslands, disturbed areas, and occasionally agricultural fields (Benyus 1989; Sutton and Sutton 1985).

Because the faunal data consist primarily of large mammal elements, we restricted our analysis to the white-tailed deer identified in the assemblage. Although the high proportion of large bones could be the result of poor bone preservation or taphonomic bias, when we compared the faunal assemblage recovered during flotation with that recovered in the screens, we found that the recovery methods did not generate a size bias (Table 8). To consider whether other taphonomic issues have biased the faunal assemblage recovered in the screens, we consider the effects of density-mediated attrition on these white-tailed deer specimens. Denser bones preserve better than fragile, porous bones in the face of taphonomic processes such as weathering, wetting and drying,

TABLE 8.—Summary of animals from flotation samples.

Common Name	Taxonomic Name	NISP	MNI	Weight
BIRDS				
UID Bird		1		0.01
MAMMALS				
White-tailed deer	*Odocoileus virginianus*	1	1	0.87
Large Mammal		91		17.09
UID Mammal		15		1.63
UNIDENTIFIED		48		5.55
TOTAL		**156**		**25.15**

TABLE 9.—Sandy site white-tailed deer parts: meat utility and bone mineral densities (ranked by descending %MAU).

Element	NISP	Observed MNE[a]	Expected MNE	%Survivorship (ObMNE/ ExMNE)	MAU[b]	%MAU	FUI[c]	VD[d]
calcaneous	9	9	10	90%	4.5	100.0%	1424	0.49
humerus, distal	12	7	8	88%	3.5	77.8%	1891	0.51
scapula	368	6	6	100%	3	66.7%	2295	0.35
mandible	223	4	4	100%	2	44.4%	590	0.51
radius, distal	3	3	4	75%	1.5	33.3%	1039	0.4
cervical vertebra	59	6	10	60%	1.2	26.7%	1905	0.17
metapodial, distal	14	4	4	100%	1	22.2%	578	0.5
metacarpal, prox.	9	2	4	50%	1	22.2%	461	0.66
astragulas	6	2	4	50%	1	22.2%	1424	0.56
tibia, distal	2	2	4	50%	1	22.2%	2267	0.5
1st phalanx	11	7	8	88%	0.875	19.4%	443	0.45
radius, proximal	5	1	2	50%	0.5	11.1%	1323	0.52
femur, distal	1	1	2	50%	0.5	11.1%	5139	0.32
femur, proximal	1	1	2	50%	0.5	11.1%	5139	0.37
humerus, shaft	1	1	2	50%	0.5	11.1%	–	0.53
innominate	1	1	2	50%	0.5	11.1%	2531	0.33
ulna, proximal	1	1	2	50%	0.5	11.1%	1323	0.37

[a] Minimum Number of Elements.
[b] Minimum Anatomical Unit.
[c] Food Utility Index (Metcalfe and Jones 1988).
[d] Volume Density (Lyman 1994; Reitz and Wing 1999).

freezing, and soil acidity, among others. If density-mediated attrition affected the Sandy site white-tailed deer assemblage, then we would expect more elements with higher density values than those with lower density values. To assess this, we consider the relationship between element survivorship and known volume density values for white-tailed deer bones (from Lyman 1994 and Reitz and Wing 1999). Survivorship is calculated for each skeletal element by dividing observed MNE (Minimum Number of Elements) values by expected MNE values (Table 9). Figure 4 plots survivorship against volume density for the white-tailed deer assemblage. Based on the scatterplot and the corresponding Pearson's *r* correlation coefficient (0.05), there appears to be almost no relationship between element survivorship and volume density. Since density-mediated attrition does not appear to have significantly affected the white-tailed deer assemblage, it is possible that density-mediated attrition is also not responsible for the preponderance of mammals with respect to other classes of animals. In other words, deer (and large mammals as a whole) dominate the assemblage because people purposefully targeted large mammals over other types of animal prey.

It appears that people focused on hunting deer at the Sandy site, but diversity analysis allows us to test whether they disproportionately exploited white-tailed deer compared to contemporary sites in the valley. Zooarchaeological assemblages from Buzzard Rock II and 44RN348 were analyzed by VanDerwarker (2005, 2006), thus eliminating problems of inter-observer bias. We

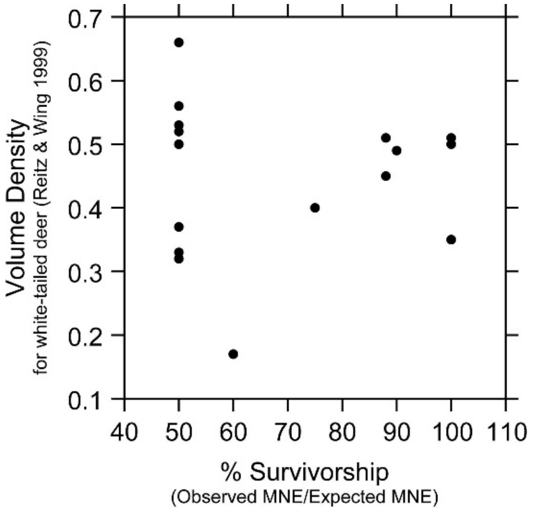

FIGURE 4.—Known volume density values for white-tailed deer elements plotted against bone survivorship (Pearson's r = 0.05).

consider two different measures of species diversity—richness and evenness. Richness refers to the number of taxa in a given assemblage; the more taxa present, the richer the assemblage (Kintigh 1984, 1989; Reitz and Wing 1999). Evenness, or equitability, refers to the uniformity of the distribution of taxa in the assemblage; if each taxon is represented by the same number of specimens or individuals, then the assemblage is more evenly distributed than an assemblage dominated by a specific taxon (Kintigh 1984, 1989; Reitz and Wing 1999).

Normally larger assemblages yield a richer array of taxa than smaller assemblages and are more likely to yield rare taxa. Thus, it is problematic to assume that assemblages with more taxa have greater diversity than assemblages with fewer taxa without first determining if differences in richness or evenness are structured by differences in sample size (Baxter 2001; Jones et al. 1983; Kintigh 1989; Rhode 1988). We used the DIVERS computer simulation to assess the diversity of our assemblages.

The DIVERS program simulates assemblages based on the taxonomic categories and sample size of a given archaeological assemblage and produces expectations for diversity that can be compared with the actual data (Kintigh 1984, 1989). Thus, it is possible to judge whether an archaeological assemblage is more or less diverse than expected by comparing the richness and evenness of the actual assemblage to the expected values that are randomly generated by the DIVERS simulation (Kintigh 1984, 1989). Archaeological assemblages, then, are not directly compared to each other. Rather, actual diversity values are compared with expected values for the same sized sample at a 90% confidence level. The actual values for richness and evenness of each assemblage are then plotted against sample size along with the 90% confidence interval based on the expected values. If a value falls above the confidence interval, then the assemblage is more diverse than expected. Conversely, if a value falls below the confidence interval, then it is less diverse than expected.

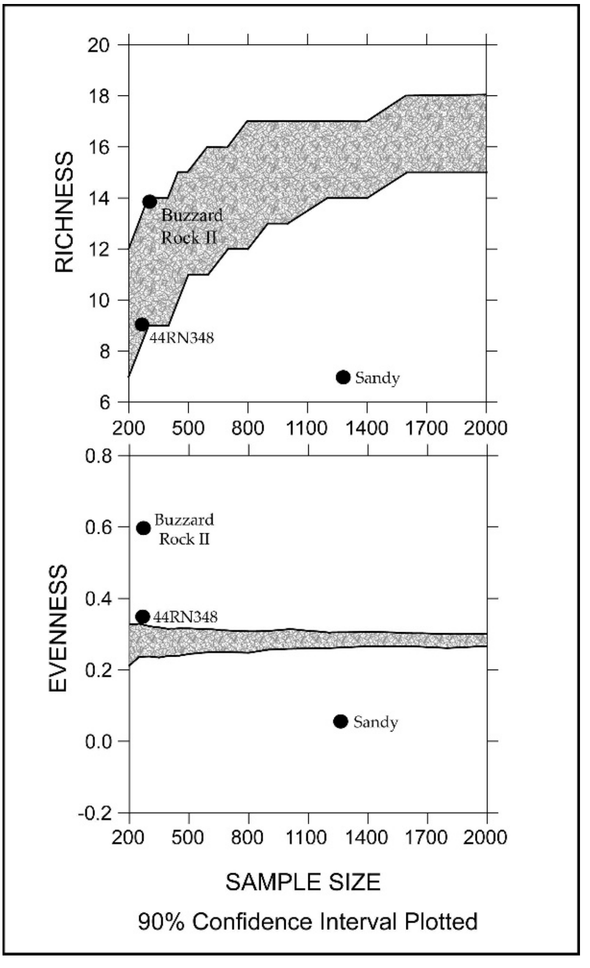

FIGURE 5.—DIVERS richness and evenness plots of vertebrate fauna from comparative Late Woodland sites in the Roanoke Valley.

Figure 5 plots both richness and evenness for all three sites against sample size. In terms of richness, both Buzzard Rock II and 44RN348 fall within the 90% confidence interval for expected richness given their respective sample sizes. The Sandy site, however, falls well below the 90% confidence interval and therefore is less rich than expected. In terms of evenness, both comparative sites appear to be more evenly distributed than expected; 44RN348 is slightly above the 90% confidence interval, and Buzzard Rock II is well above it. In contrast, the Sandy site assemblage is well below the 90% confidence interval for evenness, indicating that the distribution of animals at the site is heavily skewed toward particular taxa. Both richness and evenness plots reveal the Sandy site is focused on fewer species than expected and is skewed toward a specific subset of those taxa—in this case, white-tailed deer. Moreover, comparing the Sandy site to the other two sites reveals that the Sandy site differs significantly in these two measures.

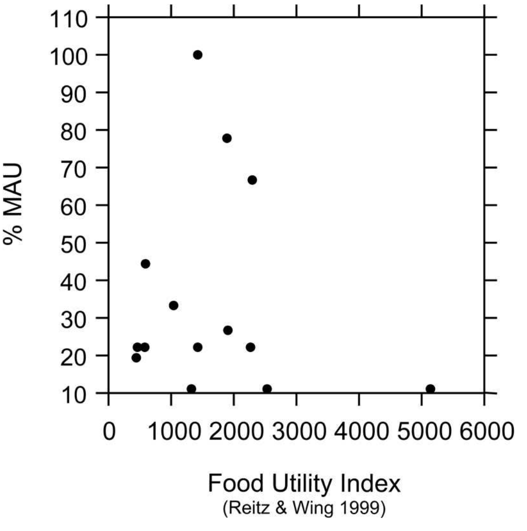

FIGURE 6.—Food Utility Index (FUI) for white-tailed deer elements plotted against % MAU (Pearson's R = −0.197).

This analysis confirms that residents of the Sandy site were targeting deer, so the next question we ask is what type of field processing/butchering strategy they used? If the site was a seasonal encampment established for the purpose of deer hunting, then we might expect the deer assemblage to be dominated by low meat-yielding bones, or low-utility elements, including the skull and mandible, and lower limb bones (metapodia, carpals/tarsals, and phalanges). We would expect fewer mid-utility parts (axial elements) and high-utility parts (forelimbs and hindlimbs) because these parts would presumably be transported back to a more permanent settlement. To examine deer body part distributions, we consider the assemblage in terms of transport decisions (Figure 6). Following Binford (1978) and Metcalfe and Jones (1988), we plot the Food Utility Index (FUI) against percent MAU (Minimum Anatomical Unit; see also Lyman 1994; Reitz and Wing 1999). MAU is calculated as observed MNE divided by the number of that element that occurs in a normal deer skeleton; MAU values are then scaled as percentages against the largest MAU value for the assemblage (see Table 9; Reitz and Wing 1999). For example, a minimum of seven deer humeri were identified in the assemblage (MNE = 7), and there are two humeri in a normal deer skeleton, resulting in an MAU of 3.5. Once MAU values are calculated for all represented elements, the highest MAU value is set at 100% and the remaining values are rescaled against this (Table 9). Figure 6 most closely resembles a reverse utility strategy because ''the reverse utility strategy graph reflects the types of elements that would be found at a kill/butchery site at which elements with low utility would be abundant; elements with high utility would be underrepresented because they are removed to consumption sites'' (Reitz and Wing 1999:24).

In sum, this analysis indicates that the faunal assemblage from the Sandy site is biased heavily toward white-tailed deer remains. Because deer element survivorship is not correlated with bone volume density, the deer assemblage is not a result of density-mediated attrition, and taphonomic factors are not responsible for this bias. Moreover, diversity analysis reveals that the skewed faunal assemblage from the Sandy site is atypical for the Roanoke valley. The results of the deer body part analysis indicate a butchering strategy geared toward processing deer for use elsewhere. Thus, it appears that white-tailed deer were likely hunted nearby and brought back to the Sandy site for field processing, after which the meaty parts were transported to another location, probably a more permanent habitation site. These data, when considered in tandem with the unique plant assemblage and the small number and variety of features at the site, support the interpretation that the Sandy site served as a short-term encampment for collecting and exploiting key resources.

DISCUSSION AND CONCLUSION

The taxonomic composition of flora and fauna in the Sandy site's assemblage is not what one would expect from a habitation site. The plant assemblage is dominated by a medicinal plant and contains relatively fewer remains of maize and hickory, the staple foodstuffs of a typical domestic assemblage. Bearsfoot, a wildflower with an array of medicinal properties, is more abundant and ubiquitous than any other plant at the site, and the assemblage contains a suite of other plants with medicinal qualities, including bedstraw, holly, and wax myrtle. The animal assemblage is dominated by a single species, white-tailed deer. If this were a typical domestic assemblage, one would expect deer to be an important resource, but one would also expect a richer array of other animals than we found. The Sandy site faunal assemblage, however, is so heavily skewed toward white-tailed deer that virtually no other taxa were present in the assemblage. A comparison of the bones from flotation samples with those from the screened assemblage ruled out size bias in the recovery methods. An examination of the deer assemblage ruled out density-mediated attrition as a taphonomic factor, so poor preservation did not cause this pattern. Rather, it appears that people at this site intentionally targeted deer. In addition, analysis of deer body part distributions produced a reverse utility curve, an outcome that strongly suggests a short-term butchery/kill site. From these analyses we can conclude that the people at this site killed and butchered a minimum of 5 deer, removed high-utility and mid-utility cuts of meat, and transported them elsewhere, possibly to a separate habitation site.

The emphasis on hunting deer and collecting bearsfoot suggests the site was occupied sometime between August and October. Peak hunting time for white-tailed deer is during the fall, especially September and October. Bearsfoot begins to bloom in July and can be collected through September. While bearsfoot roots can be exploited year-round, the fact that bearsfoot seeds are showing up in the assemblage suggests (1) a more seasonal exploitation of this plant, and (2) a potential dual use of the seeds for food and the roots for medicine. It should be noted that roots would not preserve archaeologically in this region, and thus their absence does not negate their ancient usage. Seasonality for the other medicinal species varies, but all are ripe and available for collection during

August and September, except for bedstraw, which is usually only available through August. Based on the plant and animal evidence, there are two likely interpretations for site function. One interpretation is that the Sandy site represents a short-term seasonal encampment for collecting medicinal plants and hunting deer. In this scenario, one can imagine small family groups of different ages and genders occupying the site, with some individuals hunting and others collecting key plant resources. During the length of the occupation, this hunting/collection party would have subsisted on stored, transported maize and nuts; the nuts could either have been collected nearby or brought to the site like the maize. The second interpretation is that the Sandy site simply represents a short-term kill and butchery site. In this scenario, a small, specialized hunting party, perhaps restricted to males of peak hunting age, occupied the site, bringing along food stores of maize and nuts, in addition to a variety of medicinal plants that may have functioned as a first-aid kit of sorts. The most abundant medicinal plant, bearsfoot, has a vast array of medicinal uses, and perhaps we can consider this a first-aid staple along the lines of today's topical antibiotics such as Neosporin. Given the dangers of hunting large animals, it certainly makes sense to be prepared for possible injuries and resulting infections.

In summary, analyses of the plant and animal data suggest that the Sandy site was very different from its contemporaneous neighbors in the region. Its function and its location require that we recognize a greater diversity of Late Woodland settlement types in the region, and we conduct site-level and regional comparative analyses that allow us to better define this diversity. Most Late Woodland special-activity sites, including hunting camps, occur in upland locations (Benthall 1969; Bott 1981; Holland 1970). The Sandy site, however, is located on the floodplain along the Roanoke River, so it is possible that this location was chosen not merely for hunting, but because it was a good locale for bearsfoot collection. While bearsfoot is adaptable to a wide variety of soils, it requires direct sunlight, and thus thick wooded areas (e.g., upland forests) are not ideal. Some of the best habitats for bearsfoot include low woods, alluvial thickets, and riverbanks—all good floodplain habitats. Its location along the Roanoke River floodplain may lend additional support to the interpretation that the Sandy site represents a short-term seasonal encampment both for collecting medicinal plants *and* for hunting deer.

Finally, the analyses presented in this paper exemplify the interpretive power of using multiple lines of subsistence evidence to identify broader behavioral patterns that transcend basic subsistence practices and inform us about issues of site structure and regional mobility patterns. Clearly, our subsistence ''specialties'' form the infrastructure of today's archaeological interpretations.

NOTES

[1] Two special-function features from Buzzard Rock II (Features 102 and 135) were excluded from this calculation as they were different from everyday domestic refuse. These features yielded 160,000+ maize kernels that were intentionally burned and

disposed of, perhaps as part of a renewal ritual or because they had simply spoiled in storage (see VanDerwarker and Idol 2008). These features were also excluded from the relative percentage calculations.

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