GIFTS OF THE ANCESTORS: SECONDARY LITHIC RECYCLING IN APPALACHIAN SUMMIT PREHISTORY

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Evidence of systematic secondary lithic recycling at the Katie Griffith site and Church Rockshelter No. 2 in the mountains of western North Carolina is presented. It is proposed that recycling and reuse of found stone artifacts in the Early Woodland period of the Appalachian Summit region of the southeastern United States was a regular lithic procurement option. It is concluded that systematic secondary lithic recycling was widespread in prehistory, provides an avenue for exploring economizing responses to raw material procurement challenges, and must be accounted for when using lithic artifacts in reconstructions and explanations of human mobility, exchange, and technological organization, and in archaeological constructions of lithic artifact typologies.

Se presenta evidencia de reciclamiento lítico secundario en el sitio Katie Griffith y Church Rockshelter No. 2 en las montañas occidentales de Carolina del Norte. Se propone que el reciclamiento y reuso de los artefactos de piedra hallados en el periodo Early Woodland de la región de Appalachian Summit del sureste Estado Unidense fue una opción para la obtención regular lítico. Se concluye que el reciclamiento lítico sistemático y secundario fue amplio en la prehistoria, provee avenida para explorar respuestas economisadoras (de ahorro) al desafío de la obtención de materias primas y explicaciones de movilidad humana, intercambios, y organización tecnológica, así como en las construcciones arqueológicas de artefactos tipológicos líticos.

In prehistory raw materials for manufacture of chipped stone tools were obtained by direct procurement from bedrock and transported geologic sources, through exchange, and by means of scavenging stone artifacts from archaeological deposits. Recycling and reuse of found stone artifacts has been historically documented (Amick 2007; Ascher 1968; Gould et al. 1971; Hill 1938; Sedig 2010; Tindale 1965) and identified in the archaeological record (Amick 2007; Camilli 1988; Freeman 1957; Goodwin 1960; Hayden 1976; Jolly 1970; Rolland and Dibble 1990; Sassaman 1993; Vaquero et al. 2012: Whyte 1984) as far back as the Middle Paleolithic (Debénath 1992). Amick (2007) suggests that scavenging and recycling, or "secondary recycling," was either opportunistic, in which discovered artifacts were occasionally recovered and fashioned into new tools, or systematic, in which they were decidedly sought to provide material for new tools. Systematic secondary lithic recycling was a procurement option that sometimes may have influenced decisions of mobility and settlement, and for some societies and in certain circumstances may have been the only profitable option for obtaining high quality lithic material. Much like recycling today, it was sometimes necessitated because of diminishing natural resources such as obsidian at finite quarry sites (Amick 2007), and because of developing restrictions to natural lithic sources owing to decreased mobility, territorial circumscription, or ownership control (Sassaman 1993). Regardless of its motivation, systematic secondary lithic recycling has undoubtedly influenced structures of human settlement, exchange, and technological organization; raw material compositions of lithic assemblages; and archaeological constructions of lithic artifact typologies (Amick 2007; Rolland and Dibble 1990; Sassaman 1993; Vaquero et al. 2012). Archaeologists, consequently, must take measures to recognize evidence of secondary recycling before attempting to reconstruct and explain these potentially affected cultural phenom-

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ena and before defining typologies that are based in part on lithic material associations.

The focus of this study is the salvage, recycling, and reuse of lithic artifacts in higher elevations of the Appalachian Summit region of southeastern North America. It will be shown that secondary recycling of found lithic artifacts in this region, where natural sources of tractable materials are sometimes distant, became routine in the Early Woodland period, approximately 3000–2200 B.P. This behavior is correlated with decreased mobility and increased reliance on technologies (bow and arrow) requiring smaller lithic components. Sassaman (1993:214) noted the same for the Early Woodland period of the Aiken Plateau of South Carolina, where he refers to Late Archaic base camps of the region as "cultural quarries" that provisioned subsequent Early Woodland inhabitants, whose ranges and access to geologic sources were more restricted, with lithic tool material in the form of large discarded artifacts.

It will be shown that secondary lithic recycling likely influenced prehistoric human mobility choices and the material and typological compositions of earlier (prerecycling) and later lithic assemblages. With regard to the latter, the scavenging and recycling of found lithic artifacts acted, in essence, like a taphonomic process in the erasure and transformation of earlier archaeological evidence. It also influenced lithic artifact type constructions that were based in part of the sizes, shapes, and material compositions of artifacts made from scavenged materials.

Recognizing Secondary Lithic Recycling

Although many lithic objects, from soapstone vessel fragments to hammer stones and fire cracked rocks, were sometimes found and recycled, the focus of this study is recycling of found chipped stone artifacts such as flakes and bifaces. In most cases, to identify evidence of this behavior in the archaeological record one must be able to show that an object had remained for some time in archaeological context between its initial deposition and its subsequent use. Usually for this to be achieved the archaeologist must first be able to observe evidence of both the lapse of time between deposition and scavenging (e.g., weathering in the form of patination, hydration, abrasion, burning, or staining) and subsequent modification or use (flake scars or usewear–damage that postdates weathering of artifact surfaces). Sometimes, however, the evidence of time lapse is the apparent modification of an artifact from an earlier type into a later one (Freeman 1957; Jolly 1970). Secondary recycling also may be indicated by refitting of flakes to scavenged and reworked artifacts and by evidence of a reversion in reduction strategies (Sassaman 1993). Sometimes contextual discrepancies can indicate archaeological deposition between periods of use. For example, the finding of a much earlier artifact type in a younger and vertically distant superior stratum of a relatively undisturbed profile might indicate salvage, reuse, and redeposition of the artifact (Amick 2007; Rick 1996). Stone artifacts of very early types found as deliberate human burial inclusions on more recent sites have been interpreted as "hunting charms" (Ritchie 1969:322), but may in fact represent scavenged lithic materials intended for later modification and use, and in this case, in the afterlife.

Intentional modification of thermally damaged chipped stone artifacts has been cited as evidence of secondary lithic recycling (Vaquero et al. 2012; Whyte 1984). Thermal damage most often results from postdepositional exposure of artifacts to heat sources such as forest fires (Connor et al. 1989; Whyte 1984) or superposed cooking facilities (Vaquero et al. 2012; Whyte 1984). Subsequent flaking of these artifacts results in flake scars that differ in luster or texture from the originals.

Chipped stone artifacts with variably patinated flake scars, relatively common in archaeological assemblages, are a clear and perhaps most cited indication of secondary recycling (Amick 2007; Hayden 1976; Sassaman 1993). Many lithic materials, including chert, rhyolite, and obsidian will gradually develop a patina on flaked surfaces (Goodwin 1960; Upchurch 1984). Variably patinated artifacts are ones that were made, discarded, remained in archaeological context to develop a patina, and then were later found and reworked to expose fresh (usu. darker) material. This is readily observable on certain lithic materials such as obsidian, chert, and rhyolite that are susceptible to dehydration and a concomitant fading in surface color or luster. Therefore, recognizing evidence of secondary lithic recycling and evaluating its meaning in terms of lithic technological orga-

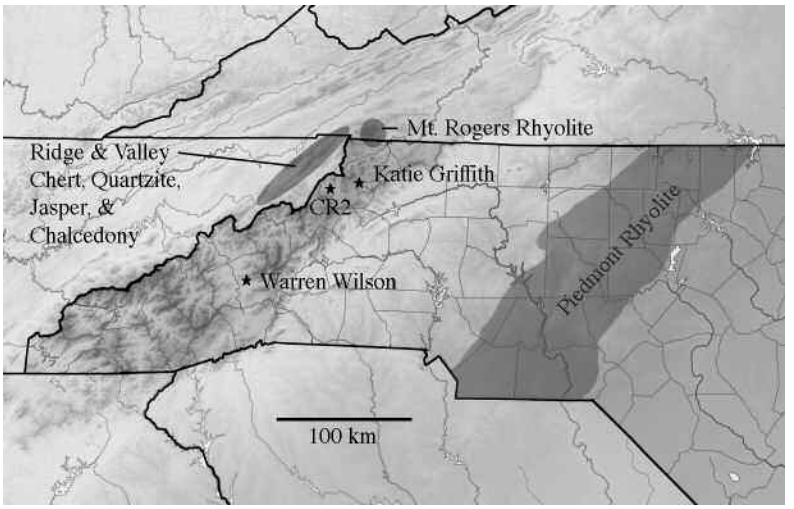

Figure 1. Locations of archaeological sites and lithic raw material sources discussed.

nization, human settlement, and exchange requires knowledge of lithic raw material sources, tractability, and responses to weathering processes, in addition to familiarity with local lithic artifact typologies.

Lithic Materials of the Appalachian Summit

The Appalachian Summit, as defined by Kroeber (1939) and redefined by Dickens (1976), is a cultural region that includes the highest elevations of the Blue Ridge physiographic province. Its metamorphic geology provided very little in the way of tractable isotropic rocks for the production of chipped stone artifacts such as projectile points and knives. Vein quartz, crystal quartz, and quartzite, which occur sporadically in metamorphic outcroppings and among the gravels of rivers and streams, are considered the materials of local provenance in archaeological studies (Bass 1977; Purrington 1983; Whyte 2013). Primary flakes of these materials, found on many archaeological sites in the region, often exhibit water-tumbled cortex indicating that humans engaged in subsistence activities obtained them from river and stream gravels and places where clean cobbles tested by the fluvial process could be identified and procured for further reduction. These are generally small package rocks that limited the possible sizes of tools produced. Larger materials such as Erwin formation quartzite, Mount Rogers rhyolite, Uwharrie formation rhyolite, and more tractable materials such as chert, jasper, and chalcedony derived from the Knox Group dolomite were imported to the highlands from lower regions to the west, north, and east (Figure 1). In other words, the Appalachian Summit, potentially perceived as a "conveyance zone" (Seeman 1994), contains a dearth of lithic materials but is immediately flanked by an abundance and variety suitable for the production of chipped stone tools.

Until the onset of the Medieval Warm period at about A.D. 900, human use of the higher elevations (above 750 m above mean sea level) was probably seasonal (Whyte 2003, 2011). Groups of humans visiting the uplands from the west brought with them lithic materials and tools made of Ridge and Valley province chert, jasper, chalcedony, and quartzite. Lithic assemblages of most prehistoric sites in the region, with the exception of those dating to the Middle Archaic period, 8000–5000 B.P., are dominated by these exogenous materials imported primarily as finished artifacts by means of human migration and to a lesser extent exchange (Kimball et al. 2010; Purrington 1983; Whyte 2013). As soon as humans began to discard artifacts in the Appalachian Summit, in the late Pleistocene epoch, they inadvertently provided their descendants with the "gifts of the ancestors"—high quality lithic materials that could potentially be discovered and used to supply their tool kits. Over time, repeated visits

to ideal base camp settings resulted in increased numbers of artifacts of exogenous and locally obtained lithic materials that could be salvaged and recycled by subsequent visitors. This was especially the case in the Late Archaic period, 5000–3000 B.P., when very large chipped stone knives and fragments thereof where deposited in great numbers on many sites and in an array of settings including rockshelters, terraces, toe slopes, and ridgelines (Bass 1977; Purrington 1983).

Anthropogenic Lithic Provisioning in the Appalachian Summit

The inadvertent anthropogenic lithic provisioning of the Appalachian Summit probably began 10,000 years ago with the occasional loss and discard of fluted points and other chipped stone artifacts of exogenous materials (Perkinson 1971, 1973; Purrington 1983; Whyte 2010). This provisioning was punctuated in the Late Archaic period between 5000 and 3000 B.P. with significantly increased seasonal use of the uplands, littering of the landscape with exhausted and broken large stone tools, and by intentional lithic caching (Nash 2005). The large stemmed bifacial tools that typify the Late Archaic period of much of eastern North America have been assigned various type names such as "Savannah River," "Appalachian Stemmed," "Ledbetter," "Holmes", and "Lehigh." They also have been given various functional names such as "knife," "point," "broadpoint," and "broadspear." McLearen (1991) provides an excellent overview of the debate as to their function. Bifacial preforms of these knives were carried along and gradually thinned to provide very large but thin soft-hammer percussion flakes intended for various modes of use (McLearen 1991; Sassaman 1993; Whyte 2007). Both the resulting flakes and discarded knives accumulated in great numbers and on many sites to potentially service the lithic industries of later visitors to the region.

Although small triangular arrowpoints of later prehistory may be more ubiquitous in and on the ground, these knives and fragments of them are by weight the most abundant bifacial stone tool types that have been found in the region (Bass 1977; Purrington 1983). They are almost exclusively made of quartzite primarily derived from the Erwin formation, blue-gray bedded chert derived from the Knox Group dolomite formations, and to a lesser extent rhyolite from the Mount Rogers formation. Considering the geologic sources of these materials and the nature of the sites on which these tools are found, they were deposited by seasonally migratory or itinerant hunter-gatherers whose mobility extended minimally 30 km to the west (Whyte 2013). The manufacture and replacement of large bifacial knives arguably required scheduled seasonal visits to geologic sources and resulted in deposition of large pieces of lithic material several kilometers from those sources. In addition, evidence of systematic transport and caching of substantial quantities of lithic material in the form of bifaces and cores has been documented for the Late Archaic period in the Appalachian region (Nash 2005). The Late Archaic period Wakeman 2 Site (31WT187) in Watauga County, North Carolina, for example, is described by Purrington (1983:129) as "literally a quartzite pavement," yet the closest natural source of this quartzite is 60 km to the west of the site and 900 m lower in elevation.

Measurement and observation of 130 specimens in the collections of Appalachian State University, recovered from various sites in the northwestern counties of North Carolina, suggest that the large stemmed bifaces of the Late Archaic functioned primarily as knives and that they would have provided effective blanks for the later production of projectile points. Over 80 percent are made of quartzite. Nearly 50 percent are complete but exhibit varying degrees of resharpening. Of these, the angle of asymmetry ranges between zero and twelve degrees and the median is 3 degrees (Figure 2). Furthermore, the tool edges are frequently very dull and exhibit microscopic striations parallel to the edge. None of the distal fragments or specimens for which the distal portion remains intact exhibits evidence of impact fractures, whereas assumed projectile points frequently do. All fractures observed are oriented transversely or obliquely with reference to the long axis. Sassaman (1993) noted the same for Late Archaic knives of the Aiken Plateau in South Carolina. These kinds of fractures usually result from impacts to the face or lateral edges of bifaces in the process of percussion (manufacture, resharpening, or deliberate termination), or from

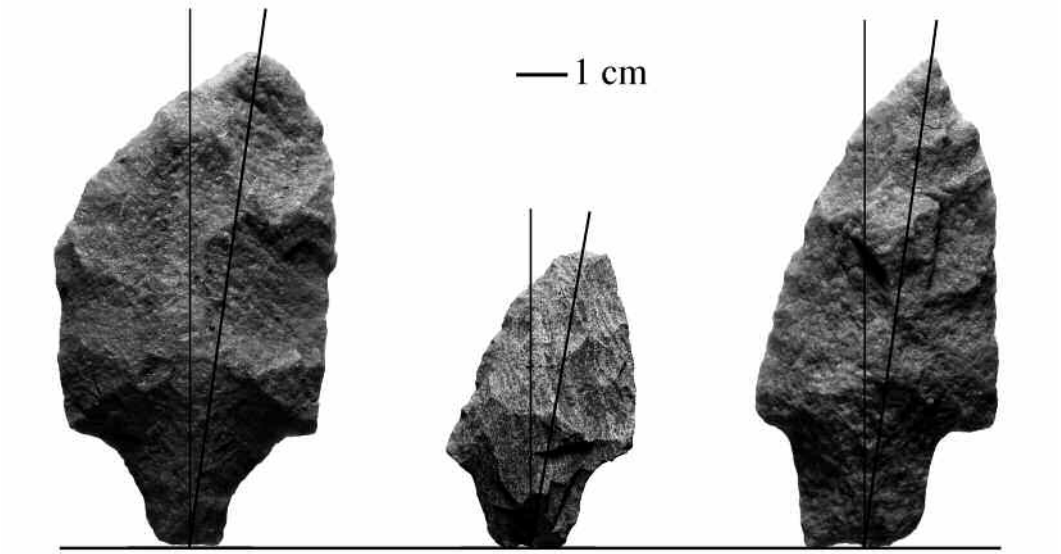

Figure 2. Examples of asymmetrical Late Archaic period knife blades from the Appalachian Summit.

pressure on the face or lateral edges while prying or cutting (Callahan 1979; Crabtree 1972).

All of the specimens measured were found in surface collections far from primary material sources, suggesting that they had been exhausted and discarded and replaced in the haft with new bifacial blades carried along as preforms or as finished replacements. A median length of 69 mm for unbroken specimens indicates an approximate size threshold for rejection. On the average, these and the larger fragments of them would have made suitable blanks for the manufacture of Early Woodland stemmed points, such as Swannanoa that average 32.6 mm in length (Keel 1976), and triangular points such as Nolichucky that average 31.4 mm in length (Lafferty 1981). The remains of these large knives and preform fragments, and large flakes that resulted from their manufacture, accumulated in great numbers throughout the region in the late Archaic period, therefore providing the most reliable source of high-quality lithic materials that could be systematically or opportunistically scavenged for expedient or extended use by later groups of humans.

Secondary Lithic Recycling in the Appalachian Summit

Evidence of secondary lithic recycling in Appalachian Summit prehistory has been recognized, but its potential influence as a formation process or on archaeological type constructions is seldom considered. Keel (1976:196), for example noted that roughly 15 percent of Early Woodland period Swannanoa points recovered from the Warren Wilson site in western North Carolina "were made on old flakes, as evidenced by differential weathering." Raw materials represented among Swannanoa points from this site are chert (73 percent), quartzite (14.5 percent), and rhyolite (12.5 percent). Because of its propensity for patination, the rhyolite points probably accounted for most of the evidence of differential weathering. In reality, an equal or perhaps even greater percentage of chert and quartzite Swannanoa points had been made from "old flakes" but do not readily exhibit the evidence. Ward and Davis (1999:143) suggest the possibility that entire projectile point types for this period, such as "Gypsy" (proposed by Oliver 1985), may have resulted from recycling of larger forms into smaller ones.

As case studies in secondary lithic recycling, I examine archaeological evidence from two sites, one small rockshelter and one open-air base-camp–residence, in mountainous northwestern North Carolina. Each contains evidence of Late Archaic and Early Woodland period use and of the secondary recycling of lithic materials in the latter period. The first of these, the Katie Griffith site (31WT330), provides incontrovertible evi-

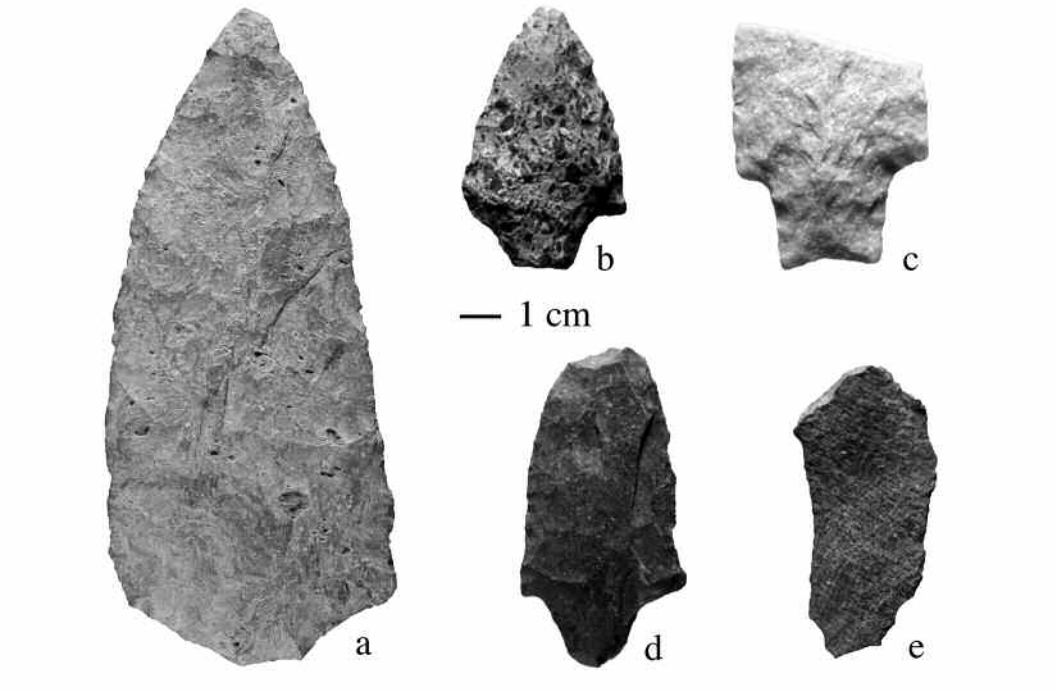

Figure 3. Large bifaces (a–d) and flakes (e) from Katie Griffith site.

dence of secondary recycling primarily in the form of variably patinated artifacts. The second site, Church Rockshelter No. 2 (31WT39), provides evidence *suggestive* of secondary recycling in the form of mismatched lithic materials and projectile point types.

Katie Griffith Site

Katie Griffith is a relatively small multicomponent site on an alluvial fan overlooking a tributary stream of the South Fork of the New River in northern Watauga County, North Carolina (Figure 1). Four seasons of excavation by Appalachian State University revealed a palimpsest representing episodic but frequent use from the Early Archaic through Late Woodland periods, 10,000–700 B.P. (Whyte 2003). A buried dark brown A-horizon of 14 to 28 cm in thickness contained most of the archaeological evidence. All components predating the Late Woodland/Medieval Warm period, A.D. 900–1300, represent temporary occupations.

For a small, primarily seasonally occupied base camp in a lithic-poor region, the Katie Griffith site has yielded a remarkable quantity of lithic artifacts. Considering only the materials recovered by 6 mm mesh, the average number of chipped stone artifacts recovered from the buried A-horizon per 1 m^3 is 2,656. Lithic materials represented include: locally abundant vein and crystalline quartz; quartzite, chalcedony, jasper, and chert derived from the Ridge and Valley formations 60 km to the northwest; rhyolite from the Mt. Rogers formation 30 km to the north; and rhyolite from the Uwharrie formation over 100 km to the east. Large flakes and bifaces composed of Mount Rogers rhyolite, Knox blue-gray bedded chert, and Erwin quartzite, typologically assigned to the Middle and Late Archaic periods, were recovered from the buried A-horizon (Figure 3). Also recovered from this horizon were smaller Woodland period stemmed and triangular arrowpoints made of these same lithic materials.

Recovered Early Woodland period arrowpoints primarily include stemmed forms (Ebenezer or Swannanoa types) probably dating to the earliest part of the Early Woodland period, approximately 3000 B.P. (Keel 1976; Lewis and Kneberg 1957). A conventional calibrated radiocarbon assay of 3100 ± 60 cal B.P. (Beta 147981; $\delta^{13} = -25.0$ per mille) was derived from carbonized wood recovered along with Swannanoa series pottery from a pit feature on the site (Whyte 2003). Also recovered

Table 1. Projectile Points from the Katie Griffith Site (Unassignable Fragments Excluded).

Projectile Point Type	Age	Lithic Material	% Recycled	Total
Kirk Corner-notched	Early Archaic	jasper	0	1
Kirk Corner-notched	Early Archaic	Knox chert	0	1
Kirk Corner-notched	Early Archaic	rhyolite	0	1
Kanawha	Early Archaic	jasper	0	1
Morrow Mountain	Middle Archaic	quartz	0	8
Morrow Mountain	Middle Archaic	rhyolite	0	3
Guilford	Middle Archaic	quartz	0	3
Guilford	Middle Archaic	rhyolite	0	3
Brewerton	Late Archaic	quartz	0	1
Brewerton	Late Archaic	rhyolite	0	3
Iddins	Late Archaic	blue-gray chert	0	1
Iddins	Late Archaic	Knox chert	0	2
Iddins	Late Archaic	quartz	0	1
Iddins	Late Archaic	rhyolite	0	1
Fishtail	Late Archaic	blue-gray chert	0	1
Fishtail	Late Archaic	quartz	0	3
Ledbetter	Late Archaic	blue-gray chert	33	3
Swannanoa	Early Woodland	blue-gray chert	71	7
Swannanoa	Early Woodland	chalcedony	0	1
Swannanoa	Early Woodland	jasper	0	1
Swannanoa	Early Woodland	Knox chert	100	1
Swannanoa	Early Woodland	quartz	0	1
Swannanoa	Early Woodland	rhyolite	0	3
Yadkin	Early Woodland	quartz	0	2
Nolichucky	Early Woodland	blue-gray chert	0	1
Nolichucky	Early Woodland	quartz	0	2
Nolichucky	Early Woodland	quartzite	0	1
Pigeon	Middle Woodland	Knox chert	0	2
Jack's Reef	Late Woodland	Knox chert	0	1
Triangular	Late Woodland	blue-gray chert	0	5
Triangular	Late Woodland	chalcedony	0	3
Triangular	Late Woodland	jasper	0	1
Triangular	Late Woodland	Knox chert	0	26
Triangular	Late Woodland	quartz	0	2

were three Nolichucky type triangular points, indicating some use of the site later in the Early Woodland period, approximately 2500–2200 B.P. (Lewis and Kneberg 1957). All of these are considered to be arrow rather than spear points because of their small size, the fact that a nocked cane arrow shaft was recovered from the earliest Woodland period stratum at the Camp Creek site in nearby eastern Tennessee (Lewis and Kneberg 1957), and other evidence indicating the introduction of bow-and-arrow technology to the region by the terminal Late Archaic period (Whyte 2007).

Of the exogenous materials found among the Early Woodland arrowpoints from Katie Griffith, the blue-gray bedded chert is particularly susceptible to patination whereas the finer grained Knox chert, jasper, and chalcedony are not. The numerous flakes and tools of the former material are generally faded to a limited range of light gray color. Some tools and flakes, however, exhibit a combination of dark and light flake scars indicating scavenging and secondary recycling of the artifacts. Examples from the Katie Griffith site (Table 1) include six arrowpoints (Figure 4), two retouched flakes, and at least seven unmodified flakes. One projectile point exhibits three different colors of patina, indicating two events of scavenging and recycling in the life of one artifact (Figure 4a). Five of the six arrowpoints exhibiting variably patinated flake scars, including the aforementioned, are of Early Woodland period types (Swannanoa/Ebenezer) that immediately postdate the popularity of large stemmed knives in the region (Figure 4a–e). The sixth (Figure 4f)

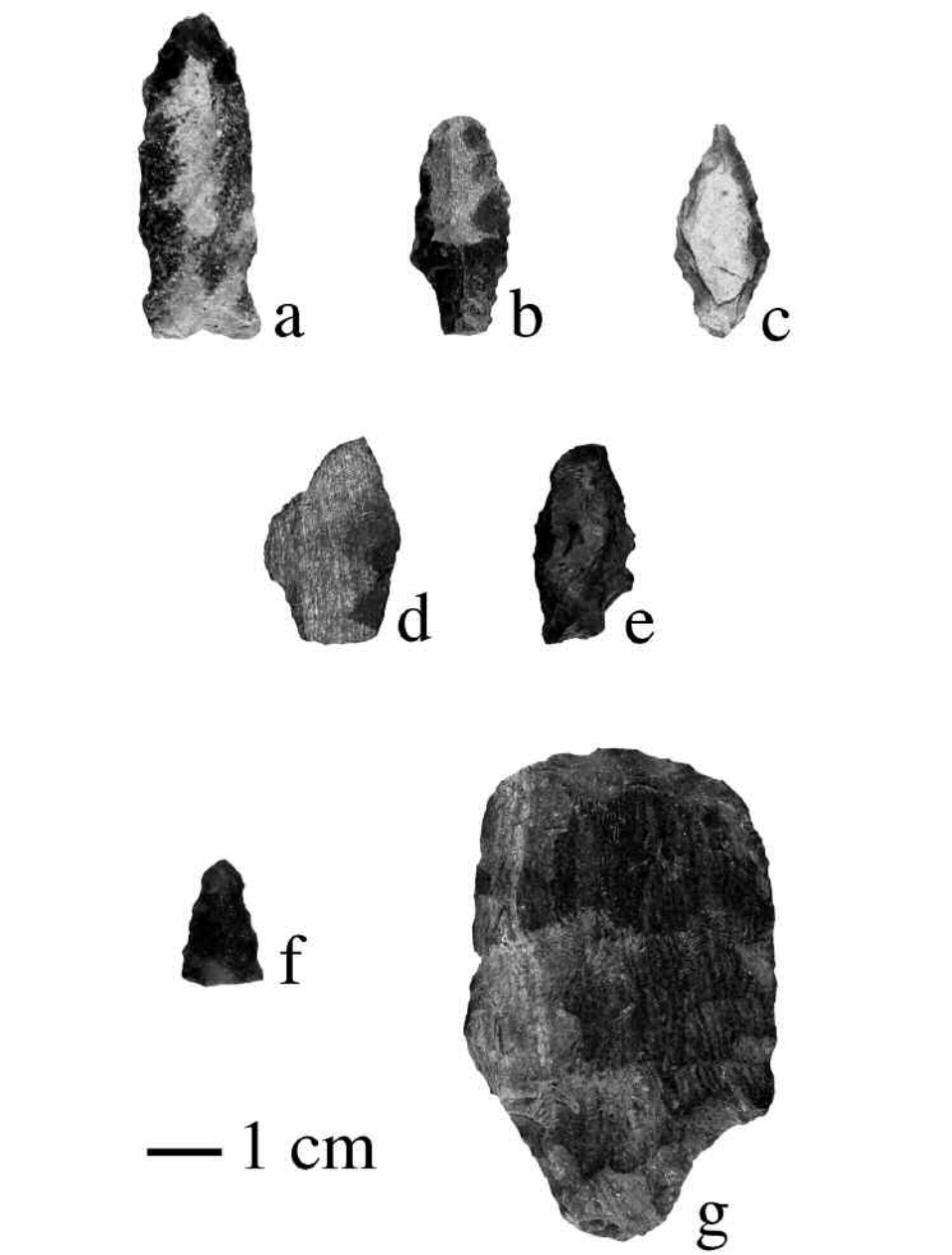

Figure 4. Variably patinated bifacial tools from the Katie Griffith site.

is a point tip that could not be assigned to a type category. Six of the blue-gray bedded chert flakes exhibit light and dark dorsal scars while one exhibits a lighter dorsal and darker ventral surface indicating that they had been detached from scavenged, weathered artifacts. A scraper fashioned from a Late Archaic stemmed knife (Ledbetter type) of blue-gray bedded chert exhibits reverse coloration in which the later flake scars are lighter than the earlier ones (Figure 4g). This suggests that the tool had become stained rather than patinated while on or in the ground prior to scavenging and subsequent modification, probably in the Early Woodland period.

An additional Early Woodland arrowpoint, made of a fine-grained Knox chert, exhibits rem-

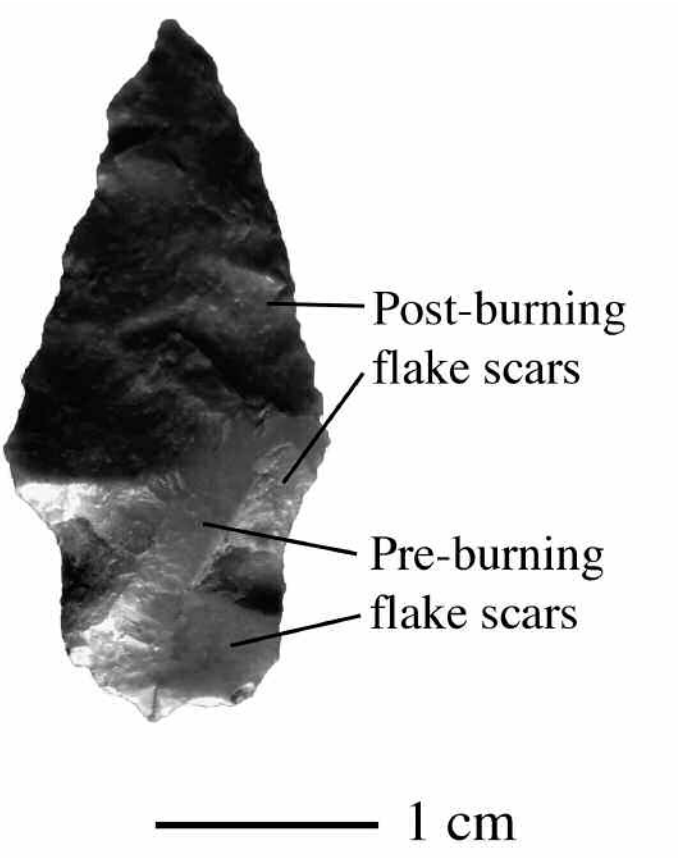

Figure 5. Burnt and reworked Knox flint artifact from the Katie Griffith site.

nant flake scars that are lustrous and secondary flake scars that are of a coarse or "sugary" texture (Figure 5). This arrowpoint was made from probably a large flake or flake tool that had been discarded and became burnt and crazed before it was scavenged and reworked. The subsequent flake scars are textured because of the crazing or "incipient pot lid" fractures that resulted from the preceding burning (Collins and Fenwick 1974; Crabtree 1972; Purdy 1975; Whyte 1984).

To summarize, approximately half of Early Woodland stemmed arrowpoints recovered from the site were clearly made from scavenged artifacts. Some of the remaining six also may have been fashioned from scavenged artifacts, but are of materials that do not develop a patina (such as quartz), had not become burnt or patinated in the interim, or the subsequent flaking removed all evidence of patination. Only three out of eight Early Woodland points made of blue-gray bedded chert are *not* variably patinated. This strongly suggests that Early Woodland period visitors to the region regularly availed themselves of the artifacts of their Archaic period predecessors and did not obtain most if any of their lithic materials from exogenous primary geologic sources. The many scavenged and recycled artifacts recovered may have been made from earlier artifacts found on the Katie Griffith site or at other nearby sites where they were inadvertently discovered or actively sought in the course of subsistence or other pursuits. The recovery of repatinated flakes indicates some degree of on-site manufacture of tools using scavenged artifacts as material sources.

Five of the six variably patinated projectile points (Figure 4a–d, f) were recycled from bifaces, as indicated by patinated flake scar remnants on opposing faces. These artifacts and thus the original bifaces from which they were derived range in thickness between 6.01 and 8.93 mm

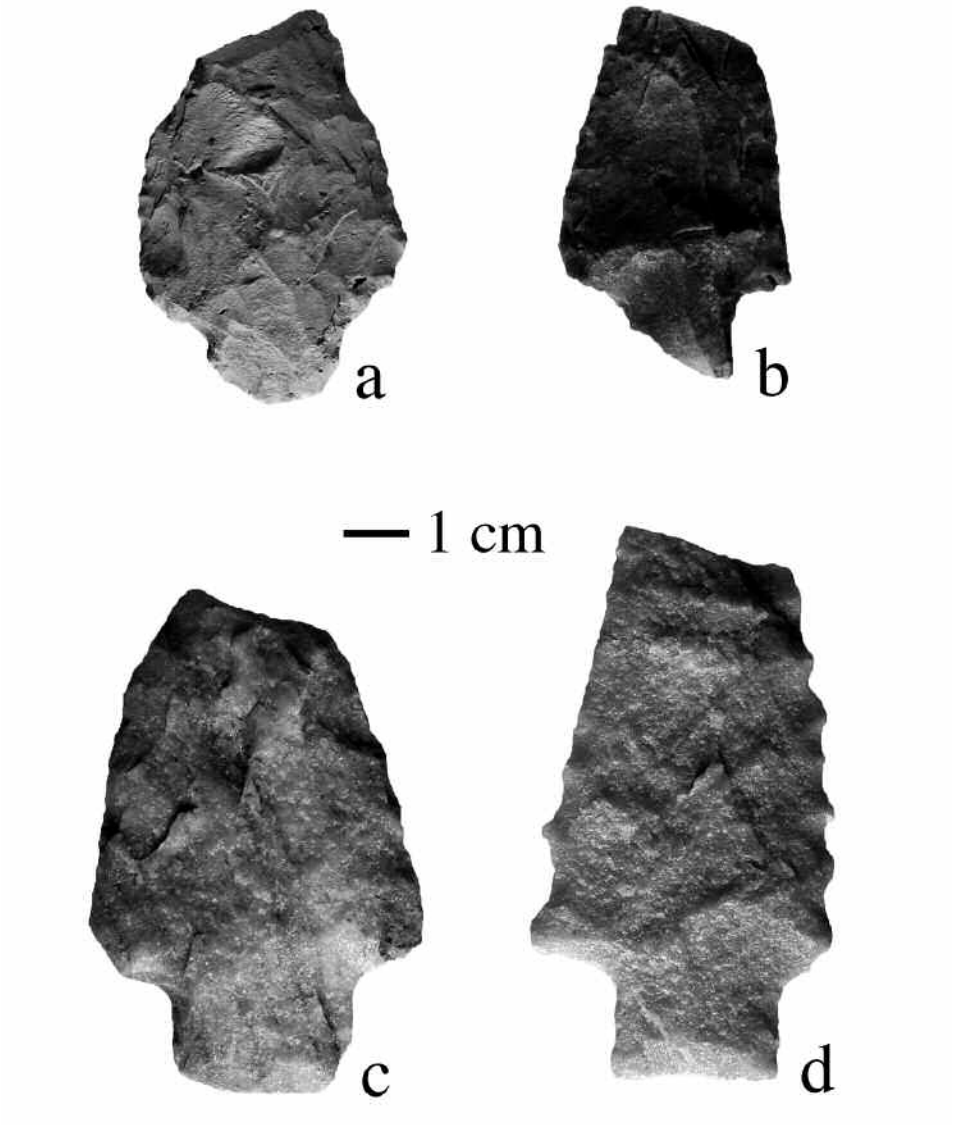

Figure 6. Large Archaic period bifacial tools from Church Rockshelter No. 2.

with a mean of 7.58 mm. The likeliest scavenged source materials for their manufacture were Late Archaic knives of the same material that, of ten measured specimens from the Katie Griffith and nearby sites, range in thickness between 7.39 and 11.02 mm with a mean of 8.6 mm. Remnants of a well-developed patina on most of these recycled artifacts indicates that the source artifacts were scavenged from open-air sites, rather than rockshelters. Although no study of patination rates on these materials has been conducted, it is likely that development of patina is dependent on mineral variations within materials and environmental variables such as surface exposure, soil acidity, and moisture.

Church Rockshelter No. 2

Church Rockshelter No. 2 (CR2) is a small recess in the bedrock overlooking Watauga River in western Watauga County, North Carolina, approximately 20 km southwest of the Katie Griffith site (Figure 1). Two seasons of excavation by Appalachian State University revealed typological evidence of the Middle Archaic through Late

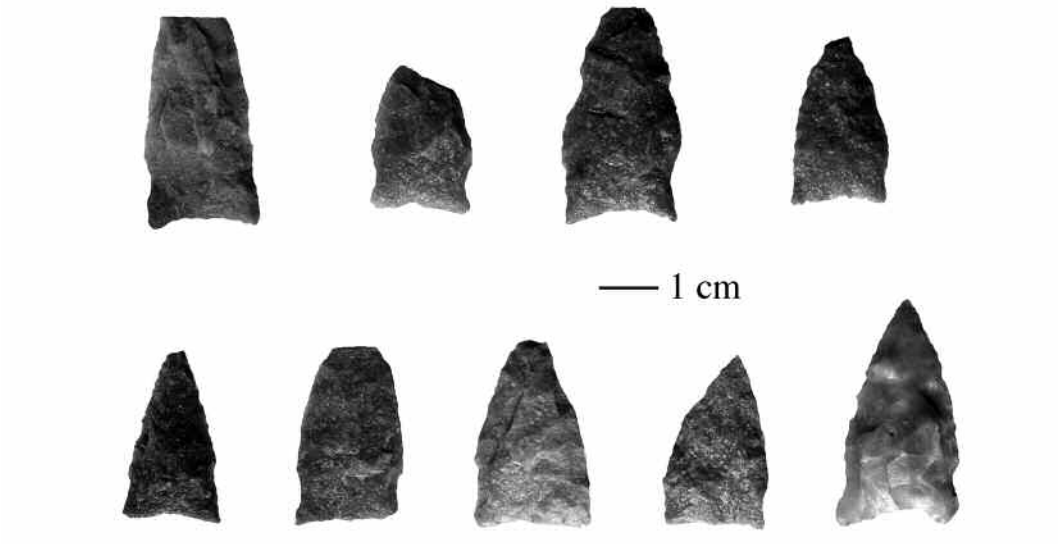

Figure 7. Nolichucky points from Church Rockshelter No. 2.

Woodland periods, 7500–700 B.P., with an emphasis on the Early Woodland, 3000–2200 B.P. (Whyte 2013). However, only the upper levels (0 to .3 m below surface) contained Late Woodland period pottery, whereas Early and Middle Woodland period pottery were found throughout the profile. No strictly preceramic (Archaic) *deposits* were found, however one Middle Archaic Morrow Mountain point and three Late Archaic Savannah River knives were recovered from the Woodland period deposits (Figure 6). Similar anachronisms were noted by Keel (1976) at the stratified Warren Wilson site in western North Carolina. There, seven of the 10 Late Archaic Savannah River knives were recovered from Woodland period strata. Also found in a Woodland stratum (Zone B) were two Early Archaic Lecroy points, of which Keel (1976:193) states: "The presence of these types in the relatively recent Zone B calls for explanation … several hypotheses can be offered: redeposition by the river from a site further upstream, aboriginal digging into a yet unidentified early deposit, or perhaps the activity of some prehistoric collector."

In contrast to the evidence from the Katie Griffith site, Early Woodland period arrowpoints from CR2 are primarily assignable to the slightly later Nolichucky type (Kneberg 1956; Lewis and Kneberg 1957) and primarily made of Erwin formation quartzite (Figure 7). These are relatively large (averaging 36 mm long by 19 mm wide) triangular or slightly side-notched arrowpoints that are found in greater numbers to the west in the Ridge and Valley province of eastern Tennessee.

Of the 10 Nolichucky points found, eight are made of Erwin quartzite, one is made of Shady chalcedony, and one is made of Uwharrie rhyolite. A traditional lithogeographic reconstruction based on these material identifications would suggest that nine of the artifacts were made and imported to the site by migratory visitors from 30 km to the west (the nearest source of the chalcedony and quartzite) and from over 100 km to the east (the nearest source of Uwharrie rhyolite). Nolichucky points, when found in the Ridge and Valley province to the west, however, are usually made of the locally abundant, high-quality Knox chert and only infrequently made of the local Erwin quartzite (e.g., Benthall 1990; Chapman 1979; Kneberg 1956). Although none of these ten artifacts shows physical evidence of secondary recycling (e.g., variable colored or textured flake scars), the unusual raw material and typological combinations are *suggestive* of scavenging and recycling. Exhausted and fragmentary Erwin quartzite knives made in the Late Archaic period are the largest and one of the most abundant stone tool categories of the Appalachian Summit region. The three examples found at CR2, recovered from the same depths as Early Woodland arrowpoints

and pottery, may have been collected in the Early Woodland period and used or carried along for tool supply while others were reduced into Nolichucky points. Only 24 flakes of this material were recovered, all of which are less than 1.5 cm in maximum dimension. Of those bearing the striking platform, 80 percent are clearly bifacial thinning flakes. Small bifacial thinning flakes of quartzite would have resulted primarily from the finishing or resharpening of Late Archaic stemmed knives or the recycling of them into smaller bifacial tools such as the later Nolichucky points. Of note, but perhaps coincidence, is that six of the eight quartzite Nolichucky points exhibit reddish coloration owing to thermal alteration. Experimental studies remain to be conducted to determine if this may have been intentional, either for technological, animistic, or aesthetical reasons. These may have become reddened because of unintentional exposure to fire while in archaeological context prior to scavenging (Whyte 1984).

At the Garden Creek sites in western North Carolina, Keel (1976) found that 80 percent of Early-Middle Woodland Garden Creek triangular points were made of nonlocal quartzite. When found in the Ridge and Valley province where Knox chert and Erwin quartzite are sympatric, points of the Garden Creek and related types are usually made of Knox chert. In other words, when given a choice of equal cost, chert was the preferred material. In the Appalachian Summit, where these materials are available only in the form of discarded artifacts, quartzite bifacial knives would have been the only ones large enough to be recycled into these large arrowpoints.

The one Nolichucky point recovered from CR2 that is made of Uwharrie rhyolite is a conundrum in that the Nolichucky type is rarely if ever identified among projectile points from the eastern Piedmont region where this material originates. Most temporally diagnostic artifacts made of this material that are found in the Appalachian Summit date to the much earlier Middle Archaic period, 8000–5000 B.P. One such artifact found at CR2, a large Morrow Mountain point, may have been scavenged in the Early Woodland period from elsewhere and brought to the site for intended use or modification, perhaps into a Nolichucky point such as the one recovered (Whyte 2013). This would explain the presence of a western Ridge and Valley type made from an eastern Piedmont material.

Summary and Discussion

Archaeologists routinely attempt to identify the lithic materials from which stone artifacts are made and connect these materials with geologic sources to provide data that may be used to: identify lithic raw material preferences potentially expressing values of tractability, function, cultural identity, magic, or object agency; reconstruct human mobility ranges, territories, and source ownership; reconstruct regional interaction such as exchange and political alliance; and explain temporal and geographic variation in these dimensions of culture. It is usually assumed that lithic materials were either acquired by visiting outcrop or stream gravel sources, sometimes embedded within subsistence procurement (direct procurement) or obtained indirectly by exchange from human to human (indirect procurement) (Binford 1979). For example, when nonlocal lithic materials are represented among the artifacts found on a site interpreted as a migratory hunter-gatherer seasonal base camp, it may be argued that the region in which those materials naturally occur had been visited earlier in the annual round (e.g., Andrefsky 2009; Bass 1977; Jones et al. 2012; MacDonald and Cremeens 2005). When they are found at the sites of relatively permanent residential villages or towns it may be argued that the materials were procured directly through resource-targeted forays or indirectly through exchange (e.g., Bass 1977; Jeter and Jackson 1990).

Yet the abundant evidence of secondary recycling cited here and by others reveals that when stone tool makers found themselves in naturally lithic poor regions, at quarry sites with diminishing returns, in places where access to primary lithic sources was restricted, or when salvageable artifacts simply were available, they availed themselves of the inadvertent provisions of their predecessors. For the Appalachian Summit region, this behavior appears to have been prevalent in the Early Woodland period when sufficient numbers of large artifacts of preceding periods, especially the immediately preceding Late Archaic, were available for scavenging, when the intended products (arrowpoints) were small, and when ac-

cess to primary sources was more restricted because of decreased mobility and territorial circumscription. It may be that a partial dependency on these discarded materials restrictively influenced settlement patterns of the Early Woodland period in the Appalachian Summit and elsewhere. In other words, we may expect Late Archaic and Early Woodland components to regularly occur on the same sites, which they do (Bass 1977; Nash 2005; Purrington 1983; Whyte 2011), not exclusively because of a continued need for access to the same subsistence resources but partly because of a dependence on recyclable lithic materials in areas where geology did not provide. The decision of a group to camp at a certain site, even in lithic-rich regions, may have been at least influenced by the knowledge that the local landscape provided salvageable lithic artifacts.

Another result of regular scavenging and recycling of Late Archaic period artifacts is the false perception of a persisting preference for the same lithic materials into the subsequent Woodland Period. It is commonly inferred that if projectile points of a particular type or time period in a region are disproportionately made from a particular raw material, when a variety of tractable materials was equally accessible, the makers must have preferred that material over others perhaps in expression of cultural identity or other symbolism associated with that material or its source (e.g., Cooney 2002; Reynolds 2009). The quartzite Early Woodland period triangular points from Church Rockshelter No. 2 (Whyte 2013), Garden Creek (Keel 1976), and sites in the Great Smoky Mountains (Bass 1977) illustrate the potential fallacy of such an inference. That 60–80 percent of the Early Woodland triangular points from these sites is made of Erwin quartzite might lead one to the conclusion that it was the preferred material, at least for makers of these tools seasonally residing in the Appalachian Summit. By extent, one might infer that a continued preference for quartzite from the Late Archaic through the Early Woodland period reflects an adherence to technological tradition and a continuation of Late Archaic mobility patterns that allowed access to those materials when, in fact, the choosing of quartzite was likely prevailed by the most conspicuous and sizeable artifacts that could be salvaged from archaeological deposits and then reworked.

And this gives cause to consider the impact of recycling behaviors on archaeological interpretations of site activities, site function, and regional demographic changes that are wholly or partially based on lithic artifact types and numbers. In the case of systematic secondary lithic recycling, the larger bifaces, cores, and flakes of earlier site components that are the evidence of tool maintenance, core reduction, and the progressive thinning of large bifacial tools were the most likely objects to be found, removed, and reformed (Sassaman 1993).

Failure to take secondary lithic recycling into account in the analysis of Archaic period artifacts from any site, but especially ones containing few large Archaic period artifacts and exhibiting clear evidence of recycling (e.g., variably patinated artifacts) in later, more sedentary components, potentially results in untenable reconstructions of site activities, site function, and technological organization. Furthermore, routine prehistoric scavenging of large, temporally diagnostic spearpoints and knives of the Archaic period, much like modern-day artifact collecting, has undoubtedly influenced or impeded interpretations of site age because of their erasure from the archaeological record or their redeposition in later strata. Often, anachronistic associations in stratified sites are attributed to bioturbation (e.g., Burns and Lyren 2005) when, in fact, the blame may just as well be placed on scavenging humans (Vaquero et al. 2012).

Variation in the numbers of projectile points found on archeological sites is sometimes used in "accumulation research" to reconstruct and explain variation in human population densities and subsistence practices. Arakawa et al. (2013), for example, argue that a lower ratio of projectile points to cooking vessel sherds is found in areas with higher population densities in the Southwest and is an indication of a necessary shift in subsistence focus away from large game. Their research attempts to account for biases influenced by decomposition (of organic projectile points) and archaeological recovery but fails to consider the potential impacts of scavenging and recycling. If anything, regular practice of systematic secondary recycling, already shown to have been a common lithic procurement strategy in the Southwest (Amick 2007; Hill 1938; Sedig 2010), would have led to a decrease in the numbers of earlier projectile points available for discovery.

Another concern that the substantial evidence for scavenging and recycling raises is the relocation of lithic artifact types from one site or stratum to another (Amick 2007; Vaquero et al. 2012). The finding of earlier types of projectile points in later archaeological deposits when evidence of vertical disturbance to the deposits is lacking implicates scavenging (Amick 2007). These earlier artifacts may have been found on distant sites situated on other kinds of landforms. Reused and redeposited without significant modification, these artifacts typologically identify the time of their initial manufacture but not their final deposition. Thus, the scavenging and relocating of these chronological markers to different landforms in the past has to some extent muddied the databases used in settlement pattern reconstruction, and particularly when those data are derived from surface collections. Assessing the age of a site discovered through archaeological survey on the basis of a single projectile point type, in light of the above-mentioned reasons, is risky; indeed, only a *terminus post quem* is possible.

A final point for discussion concerns the means and social and environmental settings of lithic scavenging. Amick (2007:227) suggests that: "archaeologists need to consider recycling as a regular lithic procurement strategy in situations where archaeological sites are commonly exposed on the surface." Indeed, most ethnographic accounts of secondary lithic recycling are from arid regions with substantial surface exposure such as the American Southwest and desert Australia (Amick 2007; Hill 1938; Sedig 2010). However, it is these same regions where stone-tool users remained in existence for the convenience of ethnography. Considering the evidence from the Katie Griffith site, CR2, Warren Wilson (Keel), and the Aiken Plateau of South Carolina (Sassaman 1993), archaeologists need to consider recycling as a regular lithic procurement strategy in the lush Eastern Woodlands and therefore the rest of the human world as well.

There are several ways in which lithic artifacts may have been discovered or sought for scavenging in forested environments. They were undoubtedly regularly discovered during residential site activities that involved clearing or disturbing the ground. Creation of features such as postholes and cooking facilities, digging for food, or the mining of soil for various needs would have brought artifacts to the surface for discovery and evaluation. Pollen and particulate charcoal from pond and bog cores indicate intensification of anthropogenic burning in the Appalachian Summit region after 5000 B.P. (Delcourt et al. 1998). Frequent burning of brush or forest understory, presumably for gardening and settlement, may have exposed artifacts on the surface for collection. This, in fact, may explain some of the reddened quartzite artifacts of the Late Archaic and Early Woodland periods.

These scenarios describe potential conditions for *opportunistic* secondary recycling of found artifacts in vegetated regions. *Systematic* secondary recycling (Amick 2007) implies a deliberate procurement strategy in which artifacts are sought. In the densely vegetated Eastern Woodlands, this may have been accomplished by intentionally mining the lithic-rich residential camps of Archaic period hunter-gatherers or by seeking artifacts on the less-vegetated floors of previously used rockshelters. If certain kinds of sites such as rockshelters were systematically mined in prehistory for lithic artifacts, the implications of this behavior for contextual disturbance and settlement pattern studies are potentially alarming. Vaquero et al. (2012:2792) note: "The availability of artifacts for scavenging would be more conspicuous in large occupational palimpsests, associated with slow sedimentary rhythms. Although undocumented as of yet, we cannot rule out that some anthropic disturbances of sediments in archaeological sites may be related to the search for useable lithic materials."

Systematic scavenging of artifacts, while providing raw materials for technology, may at times have been ontologically prescribed or even restricted by beliefs (object animacy or object agency) involving the material, cultural, geographical, or contextual sources of the artifacts. For example, the perceived powers, persons, or spirits of scavenged artifacts were potentially reincarnated in the derived artifacts or transferred to their makers. As noted by Zedeño (2009:410): "In many non-Western societies, specifically Native American groups, toolmakers, ritual performers and even ordinary object users manage the capacity for personhood that emanates from objects to fulfill their needs." The decision to collect

(or not) an artifact for modification and reuse may have been influenced by animistic belief (Hill 1938; Sedig 2010; Weigand 1970).

For the southern Appalachian region, secondary lithic recycling in the Woodland period may have been intermediate between Amick's (2007) proposed extremes of opportunistic versus systematic. In reality, the practice of scavenging and recycling was probably considered a viable option of lithic procurement that varied in degree according to the needs presented in various seasons and environmental and social settings. To be certain, barring the influences of cultural taboos, usable lithic artifacts encountered during subsistence, construction, and other activities would have been collected and may have been regular contents of an individual's personal gear. However, preparation for unexpected hunting opportunities or warfare may on occasion have forced an immediate need for raw materials that could only be provided in sufficient quantity by pilfering archaeological deposits where they were expected to be found. In the extreme, it probably cannot be proved that any lithic artifacts of exogenous materials found on Woodland period sites in the region were made from materials procured from natural sources.

The vast majority of recognizably scavenged and recycled (i.e., variably patinated) artifacts found on sites reported here and in the studies of Amick (2007), and Sassaman (1993) are projectile points rather than flake tools. This may indicate that the makers and users of weaponry (presumably men) were more frequently provisioned by scavenged high quality lithic materials, whereas abundant local materials such as quartz readily provisioned activities serviced by expedient flakes. It has been argued that the vast majority of Early Woodland sites in the higher elevations of the Appalachian Summit represent late summer and fall occupations when immigrants were focusing their subsistence efforts on mast and white-tailed deer (Whyte 2003, 2011, 2013). On arrival, their lithic tool kits may have included mostly materials obtained from primary and secondary geologic sources in lower elevations of their previous residence such as the Ridge and Valley province to the west (chert, jasper, chalcedony) and the Piedmont Plateau to the east (Uwharrie rhyolite). Anticipating an abundance of salvageable and recyclable lithic artifacts on or near anticipated sites of encampment in the uplands, immigrant hunters may have prepared their toolkits accordingly, and only with minimal concern for potential lithic shortfall. The gifts of the ancestors were, in a way, analogous to Binford's (1979:257) "insurance gear" in the sense that they represented caches, albeit unintentional, that could be prevailed on when faced with the need to retool in a geologically lithic-poor region. The result, as expressed in the Early Woodland lithic assemblages from various sites within the region, in addition to physical evidence of scavenging and recycling, is a mix of imported and scavenged lithic materials from a variety of sources.

Conclusion

Humans have historically engaged in materials recycling for many reasons (Alexander and Reno 2012), but primarily because of dwindling resources (conservation), restricted access to resources (cost), because it sometimes was easier than "starting from scratch" (energy), and possibly because of object agency (power). Prehistoric humans throughout the world faced these same challenges and choices. One strategy for meeting such needs was secondary lithic recycling, and it was evidently not restricted to arid regions where the "gifts of the ancestors" could be found lying on the surface of the ground. It is a lithic procurement strategy that was facilitated by the technologies and behaviors of mobile Archaic period hunter-gatherers and frequently employed in the Early Woodland Period of the Eastern Woodlands, and so it must be taken into account for all regions, regardless of climate and vegetation cover. Recognizing the products of lithic recycling in prehistory presents an avenue for exploring economizing responses to raw material procurement challenges. Recognizing the products of *secondary* lithic recycling allows also more cautious and tenable reconstructions and explanations of lithic technologies, human mobility, and exchange. Indeed, the search for this evidence, commonly in the form of variably patinated artifacts or typological anomalies such as those discussed above, should be as requisite in lithic analysis as taphonomic studies are in zooarchaeology. "It is essential that studies of formation processes come

to be conducted routinely; for unless the genesis of deposits is understood, one cannot infer the behaviors of interest from artifact patterns in those deposits" (Schiffer 1983:675). Although the emphasis of Schiffer's warning is on *deposits*, the same can be said for any kind of archaeological evidence. In cases where secondary lithic recycling is shown to have been a regular strategy, one must consider its potential influences on archaeological inferences regarding site age, site activities, technological organization, human mobility, and exchange to avoid erroneous reconstructions and interpretations.

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