The Crucible of Complexity: Community Organization and Social Change in Bronze Age Transylvania (2700–1320 BC)

by

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For my mother and father

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Abstract

This dissertation examines the development of regional polities with institutionalized inequality in Bronze Age Transylvania, Romania (2700-1320 BC). During the Bronze Age, southwest Transylvania became one of the most important mining regions in Europe, providing the copper, tin, and gold that funded the establishment of permanent social hierarchies across the continent. Through a holistic approach across social, economic, and ideological institutions, I document how communities living in these metal-rich mountains participated in, and were effected by, these social, political, economic, and ideological transformations. Specifically, I focus on two interrelated research questions: (1) How were communities in the mining districts of southwest Transylvania organized during the Bronze Age, and (2) How did community organization in southwest Transylvania change throughout the Bronze Age?

This study makes two important contribution to the culture history of the Transylvanian Bronze Age. First, I develop an absolute chronology for the Transylvanian Bronze Age based on the largest corpus of dates yet published. Second, I present a regional survey and spatial analyses conducted in Transylvania to document changes in community organization at multiple scales. This study develops the first historical trajectory of the organization of economic, political, social, and ideological institutions in Bronze Age Transylvania.

More broadly, this dissertation builds on existing frameworks for studying community organization in middle-range societies in two key ways. First, it moves beyond political economic approaches to incorporate alternative pathways towards hierarchical complexity. In addition to economic and political realms, ideologies, identities, and how they are materialized are important factors in the institutionalization of inequality. Different institutions, however, will not always be organized the same way. I argue that the coherence and dissonance in the presence of inequalities across

institutions is a critical attribute of social organization. Second, it further problematizes the study of change in community organization in middle-range societies. The proposed framework distinguishes qualitative and quantitative changes in how institutions are organized, how they articulate, and social forms that emerge out of human action and institutional conditions.

Through examination of settlement, mortuary, chronological, and artifactual evidence, I argue that inequality became institutionalized only during the Late Bronze Age, centuries later than previously assumed. Throughout the Early and Middle Bronze Ages, there was dissonance across multiple institutions in how inequality was made, marked, and masked. Many institutional changes that occurred throughout the Early and Middle Bronze Age set the stage for Late Bronze Age social transformations. In particular, the expansion of long-distance trade, a diversification in burial rites that emphasized intra-community difference, and an increase in the venues for signaling identities and inequalities provided opportunities for Late Bronze Age communities to reorganize hierarchically. These institutional changes were incremental, and unintentionally created the context in which historically specific events and processes ultimately led to the emergence of complex regional polities.

The social history of communities in southwest Transylvania challenges how archaeologists conceptualize mining districts in Bronze Age Europe. In regions with rich ore sources, more than just metal procurement mattered. In southwest Transylvania, changes in social organization throughout the Bronze Age involved ideological, political, social, and economic institutions beyond metal procurement. The archaeology of pre-state societies in mining districts is uniquely positioned to contribute a deep historical perspective to the origin and evolution of the dynamics of resource extraction.

Chapter 1 - Introduction

Salvați Roșia Montană

In the quiet Apuseni Mountains of southwestern Transylvania, a Canadian-run transnational company – funded primarily by American investors – is locked in a battle with the Romanian people to mine the richest gold deposits in Europe. The proposed mining project at Roșia Montană would be the largest open-cast mine in Europe, and one of the largest in the world. Cyanide, used to more efficiently separate gold from parent rock, would be employed in staggering quantities. Over the approximate 17-year duration of the project, an estimated 204,000 tons of cyanide would be used to extract 300 tons of gold and 1,700 tons of silver, along with smaller quantities of rare metals (Ciobanu 2013). Since the project's first proposal in the early 2000s, Romanian communities and global NGOs have engaged in a fight to stop the mining project. In 2013, the largest civil protests since the overthrow of Ceaușescu and fall of communism in 1991 successfully convinced the Romanian Parliament to temporarily abandon efforts to push through constitutional changes to allow the mining project to continue despite its obvious threats to the health of the Romanian people, environment, and cultural heritage. On December 30, 2015, the Romanian culture ministry's advisor on cultural heritage, Adrian Balteanu, declared the Roșia Montană village a historic site of national interest, which prohibits any mining activity within a radius of two kilometers. Despite these setbacks, planning for the mining project, and protests, are ongoing as the transnational company threatens legal action in international court to force the Romanian government to approve mining permits or pay $2.56 billion in compensation.

Southwest Transylvania is no stranger to fights for its rich metal resources. The Southern Apuseni Mountains, a region known as *The Golden Quadrilateral*, hold the largest deposits of gold, copper, and several other rare metals in Europe, and are the third-richest metal deposit in the world (Manske et al. 2006). Metal deposits, large and small, are ubiquitous in the southwest Transylvanian mountain ranges. Gold from this region was the most important source of economic power in ancient Dacia, and it was in part gold from Roșia Montană that drew Trajan to march Roman legions into Transylvania and topple the Dacians. Roman-era mines, roads, fortifications, and villas cover the landscape, all oriented towards extracting metal and mobilizing it throughout the Roman Empire. The rich history of mining continued through the Medieval period, all the way up to Communist and post-Communist Romania today.

Modern communities in the Apuseni Mountains face a paradox: communities that engaged in mining for centuries are crumbling under pressure from modern mining projects. Community and personal identities in this region are inextricably linked to the craft of mining. When walking down the streets of Bucium Poieni, a small village in the Apuseni Mountains, the signs of this connection are everywhere. Stone crosses positioned throughout the village are adorned with prayers for the health and safe return of miners and the crossed hammer and pick, an unmistakable symbol of mining (Figure 1.1a). Sheds are covered with mining tools, now rotting or rusting from disuse, standing as unintended museums of a lost industry (Figure 1.1b). With the current proposed mining project, communities are being asked to choose (1) continued poverty, fading connection to mining heritage, and an exodus of younger community members, or (2) displacement and likely environmental and health catastrophe. Either choice spells doom for these mining communities unless something changes. The choices being offered Transylvanian mining communities are the product of state-level societies trans-national globalization where political control is centralized in state institutions and decisions are forced upon marginalized communities. While this process began under Communist rule, the proposed modern mining operations have hastened the threat to southwest Transylvanian mining communities.

Figure 1.1 - Materialization of mining in Bucium Poieni: (a) a stone cross with the traditional hammer and pick symbol and a carving wishing miners good luck; (b) shed storing and displaying traditional gold mining tools.

Across the globe, from Peruvian copper mines to blood diamonds in Africa, communities in resource procurement zones are often exploited for labor or for access to natural resources with minimal compensation. But how did these dynamics emerge? How were communities in resource procurement zones organized prior to the development of these world-system, globalized, colonialist institutions? In effect, when, and how, did *communities in mining zones* become *mining communities*, specialized communities on the margins of hierarchical power structures? Archaeology of pre-state societies in resource procurement zones is uniquely positioned to contribute deep-historical understanding to the social, political, and economic dynamics of resource extraction.

Archaeological Approaches to Community Organization in Bronze Age Procurement Zones

This dissertation centers on the intersection of economic, political, and ideological institutions and its impact on the long-term dynamics of community organization in southwest Transylvania during the Bronze Age (2700-1300 BC). This research is situated within anthropological archaeological approaches to social change in middle range societies, in particular the development and institutionalization of inequality within complex regional polities. *Regional polities* are vertically-integrated socio-political groupings of multiple spatially distinct residential communities with high degrees of inequality as well as centralization of key economic, social, and ritual institutions. These socio-political formations, often referred to as chiefly societies, stand in contrast to more autonomous or semi-autonomous village societies that were present throughout the Neolithic and Eneolithic (Copper Age) in Europe, and continued, at least in some areas, into the Bronze Age (see O'Shea 1996). Together, village, tribal, and chiefly societies are often referred to as *middle range societies*, social groupings without broad egalitarian institutions and leveling mechanisms characteristic of band-level societies, yet lacking the internal segmentation and specialized bureaucracy of state-level societies (Rousseau 2006:20). The study of when and how European societies transformed from autonomous to hierarchical societies has been a pillar of Bronze Age scholarship for decades (Chapman 2008; Childe 1930, 1951; Duffy 2010, 2014; Earle and Kristiansen 2010; Kienlin 2015; Kienlin and Roberts 2009; Kristiansen and Larsson 2005; Nicodemus 2014; O'Shea 1996; Shennan 1986, 1993).

Metal: Important, But Not Everything

Metal has been at the core of most archaeological explorations of the development of institutionalized inequality in the European Bronze Age (Childe 1930, 1951, 1954; Krause 2009; Kristiansen and Larsson 2005; Pare 2000). The industrial-scale of production, distribution, and consumption of copper, tin, and gold that developed during this period was previously unmatched (Pare 2000). As a result, archaeological approaches to social organization in the Bronze Age often hinge upon understanding the role of metal in the political economy (Earle 2002; Pare 2000).

Even though there is a long history of study of metal sources and techniques of production by archaeometallurgists, little is known about how mining communities and metal procurement were organized in Bronze Age societies. This is not only due to the paucity of systematic multiscalar projects that have focused on resource procurement zones, but also the lack of models to systematically evaluate metal procurement strategies. *Resource procurement zones* are areas that are rich in resources that are extracted locally and exchanged widely. Within resource procurement zones, the extraction and movement of metal have demonstrable effects on local community organization (Kienlin and Stöllner 2009; Krause 2009; O'Brien 2003, 2007, 2013; Shennan 1989). Southwest Transylvania, with its rich deposits of copper, gold, and tin, was one of the most important sources of metal in Europe during the Bronze Age and is a critical region for documenting the organization and evolution of metal procurement.

While the organization of the procurement, production, distribution, and consumption of metal in the Bronze Age remains a cornerstone of research in Europe and Eurasia (Hanks 2009; Kienlin and Roberts 2009; Knapp 1990; Ling et al. 2013, 2014; Nørgaard 2014; Ottaway and Roberts 2008; Peterson 2009), archaeologists are increasingly looking beyond metal for more holistic understandings of the organization Bronze Age social, economic, political, and ideological institutions and the development of institutionalized inequality (see Brück 2004a, 2004b, 2006; Duffy 2010; Fowler 2005; Harding 2011:328, 2013; Harding and Kavruk 2010). There are several important reasons why Bronze Age archaeologists have begun looking beyond metal. First, work in recent decades has demonstrated that metal technology alone is not sufficient for the development of institutionalized inequality. The link between metal and social complexity was first established by V. Gordon Childe (1930, 1951), who suggested that metal production would have been conducted by full time specialists, supported by incipient elites who used the metal to display authority and make war. For Childe, the bronze and gold work that came to define the Bronze Age was both the archaeological evidence of a hierarchical class of elites (without whom attached metallurgical specialists could not survive) and the mechanism by which elites created and maintained authority. However, the causal link between metal and specialized itinerant smiths in societies with significant institutionalized inequalities has all but been severed. Archaeometallurgists working on the origins of metal and mining technologies have pushed back the dates of the earliest metal procurement in Europe well into the Neolithic (O'Brien 2015; Roberts et al. 2009), where there is minimal to no evidence of regional polities with institutionalized inequality. It is now clear that the presence of metal technologies alone cannot explain the development of institutionalized inequality in European prehistory.

The second reason archaeologists are looking beyond metal in the search for the origins and evolution of institutionalized inequality is that there is much more to Bronze

Age economies. Agro-pastoral economies are important, both as a form of food production and as a source of secondary products (Greenfield 2010; Marciniak 2011; Nicodemus 2014; Sherratt 1983). Additionally, more than metal flows through interregional exchange systems, which appear to have grown throughout the Bronze Age (Bartelheim and Stauble 2009; Bell 2012; Cunliffe 2001; Harding 2011; Harding and Kavruk 2010; Henderson 2007; Kern et al. 2009; Kowarik et al. 2012; Kristiansen and Earle 2015:241; Monroe 2009; O'Shea 2011; Shennan 1993; Sherratt 1993). The increased recognition of the importance of non-metal economic resources in the emergence of institutionalized inequality is owed to the growing influence of political economic models for Bronze Age societies (Earle 2002; Earle and Kristiansen 2010; Earle et al. 2015; Kristiansen and Earle 2015; Nicodemus 2014). *Political economy* is defined as the organization of procurement, production, distribution, and consumption systems in relation to political systems (D'Altroy and Earle 1985; Earle 1991, 1997, 2002, 2011; Earle et al. 2015; Feinman and Nicholas 2004; Hirth 1996; Johnson and Earle 1987; Knapp 1990). At its core, political economic approaches to the development of institutionalized inequality focus on mechanisms that promote differential access and control of resources, often as a dialectic between staple and wealth finance (Earle 2002; Kristiansen and Earle 2015:241). The control of labor, resources, and feasting, are some of the more commonly cited mechanisms for promoting inequality (e.g., Arnold 1993; Clark and Blake 1994; Earle 1997; Hayden 1995; Smith et al. 2010). Elite influence over the flow of labor, resources, and commodities through an economic system is operationalized by elites who identify and restrict *bottlenecks* within the economy – points in economic systems where labor, resources, and commodities are channelized and relatively easy to restrict access by non-elites (Earle et al. 2015). Within a political economic approach to Bronze Age societies, elite authority can be constructed and maintained through control over the means and output of subsistence production, metal systems, or the flow of other non-metal exotic resources such as amber, obsidian, and faience (Nicodemus 2014). Other important resources, including salt, agricultural products, pastoral products, and fuel were abundant in southwest Transylvania. The local availability of all key economic resources within southwest Transylvania, makes this region a unique context in which to explore metal procurement, non-metal economies, and broader aspects of Bronze Age societies.

The flow of metal throughout Europe remains a critical focus of political economic research (e.g., Earle et al. 2015). These models have increasingly recognized that metal systems are not monolithic; they are complex systems involving procurement, production, distribution, and consumption at different scales. The potential for recycling and reusing metal affects the ability of elites to exert control over potentially fluctuating bottlenecks. At the same time, there has been relatively widespread confusion about the political economy of metal. For some authors, "metal" is synonymous with "bottleneck" (e.g., Pare 2000). This dangerous shorthand obscures complexities within economic institutions and broader economic institutions where bottlenecks are spatially and temporally variable. Only with a broader understanding of political economies, operating at different scales with the potential to vary through time and across space, can archaeologists understand the economic foundations of transformations in social complexity in European prehistory.

The third reason for moving beyond metal in Bronze Age research is that social organization is more than a reflection of the political economy. Anthropologists have long argued that prestige and authority are not derived from manipulation of the economy alone (Friedman and Rowlands 1978; Fowler 2005; Friedman 1979; Goldman 1975; Mills 2004; Rappaport 1999; Turner 1972; Van Gennep 1960; Wiessner 2002). Ideological institutions, such as rights and obligations associated with domestic ritual, public spectacle, and mortuary practices, provide another avenue through which relationships of inequality can be created, maintained, and manipulated (Goldman 1975; Howey 2012; Howey and O'Shea 2009; Parker-Pearson 1993; Quinn 2015; Quinn and Barrier 2014). Identity, often mediated through material symbols and styles, is another critical realm in which institutionalized inequality is negotiated (Fowler 2005). While these social and ideological institutions articulate with the economy (though the material world), they are distinct from, and sometimes at odds with, economic institutions. These non-economic social realms are no less important for organizing societies. Moving beyond metal allows for these additional, and sometime dissonant, dimensions to influence our understanding of the organization of Bronze Age societies.

Fourth and finally, the patchy distribution of metals, which results in a complex mosaic of regions with varying abundance of metallurgical resources, has necessitated moving beyond metal as the single prime mover for the development of institutionalized inequality in Bronze Age Europe. While the diversity of landscapes is not always considered (see Pare's [2000] "Bronze Age Hypothesis), archaeologists, particularly thanks to political economic models, are becoming increasingly aware that social organization and mechanisms of social transformation will vary based on the nature of access to certain key resources. For example, metal resources are not locally available in the Carpathian Basin (see Duffy 2010; Earle and Kristiansen 2010; Nicodemus 2014), therefore the flow metal during the Bronze Age, primarily along main river corridors (O'Shea 2011) provided a channelized commodity that elites could control. It is less clear how access to metal could have been controlled by any potential elite in areas where metal is widely distributed and abundant, such as southwest Transylvania. The spatial variability in the distribution of natural resources requires that we treat the organization of the metal system and social organization as separate, allowing them to articulate in different ways (e.g., metal as a key part of a political economy, or metal as insufficient for institutionalizing inequality).

This last point is the main reason why this dissertation is critical. Resource procurement zones are likely defined by historical trajectories in social, political, economic, and ideological organization that are different than those in areas where resources must be mobilized into the region. However, researchers cannot fixate on the locally abundant resources in resource procurement zones. While the organization of metal systems will substantially affect, and be affected by, community organization in resource-rich southwest Transylvania, we must not mistake the two as equivalent. Archaeological investigations in resource procurement zones must consider the full suite of economic, political, ideological, and identity institutions that would have influenced community organization rather than focusing solely on one aspect of the economy. In this way, this dissertation is a call for resource procurement zones to be approached as any other landscape, where all social institutions provide potential opportunities for creating, maintaining, and masking emergent inequalities. At the same time, this research allows for the tempo, scale, breadth, mechanism, and nature of social transformations in resource procurement zones to vary from non-resource procurement zones – in some cases as a result of interregional interaction (increasing, decreasing, or shifting), others as the result of local politics and actors, and often as the combination of the two. With this approach, we can get a better understanding of the organization and evolution of communities in Bronze Age Transylvania with a specific focus on identifying and understanding transformations in social complexity during the Bronze Age.

The Research Questions

This dissertation explores two interrelated questions:

1) How were communities socially, economically, and politically organized in southwest Transylvania during the Bronze Age?
2) How did community organization in southwest Transylvania change throughout the Bronze Age?

Community organization can be conceptualized as the specific constellations of social, economic, and ideological institutions that emerge from, and structure, human interactions. Each *institution* is a socially mediated set of rights and obligations that structure, and are negotiated through, human actions (North 1990; Wiessner 2002). Community organization, as composed of socially mediated institutions, will change over time as there is turnover in the population, changing geo-environmental conditions, historical events, and shifts in the relationships between local and non-local communities through inter-regional networks. These changes, however, will be non-linear, will occur at varying tempos across space and institutions, and will rarely result in a fundamental qualitative shift in how communities are organized. How, where, when, and why societies with less permanent regional inequalities transformed into societies with persistent institutionalized inequalities remains a major question in European prehistoric research. Unfortunately, the diversity of ways European prehistoric societies and the material record change has been under-theorized. As a result, archaeologists have had difficulty distinguishing qualitative social transformations from other, quantitative, changes in the past (see Kienlin 2012a; Kristiansen and Earle 2015). Many of the disagreements about the long-term trajectory of institutionalized inequality in Bronze Age Europe could be resolved with a common vocabulary for social change.

These research questions are situated within a long anthropological tradition of studying how past societies were organized and how human societies evolved towards the complex institutionalized inequalities that are so prominent in our modern world (see Ames 2007; Bowles et al. 2010; Earle and Johnson 2000; Flannery and Marcus 2012; Fowles 2002; Marcus 2008; Price and Feinman 2010; Rousseau 2006; Shennan 2008; Trigger 2003). They are also situated in more recent traditions for studying how communities in resource procurement zones are organized and impacted by the nature of their relationships with outside communities, societies, and corporations (Kirsch 2014; Knapp et al. 1998).

Bronze Age Southwest Transylvania: A Case Study in Social Change

Southwest Transylvania during the Bronze Age is an ideal "laboratory" in which to study how the intersection of political economy, mortuary practices, and population aggregation foster, or inhibit, social transformations in middle-range societies. The Bronze Age was a period of dynamic economic, social, ideological, and political change that lead to the invention of institutions of regional control in Europe (e.g., Childe 1930, 1951; Earle and Kristiansen 2010; Gilman 1981, 1995; Kristiansen and Larsson 2005; O'Shea 1996, 2011; Sherratt 1993). Understanding how institutionalized inequality developed out of social contexts in which local communities had previously retained autonomy is a uniquely archaeological problem. While ethnographers have studied many historic and modern societies that are organized as middle-range societies (e.g., Wiessner 2002), these societies have been affected by the presence of hierarchical state societies for generations. The Bronze Age of Europe, and particularly the Carpathian Basin, represent one of the few contexts for anthropological archaeologists to monitor the changes that preceded, potentially inhibited, and contributed to the development of complex regional polities with institutionalized inequality.

The geo-environmental context of southwest Transylvania offered Bronze Age communities an unrivalled constellation of locally accessible resources (Figure 1.2). Southwest Transylvania is home to the richest gold and copper deposits in Europe, abundant salt springs and rock salt outcrops, fertile agricultural land, forested uplands for fuel, upland and lowland grazing areas for livestock, lithic outcrops for groundstone and chipped stone, and a large and navigable river and flat terraces for water-based and overland interregional trade and exchange. As a result, southwest Transylvania is unique within Europe in not having to rely upon interregional exchange or long-distance procurement forays to acquire necessary resources that were fundamental to Bronze Age economies. Because the models for Bronze Age political economies, social change, and the development of inequality have been developed in areas where key resources were not locally available (see Earle and Kristiansen 2010), the study of community organization and change within southwest Transylvania can provide a new perspective on the timing and nature of social transformations within the European Bronze Age.

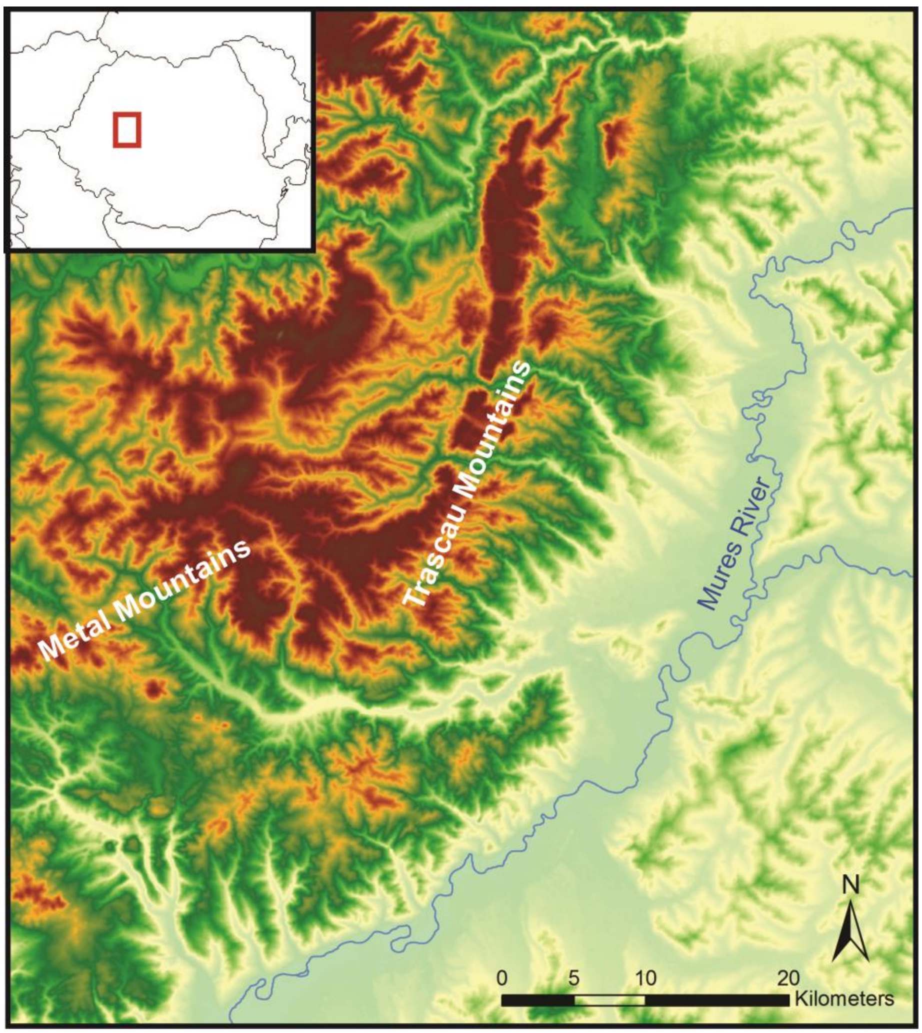

Figure 1.2 – Map of southwest Transylvania.

Transylvania's position at the crossroads between the Carpathian Basin and the Eurasian Steppe situates communities as part of larger networks of interregional connectivity. As a procurement zone, southwest Transylvania supplied societies in surrounding areas with metal and salt fundamental to Bronze Age economies. Neighboring cultural groups across the Carpathian Basin have been characterized by different scales and trajectories of sociopolitical integration. These range from potential regional polities in the lower Mureș (Pecica-*Șanțul Mare*) and Benta Valley (Százhalombatta-*Földvár*) to smaller-scale sociopolitical integration and interaction among the Otomani and Gyulavarsand, and Mureș Culture communities near the confluence of the Mureș and Tisza Rivers. Built over the past three decades of anthropological archaeological research in the Carpathian Basin, the picture of community organization that has emerged is one of a *mosaic of complexity*, where contemporary societies across the Basin are characterized by different degrees of institutionalized inequality. Southwest Transylvania, as the region's primary resource procurement zone, had been a key piece missing from the macroregional mosaic. With the new trajectory of social complexity in southwest Transylvania, this study contributes to a broader understanding of how community organization and social change took place within and beyond this mosaic of complexity.

The diversity of material evidence available in the archaeological record of southwest Transylvania is critical for a holistic, cross-institutional, examination of community organization and social change. Early Bronze Age tomb cemeteries line most every ridge in the Trascău Mountains, and Middle Bronze Age cremation cemeteries have been found in increasing frequency over the past decade. Paleobotanical, zooarchaeological, ceramic, and metallurgical production evidence can be found in Bronze Age sites across the region. The relative lack of large-scale economic development and urban growth in the past century has helped to preserve much of the Bronze Age archaeological landscape.

The focus on large-scale spatial and temporal dimensions of social complexity in this study are also central to understanding change in middle-range societies. This study is multiscalar, combining regional reconnaissance and pedestrian survey and geospatial analyses with test excavation and artifact and chronological analyses. While multiscalar, this research places large-scale spatial and temporal dimensions at the forefront. The approach to community organization focuses on how communities organize themselves across the landscape, with an emphasis on how communities are situated relative to each other and key economic resources in the diverse landscape. Examining how Bronze Age communities variably used the dead to contest territories and access to resources makes it possible to link economic, social, political, and ideological institutions through an interconnected landscape of complexity in which large-scale social transformations could take place. The long-term, deep historical, perspectives employed in this study provide a greater understanding of the necessary conditions for, and consequences of, large-scale social change in the past.

Goals of this Study

This dissertation addresses a series of substantive cultural historical questions as well as issues of broader anthropological interest. This dissertation contributes to the culture history of the Transylvanian Bronze Age through (1) the development of an absolute chronology for the Transylvanian Bronze Age, augmenting and supplanting the existing relative metal and ceramic chronologies, (2) a regional perspective through archaeological survey and landscape analyses, groundtruthing known sites and adding new sites to the map, and (3) a new trajectory of how community organization changed in southwest Transylvania over the course of the Bronze Age that can be compared with trajectories from other regions in Transylvania, the Carpathian Basin, and across Europe.

More broadly, this dissertation builds on existing frameworks for studying community organization and social change in middle-range societies. There have been significant research contributions in the recent literature, especially for the European Bronze Age (see Duffy 2010, Earle and Kristiansen 2010), towards understanding how communities in middle-range societies were organized. This study expands upon this work in two key ways. First, it moves beyond political economic approaches to incorporate alternative pathways towards hierarchical complexity. In addition to economic and political drivers to social organization, ideologies, identities, and how they are materialized, provide additional, equally critical, realms in which equalities or inequalities are negotiated. Within any society, different institutions will not always be organized the same way. As a result, I explore the *coherence* and *dissonance* in the presence of inequalities across institutions as a critical attribute of social organization. Second, it attempts to resolve theoretical and analytical paradoxes in how discrete, qualitatively different, types of social organization, can be studied with continuous, quantitatively different, social dimensions. Unlike discussions of synchronic social organization, diachronic studies of Bronze Age societies have suffered from poorly defined terms and a lack of agreeance on what constitutes *social transformation*. The proposed framework distinguishes qualitative and quantitative changes in how institutions are organized, how they articulate, and social forms that emerge out of human action and institutional conditions. Social evolution involves *microevolutionary changes*, where quantitative change occurs within a particular institution, *macroevolutionary changes*, in which there is a qualitative change within a particular institution with minimal effect on other institutions, and *social transformations* where there is a qualitative change across most, if not all, institutions. As a historical process, social transformations only occur when a certain configuration of institutions, agents, and environments provide the social conditions for change. As such, the study of social evolution in middle range societies is not only concerned with understanding transformations, but also the smaller-scale microevolutionary and macroevolutionary shifts in institutional and environmental configurations that create the conditions that discourage social transformation in some cases, but make it possible in others. When applied to the evolution of communities in the Bronze Age, this framework makes it possible to identify and characterize the emergence of complex regional polities with institutionalized inequality, as well as the fitful process of institutional changes that made such a transformation possible.

Outline of Subsequent Chapters

After this introduction, I turn to a more in depth and broader discussion of the theoretical concepts at the center of this dissertation. I begin Chapter 2 by discussing how community organization is examined in this study and contextualize it within anthropological archaeology. In particular, I focus broadly on social, economic, political, and ideological institutions in middle-range societies, and how they come together to provide the cohesive social structure that can organize social relationships coherently or dissonantly across institutions and social dimensions. My approach emphasizes that archaeologists must develop models that can account for large-scale qualitative changes in social organization emerging from small-scale quantitative actions. Documenting change in the resource procurement zone of southwest Transylvania, and comparing that trajectory with those from surrounding regions, will reveal similarities and differences in how communities in resource procurement zones affected, and were affected by, changes at multiple scales throughout the Bronze Age.

To develop testable models of the organization and evolution of societies in southwest Transylvania from these theoretical concepts, it is necessary to place them in the broader geo-environmental and archaeological context. In Chapter 3, I describe the geo-environmental setting southwest Transylvania, situating the region within the Carpathian Macroregion. All the core natural resources and raw materials that would have been necessary for Bronze Age technologies and economies were locally abundant in southwest Transylvania. This constellation of resources is unique within the Carpathian Macroregion. The Geoagiu Valley survey region cross-cuts the diverse landscape, from metal-rich uplands to interregional trade routes in the lowlands. The nature of these resources and their spatial distribution in southwest Transylvania is central to developing models of community organization that are flexible enough to allow any or all of these resources to play critical factors in Bronze Age political economies.

In Chapter 4, I contextualize this study within the local and regional archaeological record. I frame this study within the long history of studying metal procurement and the emergence of complex regional polities with institutionalized inequality in Bronze Age Europe. Based on previous work in Transylvania, it is possible to identify what types of data can be marshalled to examine dynamic community organization in the Bronze Age, and what additional work must be done to transform the unsystematic regional research into systematic models of social organization and change. I finally present a range of current models for the organization and evolution of communities and cultures in Transylvania throughout the Bronze Age. In particular, I focus on the proposed nature of social organization, the timing of changes in both material culture and social organization, and the hypothesized mechanisms of change.

Based on the theoretical, geo-environmental, and archaeological context of southwest Transylvania, in Chapter 5 I develop a system to monitor community organization and organizational change. I identify key realms, dimensions within each of those realms, and ways of measuring on each dimension through the archaeological record of Bronze Age Transylvania. The alternative scenarios for the development of institutionalized inequality in southwest Transylvania presented in this chapter can be evaluated with archaeological evidence.

The next section of this study focuses on the design and results of the Bronze Age Archaeological Survey (BATS) Project. Chapter 6 describes the fieldwork and laboratory strategies used to generate data to test the anthropological models of the organization and evolution of Bronze Age societies presented in Chapter 5. The next four chapters present the core datasets used to reconstruct the trajectory of social complexity in southwest Transylvania. In Chapter 7, I develop a new absolute-dating chronology that upends the traditional relative dating chronology for Early and Middle Bronze Age Transylvania. In particular, I focus on the duration (start and end dates) and internal development (sequential phases) of the Early Bronze Age and Wietenberg Culture. The new, more accurate, chronology for southwest Transylvania provides new opportunities to monitor change through time in settlement practices, the varied role of mortuary practices through time, and artifactual evidence of social, economic, and ideological institutions.

Chapter 8 presents the regional analyses of settlement systems in southwest Transylvania. I first employ four types of spatial analysis for settlement patterns: (1) site and rank-size analysis, (2) nearest-neighbor analysis, (3) network analysis, and (4) catchment analysis. Chapter 9 presents analyses of cemeteries and mortuary practices at multiple scales in southwest Transylvania. I focus on how the tempo and landscape setting of mortuary practices changed over the course of the Bronze Age. Chapter 10 presents preliminary analyses of artifacts recovered during the BATS Project excavations. I present analyses of (1) ceramic quality, (2) faunal assemblages, and (3) metallurgical evidence. Each of these analyses complements regional views for the organization of social and economic institutions derived from settlement systems.

Chapter 11 presents a new model for the organization and evolution of Bronze Age societies in Southwest Transylvania. I document how these different institutions articulate into a cohesive social system, and how the nature of the articulation changes over time. I evaluate the different models for how middle-range societies changed through time to identify when large-scale transformations occurred, and how smaller-scale changes made this possible. While data produced in this dissertation is substantial for some institutions, data for others are limited by the lack of previous research in the region. As such, models in this section are best thought of as preliminary and must be tested with further survey, excavations, and materials analyses. In sum, understanding the long-term development of institutionalized inequality in procurement zones can provide new, critical insights into European Bronze Age societies. With more holistic views of social variability within a variety of geo-environmental contexts, we can develop better models of social change in middle-range societies.

In the concluding Chapter 12, I draw attention to the many remaining gaps in our understanding of the organization and evolution of Transylvanian mining communities and detail a roadmap for future research that can provide new data to address these issues. More broadly, I discuss the contributions of this research to European Bronze Age archaeology, the study of middle range societies, and the study of social change and transformations in human societies. I emphasize the need for more detailed trajectories of middle range societies that focus on how these societies were organized rather than too much concern with labeling these societies. More trajectories will make broad comparative anthropological archaeology possible, and allow for the building of new theory to understand social evolution. I conclude with a discussion of how archaeological research into early mining can be used as public scholarship to inform modern discourse on identity, inequality, and change in mining communities.

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PART I: THEORETICAL ORIENTATION

Chapter 2 - Conceptualizing Community Organization and Social Change in Middle Range Societies

Chapter Introduction

In a 2012 session of the Southeast Archaeology Conference organized by Jim Knight, participants were challenged to state "your best understanding of how human sociality fundamentally works, and how this helps structure your research outlook" (Beck 2014:208). Robin Beck's response draws attention to how the historical development of anthropological archaeological theory has produced a segmentation of analytical scales within the field. For Beck, archaeologists have tended to self-organize into two camps. The first camp is primarily focused on microsociality and individual perspectives in human societies, including agency, practice theory, personhood, and individual identity. The second camp comprises those interested in macrosociality – social continuity and transformation at larger spatial and temporal scales (Beck 2014:208). Rather than replacing macroscale social evolutionary perspectives, microsociality has merely shifted the emphases of research from one scale to another (Beck 2014:209). Neither the organization and evolution of human societies, nor individual decisions and actions, however, can be understood at a single scale. Anthropological archaeology requires theoretical approaches and models that effectively bridge microscale individuals and events and macroscale structures and processes.

For archaeologists focused on a single analytical scale, other scales provide context; a backdrop or constant factor that has little effect on the issue at hand. As an example, household archaeology is at the forefront of social theory at the microscale (e.g., Wilk and Rathje 1982). Household studies are cognizant that households articulate with larger-scale social organization and long-term social change, but these larger-scale perspectives are usually treated as secondary to small-scale social and temporal issues

(Robin 2003). Household archaeologists only rarely consider households as agents of large-scale political change (but see Ames 1995; Carpenter et al. 2017; Sobel et al. 2006). Similarly, much social evolutionary literature focuses on large-scale political systems and long time scales, only rarely affording individuals, households, and singular events an active role in the organization and evolution of social complexity (but see Flannery 1976). This paucity of discussions of individuals in early social evolutionary research was a major motivation for the postprocessual critique. That is not to say that individuals are not present in evolutionary models of social change (see Feinman 1995; Spencer 1993). Instead, individuals and events are often treated as a constant; people have agency, but ultimately were not the stimuli of social change.

In the past decade, anthropological archaeologists have increasingly focused on the recursive relationship between different scales in human societies; from individuals to polities, agency to structure, and events to long-term historical processes. This trend spans many, often disparate, theoretical traditions, including traditional social evolutionary approaches (Flannery and Marcus 2012), macroevolutionary archaeology (Prentiss et al. 2009), complex systems theory (Ullah et al. 2015), social network approaches (Knappett 2012, 2013), and a range of recent social archaeology (Beck et al. 2007; Beck 2014; Bolender 2010; Robb 2013; Robb and Pauketat 2013). Beck and colleagues (e.g., Beck et al. 2007; Beck 2014; Bolender 2010) discuss the feedback between agent and structure, process and event, as “eventful archaeology.” Eventful archaeology is informed by structuralist theory of sociologist William Sewell Jr. (2005), and builds upon Giddens (1979, 1984), Bourdieu (1977), and Sahlins (1985, 1995). For Prentiss and colleagues (Bettinger 2009; Chatters and Prentiss 2005; Kuijt and Prentiss 2009; Prentiss 2011; Prentiss et al. 2009; Prentiss et al. 2014; Rosenberg 1994, 2009; Spencer 2009), feedback between agent and structure, process and event, is approached from a human behavioral ecological and evolutionary biological theory, including work by Sewall Wright (1931, 1932), Stephen Jay Gould (Gould and Lewinton 1979), and Niles Eldredge (1995). Archaeologists drawing upon complex adaptive systems theory and network analysis (Bentley and Maschner 2003; Bernabeu Aubán et al. 2012; Bocinsky and Kohler 2016; Knappett 2013; Kohler 2011; van der Leeuw et al. 2009; Ullah et al. 2015) have engaged computational modeling and theoretical advances in the study of networks, such as the work by Barabási (2002, 2016), Newman (Newman 2010; Newman et al. 2006), and Dorogovtsev and Mendes (2003), and complexity science, including work by Holland (1992), Mitchell (2009), Waldrop (1992); Kauffman (1993, 1995), and Bak (1996) (also see Lewin 1992).

There is a consistent view of the nature of the organization and evolution and human societies that runs through these diverse theoretical approaches despite the use of different terminology to describe similar units, processes, and phenomena. Human societies are composed of interacting heterogeneous individuals with *agency* – the capacity to make choices. Individual agents lack knowledge of the entirety of the system, which means they do not always act "rationally" or predictably. The resulting potential for randomness introduces *non-linearity*, or the possibility of variable and unpredictable outcomes, into a social system. These individuals self-organize into groups at multiple scales, creating new agents and identities at increasingly larger social scales, such as households, lineages, sodalities, villages, and ethnic groups. Collective groups emerge from, and affect, the interactions among constituent social units; they represent more than the sum of their parts. This emergence of larger-scale social units results in tensions within and between individuals. For example, individuals with intersectional identity may be confronted with choices that would impact themselves, their lineages, and their co-residential communities differently. There is recursive feedback between agents and the social structures: social structures emerge out of inter-agent interactions, and social structures provide constraints on the choices agents normally make. Thus, social structure, institutions, cultural norms, and beliefs are in a constant "state of becoming", or evolution and adaptation; continuously negotiated and subject to change as agents, and their interactions, change. Finally, history matters. Past events, choices by agents, and social institutions affect future events, choices, and institutional structure.

Researchers with different theoretical perspectives are thus converging towards two central issues in the study of human societies: (1) how do small-scale social units affect, and how are they affected by, large-scale collective institutions? and (2) under what conditions do short-term events produce long-term social transformations? These questions are of fundamental importance to all social sciences, and anthropological archaeology is uniquely positioned to answer them for several reasons. First, the field employs long time scales and practitioners can also study the larger spatial units that are necessary to understand the precursors and consequences of any social transformation. Second, archaeologists have access to multiple lines of evidence, including data from political, economic, social, and ideological institutions, which allows for holistic views of the context and mechanisms of change. Third, the emphasis within anthropological archaeology on global comparisons allows for scholars to identify both commonalities and historical differences in social transformations. Fourth and finally, most social transformations that have impacted the development of modern social systems occurred in the past and have no modern analogs accessible to ethnographers or other social scientists. Because of colonialism and globalization, there are no “pristine” societies that have been unaffected by modern state-level sociopolitical institutions. Studying the rise of increasingly complex social systems is only possible through the archaeological record.

This study focuses on the wider context of the development of complex regional polities with institutionalized inequality, one of the most important transformative steps in the political development of human societies (Carneiro 1981:38). The emergence of complex regional polities constituted the first transcendence of local autonomy in human history (Carneiro 1981:37). With the development of institutionalized inequality, unequal social relationships among individuals, households, and larger corporate groups were codified and maintained across economic, political, and ideological institutions. As an issue integrated with problems of scale, agency, structure, and change, the development of complex polities is an ideal context in which to develop anthropological theory to bridge the microscale and macroscale in human societies.

The study of the development of institutionalized social inequality continues to be one of the most fundamental issues in anthropological archaeology (Ames 2007; Bowles et al. 2010; Earle and Johnson 2000; Flannery and Marcus 2012; Fowles 2002; Kintigh et al. 2014; Marcus 2008; Price and Feinman 2010; Rousseau 2006; Shennan 2008). In a recent survey and synthesis of the “grand challenges” facing anthropological archaeology, Kintigh et al. (2014) identified 25 grand challenges, those the panel considered the most important questions archaeologists will continue to address into the future. Of these challenges, the first seven, grouped by the authors under a category of

“Emergence, Communities, and Complexity”, focus on processes of increasing social complexity, the role of structure and agency affecting, and being affected by, social change. Two of the “grand challenges” identified by Kintigh et al. are particularly relevant to this study: (1) how does the organization of human communities at varying scales emerge from and constrain the actions of their members? (see Barrett 2012; Bicchieri 2005) and (2) how and why do small-scale human communities grow into spatially and demographically larger and politically more complex entities (see Bocquet-Appel 2002; Bowles and Gintis 2011; Boyd and Richerson 2005; Redmond and Spencer 2012)? This call to study emergent phenomena, such as novel scales of political organization, and the long-term causes and consequences of sociopolitical reorganizations adds to over a century of increasingly nuanced research into the development of social complexity.

Resource procurement zones, where key economic resources are extracted locally and exchanged with surrounding regions, are important and unique contexts for studying the long-term dynamics of social complexity. Procurement zone approaches complement models developed in contexts where communities relied on long-distance exchange for core economic needs. World systems theory has been the most common way of theorizing community organization and social change in resource procurement zones. Within world systems, the more politically sophisticated and urban centers of manufacture form cores and engage in unequal and often exploitive economic relationships with less complex marginal societies on their periphery (Wallerstein 1974). This perspective dominates dynamics observed in mining communities today, where globalization and transnational mining corporations create strong power asymmetries with local, often marginalized ethnic minority, communities (Kirsch 2014; Knapp et al. 1998). Add in the perceived environmental marginality of upland mountain landscapes, and the resource procurement zone of southwest Transylvania appear geographically and socially peripheral by default, particularly in relation to the better studied Carpathian Basin. Additionally, world systems and core-periphery models assume a directional exploitive political and economic relationship that may or may not be present, particularly among less complex middle-range societies (e.g., Peregrine 1992). By applying a world system model to the Bronze Age, there is a danger of imposing interregional asymmetries endemic to state-level societies rather than identifying where and when political and economic asymmetries arise. Monitoring how communities situated in resource procurement zones changed with the rise of complex regional polities can reveal the political economic underpinnings and dynamics of these social transformations.

In this chapter, I present the theoretical framework for my study of Bronze Age transformations. I begin with a general discussion of community organization and social change in human societies, drawing attention to approaches that emphasize institutions, inter-institutional articulations, and the relationship between qualitative and quantitative changes in middle-range societies. I then discuss how procurement and resource procurement zones have been examined in anthropological archaeology, with a focus on middle-range societies. From these general discussions, I present a theoretical framework for conceptualizing community organization and social change among middle-range societies in procurement zones. I argue that the processes and events that produce social transformations, such as the institutionalization of inequality, emerge out of the organization of, and interplay between, social, economic, and ideological institutions. Multiscalar approaches that include regional archaeological analyses can provide unique insights into the organization and evolution of Bronze Age communities in resource procurement zones.

Middle-Range Societies in Anthropological Perspectives

Community Organization in Middle-Range Societies

"Middle-range society" is a broad category that encompasses a wide breadth of social complexity, between egalitarian and state-level societies. The study of middle-range societies, particularly how they are organized and how they change over time, continues to be a core element of anthropological archaeology (e.g., Arnold 1996; Beck 2003; Drennan 1996; Drennan et al. 2010; Earle 2001; Feinman 2000a, 2000b; Flannery and Marcus 2012; Marcus 2008; O'Shea 1996; Parkinson 2002; Price and Feinman 2010; Rautman 1998; Roussou 2006). Over decades of study, anthropological archaeologists have developed increasingly nuanced views of how middle-range societies were organized and evolved.

There are two ways in which variability within middle-range societies has been approached: (1) typological approaches that consider alternative forms and categories of sociopolitical organization, and (2) dimensional approaches that view sociopolitical organization as organized along spectra and trajectories. While often posed in opposition, the tensions between typological and dimensional approaches provide insight into the social processes that produce both qualitative and quantitative variability within middle-range societies. Typological approaches to middle-range societies have their origins in early anthropology, including Morgan (1985 [1877]) and Engels (1902), and reached their peak within broader anthropology with work by Sahlins and Service (1960; Service 1962). Archaeologists have found continued utility in typological approaches when subject to important clarifications and modifications, including (1) disarticulating evolutionary categories with social judgements of "primitiveness" that inherently view more complex societies as "better," and (2) breaking down and replacing existing typologies with more fine-grained typologies (e.g., apical and constituent hierarchies – Beck 2003). The primary benefit of typological approaches to the study of middle-range societies is that types are tools for identifying similarities and differences among unique societies. These tools are needed in order conduct cross-cultural comparisons at the core of anthropological inquiry. There are also aspects of typological approaches that continue to challenge archaeologists. Social types necessarily reduce variation, overly homogenizing societies within the same categories and over-emphasizing differences between societies in different categories. While this is by design to make societies comparable to each other, they can also ossify social differences and removes dynamism from social systems. Typological approaches thus emphasize qualitative differences, but obscure quantitative differences.

Dimensional approaches to middle-range societies in anthropological archaeology have grown in popularity over the past 35 years (see Duffy 2010). Dimensional approaches hold that social variation is continuous, rather than forming discrete categories. Such continuous variation cannot be studied with social typological approaches, and archaeologists should instead be monitoring social organization as a series of inter-dependent dimensions, measured along sets of continuous variables (O'Shea and Barker 1996:16). Examples of dimensional approaches can be seen in the work on a variety of middle-range societies. Crumley's (1979) heterarchical models for social organization allows for elements of the social organizational structure, which match dimensions discussed in this study, to be organized independently of each other, in contrast to the packaged views of Service's (1962) social typologies (Crumley 1979, 1995). Feinman and Neitzel (1984) also developed archaeological measures to conceptualize social organization along dimensions. Johnson and Earle (1987) likewise proposed a *continuum* model that organizes chiefly societies along a *spectrum* from simple to complex (Johnson and Earle 1987:211; Beck 2003:643). This view has led to the rise of "cycling", "fission-fusion", and "peaks and valleys" models (e.g., Anderson 1994; Blitz 1999; Parkinson 2002; Marcus 1998), which view social organization as dynamic, with change occurring along trajectories (Fowles 2002). O'Shea and Barker (1996) developed a dimensional approach to study variability in middle-range societies that combines ordinal scores of political differentiation with four different archaeological measures: (1) grave elaboration; (2) contribution of hereditary ascription to political office or social rank; (3) spatial distributions of ranked graves; and (4) regional distribution of symbolic markers of rank. The various combinations of these variables represent different forms of organization, and highlights the variation encompassed within middle-range societies (O'Shea and Barker 1996:16). By breaking social types into dimensions, it is possible to identify a much wider range of social forms than traditionally possible with typological approaches. Despite their utility, dimensional approaches, where all variation in social organization is quantitative, make it difficult to identity, and thus investigate, qualitative changes in social organization within middle-range societies. A solution is to view dimensional approaches as *complementary* to, rather than replacing, typological approaches.

Approaches that combine both dimensional and typological frameworks are becoming more popular components of the study of middle-range societies. Alison Rautman (1998) suggests that heterarchy provides a solution to this dilemma. Rautman critiques both the false dichotomy between egalitarian and hierarchical systems posed by typological approaches and attempts to position societies along a continuum between two extremes (see Drennan et al. 2010:45-46). She advocates that archaeologists move beyond determining how hierarchical societies were, and instead focus on qualitatively different forms of complex social organization (Drennan et al. 2010:46; Rautman 1998). Drennan et al. (2010) go further, stating that archaeologists should focus on both distinguishing different *kinds* of hierarchy (a qualitative assessment) and differences in the *degree* of hierarchy (a quantitative assessment) (Drennan et al. 2010:46). Drennan et al. suggest that in an effort to "avoid imagined implications of inferiority from ranking… societies "lower" on a scale of either hierarchy of complexity" (Drennan et al. 2010:46), archaeologists have emphasized a "separate but equal" status for individual communities and societies. In the case of Pueblo societies in the American Southwest, Rautman argues that Puebloan societies were "complex" but not hierarchical, while McGuire and Saitta (1996; Saitta and McGuire 1998) use the same data to argue that they were "complex" and both hierarchical and egalitarian (Drennan et al. 2010:46). This approach critiques efforts to isolate historical trajectories in society, a return to Boasian historical particularism, in anthropological archaeology (e.g., Pauketat 2001a, 2007), where individual historical trajectories are considered independent and cannot be compared along dimensions of social complexity. Societies are "not just *more developed* and *less developed*" (Drennan et al. 2010:71, emphasis original). They are also "not just *developed differently*" (Drennan et al. 2010:71, emphasis original). Instead, they are "more and less developed in a variety of ways" (Drennan et al. 2010:71). As Drennan et al. (2010) argue, the solution is to simultaneously recognize and confront the many dimensions of variability, not to devise new models that oversimplify social complexities to a few dichotomies or typologies. I synthesize and expand upon these discussions below, highlighting how the organization of inter-institutional articulations, more than any single institution, defines community organization and effects social change.

Social Change in Middle-Range Societies

Change over time in human societies is one of the unique purviews of anthropological archaeology within social sciences and the humanities. Despite this critical role within the academy, anthropological archaeologists continue to struggle with how to theorize social change. One reason anthropological archaeologists have struggled with understanding how, when, and why societies change is the close relationship with, and often reliance upon, cultural anthropological theory. Cultural anthropology, however, is a relatively synchronic subdiscipline and cultural anthropological theory is often ill-equipped to discuss social change at the time-scales accessible to, and usually of interest to, archaeologists. For example, practice theory, building on work by Bourdieu and Giddens, continues to be a key social theoretical perspective within anthropological archaeology. While processes in practice theory, such as habitus, contain a recursive, diachronic, and dynamic element, they focus on social reproduction and lack sufficient explanatory frameworks for when, why, and how large-scale changes emerge separate of continuous reproduction (see Lash 1993). It is not that synchronic models of community organization are incompatible with studies of social change; rather it is that they require a distinct, but complementary, set of diachronic models. Instead of lining up synchronic models from a series of individual time slices and simply describing what is similar and what is different, anthropologists need models that focus on how, when, and why social changes occur.

One potential solution is to focus on the processes of human decision-making and their relationship with community organization. In the past two decades, anthropological archaeologists from a variety of perspectives have placed increasing emphasis on the role of historically situated *events* as mechanisms of social change (e.g. Beck et al. 2007; Bolender 2010; Pauketat 2000, 2001a, 2001b, 2003). Events are defined as "a happening or encounter that transforms the articulation of social structures" (Sewell 2005:100; Beck et al. 2007:833). From Giddens (1979, 1984), structure is the "rules and resources, recursively implicated in the reproduction of social systems" (Giddens 1984:377). Events can create *ruptures*, disruptions in social structures that allow for them to recombine in novel ways (Beck et al. 2007; Bolender 2010). While framed as "eventful" archaeology, I argue that this approach relies upon a series of social processes, through human interaction, to create new forms of integration over increasingly longer time-scales (also see Sassaman 2010:5; Wright 2014:277-279). Importantly, these approaches represent a broader trend within anthropological archaeology to consider social change as working at multiple spatial, temporal, and social scales. "Eventful" archaeology likewise underscores the need to consider both broad social structures and stimuli when exploring qualitative change in the past.

Archaeologists have suggested many different causal mechanisms that lead to qualitative change in community organization in middle-range societies. These include internal forces, such as feasting (see Hayden 2001; Hayden and Villeneuve 2010) and control of surplus (see Barrier 2011; Kuijt 2009), and external forces such as warfare (see Flannery and Marcus 2003; Haas 1990; Redmond and Spencer 2012), culture contact (see Ethridge and Schuck-Hall 2009), and environmental change (see Schwindt et al. 2016). These different mechanisms include both *proximate mechanisms*, which are the key triggers for social change, and *ultimate mechanisms* which are the broader processes which provide the context for events to trigger social change.

Any study of social evolution must consider both proximate mechanisms and broader social processes. For prehistoric archaeologists, however, where individual events are often too detailed for the resolution of our data, most analytical investment must be on the side of social structures rather than on individual events. It is increasingly clear that no single causal mechanism can explain all social transformations in the past. Instead, social transformations are multi-faceted; a combination of proximate mechanisms and appropriate social conditions that allow events to spark large-scale social change. These multi-faceted transformations require a holistic view across economic, social, political, and ideological dimensions to be understood, something for which the prehistoric archaeological record is well suited. Unfortunately, the study of social change in middle-range societies in general, and Bronze Age Europe in particular, continues to be dominated by political economic approaches that employ a more restrictive view of how community organization changes over time.

Resource Procurement and Political Economy

Political Economy in Middle-Range Societies

As defined in Chapter 1, political economy is the organization of procurement, production, distribution, and consumption systems in relation to political systems. The political economic framework outlines the ways in which economic processes and political relations are mutually constitutive (Gokee 2012:6). Political economy has been a critical part of anthropological archaeological research into the evolution of social complexity for over three decades (e.g., D'Altroy and Earle 1985). Within anthropological archaeology, political economy has had a broad impact both within Marxist traditions from which it emerged (e.g., Wolf 1982; Marx 1867) and beyond (see Beck and Brown 2012; Brumfiel and Earle 1987; Cobb 1993, 2000; D'Altroy and Earle 1985; Earle 1997, 2002; Earle et al. 2015; Feinman and Nicholas 2004; Hirth 1996; Junker 1999; Muller 1997; Pauketat 1997; Scarborough et al. 2003; Schortman and Urban 2004; Sinopoli 2003; Stanish 2002; Stein 1998).

In middle-range societies, a political economic framework is designed to examine the creation and maintenance of asymmetries and hierarchies of power. Power is derived from differential control or influence over labor and its products (Arnold 1993, 1996; Cobb 1993; Earle 1991, 1997, 2002; Schortman and Urban 2004:190). In a political economic framework, elites that exert control over labor and its products coevolved with the development of commodity chains that contain constriction points, or *bottlenecks*, that offer the opportunity for elites to limit access by creating ownership over resources, technologies, or knowledge (Earle 2002; Earle et al. 2015:7). Bottlenecks can be physical (e.g., mountain passes along interregional trade routes) or conceptual (e.g., skilled labor for metalworking) elements of a commodity change starting with resource extraction and flowing through processing, fabrication, transportation, exchange, consumption, and recycling (Earle et al. 2015:7). Variation in bottlenecks within middle-range societies has led to archaeologists to differentiate between economic systems where elite-control is exerted in the flow of staple goods, such as grain, livestock, and clothing (*staple finance*), or special products, such as prestige goods and adornment items (*wealth finance*) (D'Altroy and Earle 1985; Earle 2002). No matter the nature of the bottleneck, all bottlenecks are based on scarcity or channelized access. Control of the flow of resources, products, and labor through the economic system becomes politicized when individuals or small groups turn privileged access to economic bottlenecks into social capital through selective exchange, conspicuous consumption, and gift giving.

Political economic approaches make several key contributions to anthropological archaeology. First, political economy integrates human agency and institutional structure into a social process that seeks to explain the inequities observed both in the archaeological record and in modern society. Second, the emphasis on power dynamics makes political economic approaches particularly relevant to the study of the evolution of social complexity, including the development of complex regional polities with institutionalized inequality. Third, the centrality of material relationships to political economic frameworks is ideal for archaeology, which relies upon inferring dynamic social processes from static material remains (Gokee 2012). Because of these strengths, political economic approaches have been instrumental in identifying and attempting to explain variation within middle-range societies, both within and between different scales of organizational complexity (Earle et al. 2015:2).

Challenging Political Economy

Despite their strengths, political economic models for community organization and social change in middle-range societies also have several limitations. The first limitation of political economic frameworks is how the economy is positioned relative to other social realms. In what can be referred to as the *tyranny of the economy*, economic organization is treated as coeval with political organization, which in turn is seen as defining all of community organization. Other non-economic realms and institutions, such as ideology and mortuary practices, are considered to only reflect, exaggerate, or mask the social relationships and inequalities seen in economic institutions (Kuijt 1996). This produces an analytical hierarchy, in which economic organization is treated as the "real" way communities are organized while other social and ideological institutions are secondary noise (Quinn and Beck 2016:19). Another aspect of the tyranny of the economy is that ideological institutions are primarily considered through materialist perspectives, with rituals viewed as contexts of economic production, distribution, and consumption. While the economics of ritual are an important avenue of research (see Wells and McAnany 2008; Wells and Davis-Salazar 2007), it is important to also consider the non-economic roles rituals play in negotiating identities and relationships.

A second limitation to the way political economy has been deployed in anthropological archaeology is that it presupposes, rather than explains, the presence of elites searching for something to control. Assuming the presence of elites limits the ability of political economic frameworks to model how regional elites first emerged. A similar critique has been made of Hayden's (2001) *aggrandizer* model of the origins of rank. For Hayden, aggrandizers seize control and establish claims of ownership of productive locations and desirable resources, uses food surpluses to create contractual reciprocal debts, underwrite major labor projects, and forge powerful alliances, primarily through competitive feasting (Hayden 2001). However, this model does not explain how aggrandizers would emerge, or be tolerated within a regimented egalitarian society. Likewise, political economic models for the development of complex regional polities with institutionalized inequality cannot explain how regional elites would emerge or be tolerated. Through the study of political economy, we can see the effects, not the causes, of increasing social complexity.

A third limitation in the application of political economy in the study of middle-range societies is that they are often narrow; focusing on a single resource or economic activity. Schortman and Urban (2004:210) call for researchers using political economic approaches to look across multiple resources and crafts. However, in practice, political economic models have been more narrowly applied (e.g. Earle et al. 2015). Metal systems in Bronze Age Europe, which will be explored in more detailed in Chapter 4, are an example where many archaeologists use the organization of a single economic resource to define whether communities were organized more or less hierarchically. This is a significant problem for resource procurement zones, where the organization of extraction of a specific resource is often treated as coeval with broader economic, political, and community organization. While it may be the main factor in structuring political economic relationships within a society, we must demonstrate, rather than assume, that community organization is linked to the organization of a single craft or resource. To do so, it is necessary to consider each economic activity and resource as part of a complex suite of economic activities, and to treat the economy as a single realm integrated into a larger social system.

Despite their existing limitations, political economic approaches remain a cornerstone of anthropological archaeological investigations into the origins and evolution of institutionalized inequality. These approaches must be modified, however, to take advantage of the strengths of political economic models, and to add more holistic and dynamic perspectives.

Conceptualizing Procurement and Procurement Zones

The organization of resource procurement is one of the key dimensions of the political economies of communities in resource-rich areas (Chapman 2003; Cobb 2000; Hirth 2008; Knapp, et al. 1998; O'Brien 1990, 2007; Ruiz 1993). *Resource procurement* is defined here as the suite of technological, social, and economic mechanisms by which raw material is acquired for production and/or consumption. Resource procurement has traditionally been subsumed under production (e.g., “metal production”) with the two terms often used interchangeably (e.g., Costin 2007; Flad 2011). However, the oft-used definition of production as “the transformation of raw materials and/or components into usable objects” (Costin 1991:3) does not account for the mechanisms by which raw materials are first collected, processed, and moved prior to their consumption or transformation into usable objects. As such, procurement is embedded in the larger economy yet must be modeled independently.

Resource procurement zones are areas that are rich in resources that are extracted locally and exchanged widely (Quinn and Ciugudean 2017). Economic resources critical to human societies are not evenly distributed across the landscape. The heterogeneous distribution of all resources results in some areas where certain resources can be procured locally, and other landscapes that lack local access to those resources. Many landscapes with local access to economic resources are procurement zones for a small range of resources. For example, the Baltic coast is a major resource procurement zone for amber throughout European prehistory. While the region also has sufficient arable and pasture land to produce subsistence and secondary animal products, the region lacked other key economic resources, such as metals, which had to be imported during the Bronze Age (see Earle 2002). As I will discuss in Chapter 3, southwest Transylvania represents a unique constellation of resources in both the Carpathian Basin and the broader European region, with local access to a diversity of subsistence resources plus abundant salt, copper, gold, and tin deposits. The organization of procurement specifically, and community organization more broadly, is thus affected by whether a community is in a region devoid of natural resources or in a resource procurement zone.

Procurement has been most explicitly discussed in the acquisition and movement of stone from quarries (Andrefsky 1994, 2009; Bamforth 1990; Binford 1980; Blomster and Glascock 2011; Burger et al. 2000, 2016; Cobb 2000; Feinman et al. 2013; Garvey 2015; Golitko and Feinman 2015; Golitko et al. 2012; Gould and Saggers 1985; Hirth 2008; Peterson, et al. 1997; Tykot 1996; Vaughn 2006; Vining 2015; Wolff et al. 2014). Wendt and Lu (2006) have described procurement patterns in the extraction and distribution of bitumen used for decoration, as sealant, and as adhesive by the Olmec of Mexico's southern Gulf coast lowlands. Murillo-Barraso and Martinón-Torres (2012) characterize the acquisition of amber in prehistoric Iberia as procurement. Extraction of salt is most often framed as production rather than procurement (e.g., De León 2009; Flad 2007; Harding and Kavruk 2010; Muller 1984; Parsons 2001). Metal extraction is not often framed as procurement, but as either extraction or mining (e.g., Eerkens et al. 2009; Kienlin and Stöllner 2009; Killick and Fenn 2012; Knapp et al. 1998; Levy et al. 2002; Reindel et al. 2013; Stöllner et al. 2003; Tripcevich and Vaughn 2013).

The organization of resource procurement is often described through the mode of acquisition. *Direct procurement* is the process of individuals and households acquiring raw materials directly from the source. *Indirect procurement* is the process of individuals and households acquiring raw materials through a human intermediary, through gift giving, trade, and exchange. *Embedded procurement* is the process where individuals and households combine direct procurement of raw materials with other processes that move them through the landscape, such as seasonal rounds for moving animals with pastoralism (Binford 1979; Gould and Saggers 1985; Garvey 2015).

Resource procurement has an impact on broader social, economic, ideological and political institutions beyond modes of acquisition. In understanding how procurement is organized, archaeologists must also consider who coordinates procurement activities, the frequency, directionality, scale, and tempo of procurement activities, and how procurement affects, and is affected by, broader ideologies and world-views. As an example, Cooney (1998, 2009, 2011) has explored how spirituality and procurement are materialized in Neolithic stone quarries in Ireland and the United Kingdom. In both archaeological and ethnographic cases, authors in Knapp et al. (1998) take a holistic view on mining as a social space. Nevertheless, the roles of procurement within the economy remain a core issue.

The extended influence of procurement throughout economic systems can be seen in metal economies. Metal procurement systems link several steps in the metal production sequence that are often treated separately, including mining, ore-processing, and movement of ore (Figure 2.1). Procurement occurs at various points throughout the metal system. While mining is probably what first comes to mind when thinking about metal procurement, acts of trade and exchange, and movement among artisans through a multi-step production sequence are also acts of procurement. Each of these metal procurement activities is situated in the physical and social landscape. The spatial distributions of procurement activities, whether they co-occur or are segmented from each other, therefore have broad social, economic, and political implications (Childs 1991; Childs and Killick 1993; Doonan 1994; Godoy 1985; Krause 2009; Ottaway and Roberts 2008; Rapoport 1994; Thomas 2012).

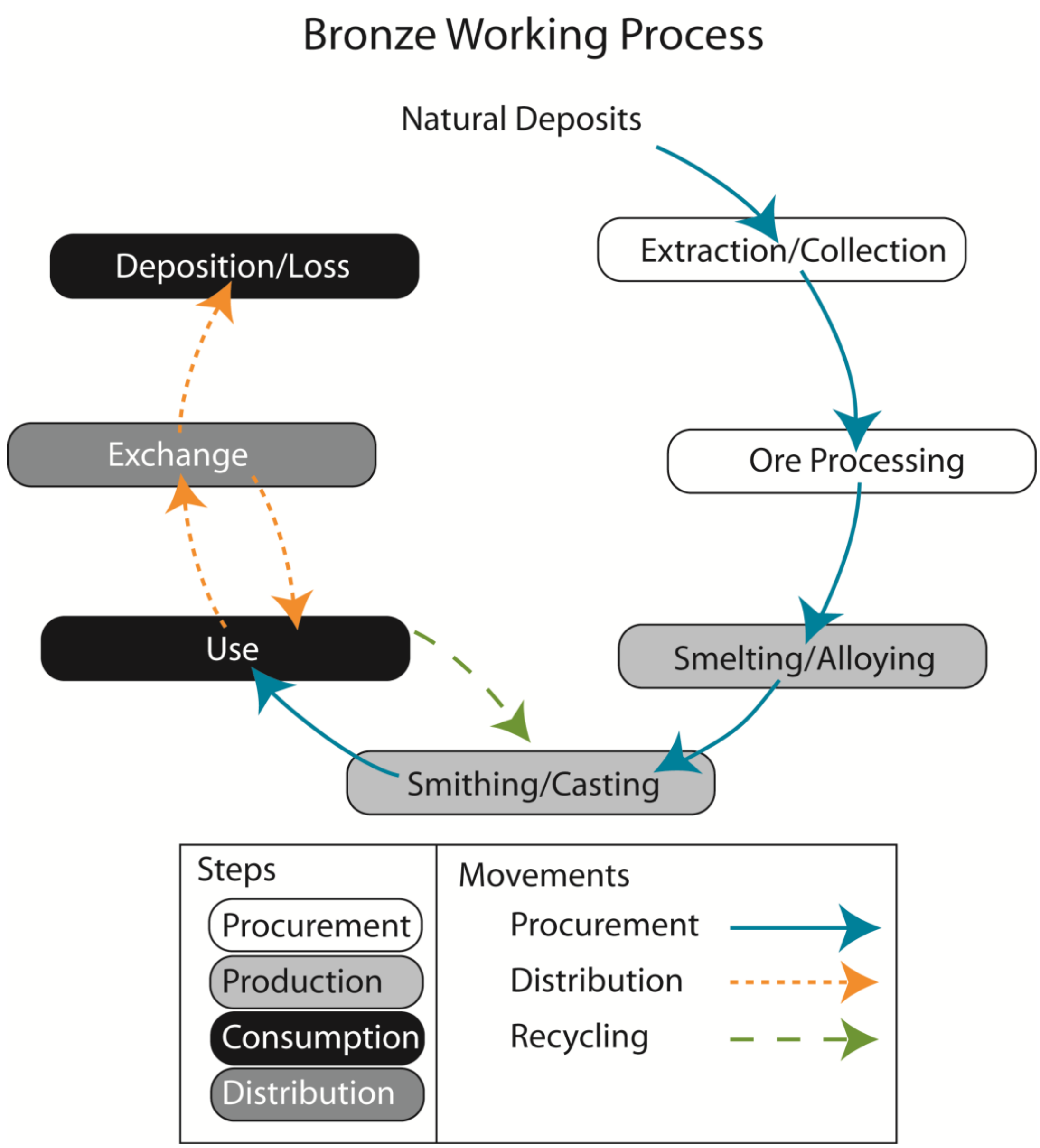

Figure 2.1 - Bronze working process (after Ottaway 1994, Figure 1).

Communities in resource-rich landscapes are clearly affected by how resource procurement is organized. The organization of communities in resource procurement zones also affects the production, distribution, and consumption of resources by communities in surrounding areas that rely on these resources. Consequently, community organization in procurement zones is both a local issue and a process mediated through interregional interaction.

Landscapes of Complexity: Regional Approaches to Social Complexity and Procurement Zones

The best way for archaeologists to monitor the long-term dynamics of middle-range societies in resource procurement zones is through multiscalar perspectives. Scale has been an important component of archaeological research for decades (see Ames 1991; Crumley 1979, 1995; Kowalewski et al. 1983; Lock and Molyneaux 2006a; Marquardt 1985; Mathieu and Scott 2004; Miroff and Knapp 2009; Spaulding 1960). Recently, there has been an increase in the explicit discussion of different types of scale, the nature of relationships between scales, and the role of scale in studying social transformations (see Lock and Molyneaux 2006a). These considerations of scale are necessary to ensure that archaeological research is designed to appropriately match the research questions being asked, the nature of the archaeological record in question, and the social dynamics that are being studied.

Scale in Anthropological Archaeology

I define *scale* as a dimension of variable inclusivity. This simplistic definition allows scale to be employed in many ways. While scales are continuous, in practice scales are divided into a system of categorical units (types) which encompass a range of values, components, correspondences, and relationships. These individual units necessarily possess a relationship of variable inclusivity; each unit is composed of smaller units and as components of larger units. Because these scalar units are created as classificatory tools, they can be viewed as offering similar opportunities and potential drawbacks as other forms of typologies that have received significant attention in the archaeological literature (e.g., Dunnell 1986; Ford 1954; Gilboa et al. 2004; Read 1974, 1989, 2009; Read and Russell 1996; Shott 2010; Spaulding 1953, 1982).

The types of scales relevant to archaeological inquiry can be broadly divided into two major categories: (1) social scales and (2) analytical scales. *Social scales* are socially meaningful, constituted, and negotiated identities. Some examples of social scales include individuals, households, villages, polities, and states. Each scalar unit has some form of agency – the capacity to make decisions. Humans operate simultaneously at multiple scales (Knapp and Miroff 2009:xxiv). When archaeologists describe social organization, they are describing the totality of the scales within a society; including which scales are socially meaningful, how units at the same scale interact, and how different scales articulate with each other. Social scales, and different forms of identity, are not benign phenomena; rather they an active instrument in making and changing society (Lock and Molyneaux 2006b:6). Processes of creating social scales are always ongoing, and always in potential flux (Giddens 1984; Wobst 2006). As socially constituted, social scales (and therefore social organization) can and will vary across space and time.

In contrast to social scales, *analytical scales* are the spatially and temporally defined units that archaeologists employ to understand human society. Examples of analytical scales include artifacts, houses, sites, regions, and macroregions. Certain analytical scales are particularly useful in understanding the structure and dynamics of certain social scales (e.g., excavation of structures for understanding household organization or conducting regional survey to understand the development of polities that integrate multiple settlements).

There is a necessary tension between social scales and analytical scales. Anthropological archaeologists are fundamentally interested in understanding processes occurring at social scales and must use analytical scales to define and understand these social scales. However, archaeologists must be careful to never assume a link between a particular analytical scale and a comparable social scale. For example, it is a commonly repeated dictum in household archaeology that a house is not a household. Archaeological structures may be residences, but it cannot be assumed a priori that every structure was a separate household. In some cases, a single structure may house many households (e.g., Northwest Coast long houses; Neolithic European houses), and in others many structures together may be used by a single household (e.g., courtyard groups and household clusters in Mesoamerica). Archaeologists must first demonstrate the presence of the particular social scale, which can only be done by employing multiple analytical scales and developing means of detecting that social scale in the archaeological record. Multiscalar research is built on the principle that there is no singular effective scale of analysis. Rather, archaeologists must tack back and forth between different scales to reach a broader understanding of the dynamics of past social formations (Marquardt 1992:108; Nassaney and Sassaman 1995:xxvi).

All human societies are multiscalar. However, when describing research as multiscalar, archaeologists are almost exclusively referring to employing multiple analytical scales (e.g., Crumley 1979, 1995; Feinman and Nicholas 2010; Marquardt 1985; Marquardt and Crumley 1987). This can include using various time scales (e.g., Bailey 2007; Foxhall 2000; Gosden and Kirasnow 2006; Holdaway and Wandsnider 2006; Lucas 2008; Shryock and Smail 2011) and multiple spatial scales (Andrews et al. 2008; Bevan and Conolly 2006; Burger and Todd 2006; Henderson and Ostler 2005; Kanter 2008; Kowalewski et al. 1983; Neubauer 2004; Parkinson 2006a; Peterson and Drennan 2005; Ridges 2006; Smith 1987; Sulas and Madella 2012; Trifkovic 2006; Wobst 2006).

Multiscalar research has been at the center of archaeological research design since the start of the New Archaeology in the 1960s. *The Early Mesoamerican Village* (Flannery 1976), a cornerstone work in American anthropological archaeology, is practically a text book on how to conduct multiscalar research. Flannery and the other authors in the volume were quick to identify the important differences between social scales (e.g., households) and analytical scales (e.g., household clusters), employing terms consistent with analytical scales rather than social scales when discussing the material record. The book incorporates all scales of analysis, from the region to individual artifacts and makes a strong case for the necessity of multiscalar research to fully understand the organization and evolution of societies.

Multiscalar research, while not novel, has increased in prominence in the past two decades. There is growing awareness that patterns observed at one scale may not match patterns at another scale. Archaeological research that is conducted at only one scale, such as a single site or region, will produce an incomplete picture of social dynamics. Research at the local scale can reveal the idiosyncrasies of the local trajectory while failing to see how these idiosyncrasies may be central to the operation of larger systems of which the communities are parts (Maurer 1999:64-65). The causal mechanisms of change vary across different spatial and temporal scales due to scale dependence – where patterns depend on the scale at which a phenomenon is studied (Hewitt et al. 2007). The picture of community organization and change seen at one scale may be different at another. Additionally, archaeologists are much more cognizant of the role social agents at different scales can play in the organization and evolution of societies.

A multiscalar approach is thus essential in almost all archaeological contexts. First, it can be extremely cost effective. Patterns observed at one scale can be compared with patterns at another. As a result, excavation samples can be smaller and more targeted when informed by regional survey, and regional survey can target landscapes that are otherwise poorly understood. Second, no single analytical scale can provide a complete picture of a society. Just as human lived experience is multiscalar, multiple analytical scales are required to characterize the broad suite of communities, interactions, and identities that make up a society. This is particularly important in Bronze Age research, where the emergence of new political formations and interregional exchange are fundamental issues.

Regional Approaches to Social Complexity

Anthropological archaeologists have a long history of using regional approaches to study social complexity (e.g., Adams 1965, 1981; Adams and Nissen 1972; Anscheuentz et al. 2001; Ashmore and Knapp 1999; Balkansky et al. 2000; Bevan and Conolly 2006; Blanton et al. 1979; Blanton et al. 1979, Blanton et al. 1982; Drennan and Peterson 2004; Feinman and Nicholas 1990; Feinman et al. 1985; Galaty 2005; Howey 2011; Howey et al. 2016; Johnson 1977; Kanter 2008; Kosiba and Bauer 2013; Liu et al. 2004; Ortman et al. 2016; Parsons 1974, 2008; Peterson and Drennan 2005; Sullivan and Bayman 2007; Thurston and Salisbury 2009; Underhill et al. 2002; Wilkinson 2000; Willey 1953; Wright 2007; Wright and Neely 2010). Regional approaches provide a unique perspective on community organization and social change in middle-range societies (see Earle 1997, 2001; Earle and Kristiansen 2010; Liu 1996).

The development of complex regional polities includes the emergence of a new social scale with political agency. Consequently, the development of complex regional polities with institutionalized inequality must be studied at the regional level. Village autonomy can only be identified if different interacting settlements are examined.

Asymmetries in interaction and authority across regions also requires a regional scale to identify.

Complex polities also participate in, and depend upon, relations with other communities in other regions (Gokee 2012:26). Macroregional perspectives are needed to examine how communities in different regions are organized and interact with each other. In Bronze Age Europe, previous inter-regional comparisons in community organization across landscapes have identified the presence of a *mosaic* pattern of social variability (Duffy 2010:402), where communities in different regions are organized more or less complexly than their contemporaneous neighbors. A similar view of political landscapes as mosaics – assembling communities with diverse economies, technologies, social identities, embodied habits, religious beliefs, and cultural schema – has been applied to prehistoric and historic African landscapes (Gokee 2012:26-27; Kusimba and Kusimba 2005:393; Stahl 2004). Gokee (2012:26-27) argues that "the concept of mosaic highlights the diversity of multiscalar social institutions and identities that defined political economies" in the past. Situating the resource procurement zone of southwest Transylvania within the broader Carpathian area fills in a critical gap in the macroregion and can provide insight into the dynamics of social interaction, economic centralization, and political power at multiple scales.

Essential Tensions: An Institutional Approach to Community Organization and Social Change in Middle-Range Societies

This dissertation situates the study of the organization and evolution of communities in procurement zones within anthropological approaches to middle-range societies, political economies, and landscapes. Anthropological archaeological approaches to social change are most effective when they are multiscalar and recursive between process and event, structure and individual action. The resolution of the archaeological record provides advantages as well as limits for building models of social change in the past. To this end, I employ a multidimensional approach to community organization and social change in resource procurement zones that examines how social, economic, and ideological institutions articulate to encourage, inhibit, and ultimately set the foundation for the emergence of novel forms of sociopolitical complexity. This approach is holistic, processual, and focuses on social contexts in a way that allows for individuals and events to play a role in social change. In this section, I present a more detailed discussion of the theoretical framework of this study.

Community Organization and Institutional Approaches in Anthropological Archaeology

As discussed in Chapter 1, *community organization* is defined as the specific constellations of social, economic, and ideological institutions that emerge from, and structure, human interactions. *Institutions*, following work by North (1990) and Wiessner (2002), are defined as sets of socially mediated rights and obligations that shape, and are shaped by, human action and interaction. Institutions can be grouped together in terms of three *realms*: social, economic, and ideological. I use the term *realm* to discuss groups of distinct yet interdependent parts of a society that collectively make up the sociopolitical system (see O'Shea and Barker 1996, Duffy 2010).

Institutions are extrasomatic – emergent phenomena that have real-world impacts on the choices human agents make that extend across space and endure through time (Giddens 1984:16-34). As such, institutions can best be thought of as contexts in which cultural norms come to be defined. They represent the broader social structures in which human action takes place. This does not mean, however, that institutions *dictate* human behavior. Instead, institutions *influence* the choices people make, patterning human behavior in ways that can produce material traces accessible to archaeologists. Given that humans are independent, non-rational agents, we should always expect there to be variation in behavior within institutions.

Institutions help set the parameters for human actions and relationships. Let us take the institution of metal procurement as an example. First, the set of rights and obligations for metal procurement first determines who is considered an agent – the scale of social unit or units coordinating metal procurement activities (e.g., individuals, households, villages, polities). It should be noted that within any institution, there may be multiple scales of agents, but there will usually be an "effective scale", the agent that is responsible for making choices (Crumley 1995:2). For example, the timing of procurement forays may be coordinated at the village level, but the responsibility for organizing procurement tasks may fall to individual households. Second, institutions establish when activities should take place, from scheduling to duration and frequency. The institution for how metal procurement is organized will establish if metal procurement is, for example, an ongoing activity conducted by permanent mining communities or an episodic activity perhaps embedded within other activities such as pastoralism. Third, institutions inform where activities, such as mining, ore processing, and production, can take place. Fourth, and most importantly for this study, there is feedback between how decisions are made and the overall form of political organization in a society. For example, a centrally controlled system of metal procurement may be one hallmark of a society with regionally influential elite communities. Together, institutions, which combine small-scale choices and large-scale processes with material consequences, are an ideal framework through which to study community organization (see Wiessner 2002).

Anthropological Archaeological Approaches to How Institutions Articulate

Institutions are not independent of each other. Each action recursively affects, and is affected by multiple institutions. For example, if metal production was conducted by specialists attached to elite households, then the organization of crafting institutions would also impact subsistence production (e.g., how those specialists obtain food) and how they situate themselves across the landscape (e.g., within regional centers near patrons). As a result, while institutions can be analyzed separately, they are mutually constitutive. But what are the ways institutions articulate with each other, and what might it mean for how we define community organization?

There is a long tradition in anthropology of examining how different social realms and institutions articulate. For example, Goldman (1975) explored how different institutions and social realms reinforce and support each other in his examination of Kwakiutl society. Institutional approaches in ethnographic contexts have also shown the ability to provide a synthetic and dynamic framework of community organization and social change in middle-range societies. In his structural Marxist examination of the dynamics of Kachin social systems, Johnathan Friedman (1979) emphasized that the economic modes of production, the social units, and organization of ideology form a cohesive whole, articulated through political actions of human agents. Ritual action is not merely a reflection of social categories (e.g., social hierarchy) – it is essential to their formation. Hierarchical social structures do not simply emerge because big-men compete for social status (Friedman 1979:105). Instead, it involves all social realms, including economic production, ideology, and politics (Friedman 1979:24).

The roles of tensions between different institutions in organizing and changing societies continues to be a major theme within anthropological archaeology. Much of this tradition can be traced back to work on heterarchy first applied to anthropological archaeology by Crumley (1979, 1995). Researchers have defined heterarchy as an organizational form in which lateral and hierarchical decision-making frameworks co-occur, and alternate, both horizontally and through time (Henry and Barrier 2016:89; Stark 2009:23-27). While often proposed as an alternative to hierarchical models of social organization (see Stark 2009; Crumley 1979), synchronic and diachronic variability in the degree of centralization across institutions is better seen as a characteristic of all societies rather than an alternate organizational form. This approach opens a wide variety of ways in which community organization can be conceptualized beyond the simplistic 'autonomous vs. hierarchical' divisions that social evolutionary approaches are often accused of espousing.

Beyond heterarchy, there are several other theoretical approaches that similarly isolate individual institutions and examine how they articulate into a consistent social whole. Frachetti (2009, 2012), for example, has advocated for a concept of *nonuniform institutional complexity* to characterize Eurasian Steppe societies in antiquity. Like this study, Frachetti's work is rooted in North's (1990) definitions of institutions as the organizational and ideological norms and structures that shape human actions and interactions. Frachetti (2012:5-6) argues that institutional categories vary in spatial scale, from local and specific communities to broad and diverse societies. This lack of overlap in institutional structures is considered to have produced nonuniform political structures across Eurasia, as more mobile pastoral Steppe communities differentially articulated with more sedentary and organizationally complex agricultural communities in the East. Henry and Barrier (2016:91) highlight that this nonuniform complexity approach contributes an alternative to hierarchy that allows for increases in organizational complexity and raises questions about how, when, and under what conditions community members comply with authority in certain situations but reject authority in others.

Drennan et al. (2010) have made the case for studying community organization and social change in middle-range societies in the archaeological record by focusing on how institutions articulate. They examine inequality in burial practices, households, and public works using three domains of archaeological evidence to explore the organization of several political, economic, and ideological institutions and how they articulate in a variety chiefly societies in a global context. Based on this work, the authors conclude that traditional egalitarian-hierarchical dichotomies must be abandoned in order to develop "a fuller and richer recognition of the variability in early complex societies and of the patterning in it" (Drennan et al. 2010:71). As Drennan et al. write:

> "Without the vertical–horizontal dichotomy, we are left with a potentially goodly number of interesting dimensions of variability whose relationships can be *both* theorized about *and* investigated empirically. This means that relationships between these dimensions of variability are not simply assumed at the outset because they seem to make sense, but rather that relationships between dimensions of variability are posed as hypotheses for empirical evaluation." (Drennan et al. 2010:71, emphasis original).

In place of separate typological and continuous dimensional approaches, Drennan et al. suggest two possible avenues of research. First, they suggest focusing on "the correlations between dimensions. If high values on some dimensions correspond to consistently high (or low) values on others, these dimensions form 'packages,' and knowing that such packages exist give us patterns to try to make sense of by building theoretical constructs to account for them" (Drennan et al. 2010:72). Second, they suggest archaeologists consider how dimensions articulate "in terms of social profiles. A society that ranks very high on one scale, low on another, and in the middle on a third has a different profile from a society that ranks low on the first scale, low on the second, and middle on the third. Its profile is, however, not as different from the society as it is from a third that ranks low on all three scales" (Drennan et al. 2010:72).

While we can imagine any number of ways for institutions to articulate in human societies, it is also an empirical problem that can be resolved through archaeological research. By examining inter-institutional articulation in archaeological case studies, we get a better understanding for what different constellations of institutions might mean for the organization and evolution of middle-range societies. In practice, examining community organization through this multidimensional approach begins by measuring inequality within different dimensions, then examining how they articulate to characterize inter-institutional "packages" and "profiles", to use Drennan et al.'s (2010) terms. In this tradition, I approach community organization and social change in middle range societies by focusing on the potential *tensions* across institutions.

Inter-Institutional Coherence and Dissonance

In this study, I employ two complementary theoretical concepts to characterize how institutions articulate: coherence and dissonance. I define *institutional coherence* as a characteristic of societies where institutions act to reaffirm and reinforce one another. Whether an institution is more or less hierarchically organized, other institutions and realms will be similarly organized. As a theoretical concept, coherence has begun to receive greater attention within anthropological archaeology. Recently, Adams (2012) used *coherence* as a model of synchrony of technological, economic, and social changes associated with urbanism as a "revolution." Expanding on this discussion, Chesson (2015) defines coherence as "a synthetic qualitative 'measurement' combining multiple evidentiary lines (e.g., settlement patterns, community scales, economic complexity, social differentiation, political structures) to suggest an overall characterization of a society" (Chesson 2015:58). For Chesson, the concept of coherence is an archaeological issue; describing how well or poorly different lines of archaeological evidence support a specific theoretical model of social organization (Quinn and Beck 2016:21). However, I argue that coherence is well positioned to describe the types of inter-institutional articulations that are often assumed in social evolutionary typological categories and in models such decentralized complexity by Kristiansen (2010).

If institutional coherence describes community organization in societies where different institutions reinforce each other, then *institutional dissonance* is a way of describing societies where different institutions and realms are organized in drastically different ways. Community organization is characterized as dissonant when different institutions establish or legitimize alternative forms of inequality and vertical decision-making hierarchy (Quinn and Beck 2016:21). Henry and Barrier (2016) have recently elaborated on work by the economic sociologist David Stark (2009) to develop new theoretical models for how dissonance structures societies and fosters social change. Stark distinguishes between *organization of diversity* within a community or corporation, where there "is an active and sustained engagement in which there are more than one way to organize, label, interpret, and evaluate the same or similar activities" (Stark 2009:26), and *organization of dissonance*, where diverse forms produce friction that can be destructive or destabilizing to the community (Stark 2009:27). In describing how his framework applies to the study of organization within businesses, Stark writes:

> "[d]issonance occurs when diverse, even antagonistic, performance principles overlap. The manifest, or proximate, result of this rivalry is a noisy clash, as the proponents of different conceptions of value contend with each other. The latent consequence of this dissonance is that the diversity of value-frames generates new combinations of a firm's resources. Because there is not one best way or single metric but several mutually coevolving yet not converging paths, the organization is systemically unable to take its routines or its knowledge for granted. It is the friction at the interacting overlap of multiple performance criteria that generates productive recombinations by sustaining a pragmatic organizational reflexivity." (Stark 2009:27).

For Stark, inter-institutional dissonance is a volatile state for any system, as recombinations of institutions can only occur when tensions emerge among existing inter-institutional articulations. Temporality of dissonance is therefore a key aspect, as the nature of inter-institutional articulations with dissonant systems will often be dynamic over short periods of time and maintained over longer-time scales through agent-structure feedback (Stark 2009:27).

In adapting Stark's concept of organizational dissonance to archaeological cases, Henry and Barrier (2016) focus on how organizational dissonance can help explain how shared symbolic marking within and between corporate groups across large geographic distances, persistent places, and monumentality in Middle Woodland in eastern North America can be explained without relying upon hierarchical forms of leadership and social organization that do not appear to be present at the time (also see Byers 2011; Carr and Case 2006; Henry 2013; Wright and Loveland 2015). Specifically, they argue that dissonance may arise in the Middle Woodland when multiple groups enter into temporary coalition and must agree to comply with new forms of leadership that are situationally dependent and subject to contestation and revision over time (Henry and Barrier 2016:92). Following Stark, they argue that dissonance within these communities, born out of variable and sequential small-scale coalitions, is both a central component of organizing societies and the impetus for redefining social organization (Henry and Barrier 2016:92). In many ways, this view builds upon the concept of *ruptures* in eventful archaeological approaches (Beck et al. 2007; Bolender 2010), where events can disrupt the existing inter-institutional articulations and allow for them to recombine in novel ways.

My use of *dissonance*, however, differs in several subtle ways from that of Stark and Henry and Barrier. The analytical scales needed to assess inter-institutional articulations as dissonant requires conceptualizing how decision-making is organized across multiple institutions. While this is most effectively accomplished through a holistic treatment of society that examines multiple social realms (e.g., Goldman 1975), it can also be done within a single category of archaeological data (e.g., mortuary contexts, see Quinn and Beck 2016). Temporally, I suggest that in addition to brief episodes, institutional dissonance can also persist for long periods of time. As I will show through my examination of the Transylvanian Bronze Age, societies can tolerate seemingly contradictory organizational principles for longer than may be expected. The Transylvanian case study demonstrates that dissonance between institutions does not always precipitate rapid change. We must also consider the possibility that institutional dissonance can actively inhibit social change, in addition to being "a creative social tension… [which] entails the constant discovery of new mechanisms to manage temporary and situational influence and control" (Henry and Barrier 2016: 89).

Community organization would have made intuitive sense for most people in the past, even if the constellation of institutions was dissonant. For these communities, tensions observable to archaeologists may not have been easily recognizable. For example, in modern American society, the persistence of the "American Dream," where anyone can become rich and successful by pulling themselves up by their bootstraps, co-occurs with deep institutional racism and inequality that disenfranchises large swaths of society. The myth of the "American Dream" is a case where ideologies of equality to do not match economic reality. Many members of contemporary U.S. society give little thought to this contradiction and many even deny the contradiction exists. The seeming "natural" state of this dissonance does not mean that inter-institutional dissonance will not play a significant role in the future of American society. Indeed, many modern political frictions, and potentially future socio-political transformations, are rooted in how these dissonant institutions change over time, and whether they will rupture or be resolved.

It is not the goal of an institutional approach to simply identify coherence and dissonance in community organization in past societies. It is important to go beyond finding dissonance, to understanding *how* societies were dissonant, lest this approach ossify social dynamics in similar ways to traditional typological approaches to social organization. To this end, it is important to note that societies can have many forms of institutional dissonance. For example, through mortuary practices, communities can exaggerate or mask social inequalities that may or may not be experienced in daily life (see O'Shea 1984, 1996). While either scenario would result in institutional dissonance between ideologies and economies, the differences between these constellations of institutions cannot be overlooked.

Together, a framework of inter-institutional coherence and dissonance provides a way to conceptualize community organization as a suite of quantitatively and qualitatively different organizational forms. A society characterized with *institutionalized inequality* is defined as having hierarchical political authority that is maintained or tolerated across all social realms. While not all institutions may be defined hierarchically, at least one institution in each realm must be organized hierarchically. Consequently, a society in which subsistence surplus is controlled by a few elite individuals cannot be considered to have institutionalized inequality unless the presence inequality is legitimized in social and ideological institutions.

As an analytical approach to social complexity, focusing on inter-institutional coherence and dissonance has several benefits. First, it does not rely on a single institution, or archaeological measure, to define community organization. In some cases, very different forms of community organization may have single institutions that are organized in a similar way. For example, undirected village-level craft production can exist within autonomous village societies (e.g., groundstone bead production in Early Neolithic Southern Levant – Quinn 2006a) or within state societies (e.g., textile and other types of craft production in Classic Period Oaxaca – Carpenter et al. 2012). Additionally, when archaeologists focus on a single institution, it creates an analytical hierarchy, where organization in that dimension is seen as more "real" than others. This is often the case in political economic models of middle-range societies, where the organization of a single economic institution defines community organization (e.g., metal production in European prehistory – Pare 2000). Tensions between institutions are only detectible if archaeologists look across multiple institutions.

Second, by looking at institutional *constellations*, it is possible to question how individual institutions affect and are affected by others. This has been a major component of mortuary archaeology, where mortuary practices are seen to have the capacity to mask or exaggerate social inequalities in lived contexts (see Brück 2004a, 2004b, 2006; Cannon 1989; Cerezo-Roman 2014; Fowler 2005; Keswani 2004; Kuijt 1996, 2000, 2008; O'Shea 1984, 1996; Parker-Pearson 1993, 1999; Shanks and Tilley 1982). However, archaeologists do not always reflect on how other archaeological measures (e.g., economic institutions, settlement patterns) intersect with other institutions, especially allowing for other measures to mask or exaggerate inequality not observed in other cases (e.g., urbanization at Cahokia – see Barrier and Horsley 2014). This contrasts with traditional typological trait-list approaches where if one institution is organized hierarchically (or not), it is assumed that all other institutions are organized the same way as well.

Third, because community organization can be dissonant in different ways, it is possible to have multiple, historically specific, pathways to complexity. The presence of multiple pathways to power has been adequately demonstrated within anthropological archaeology (see Feinman 1995; Price and Feinman 2010). It is possible for communities to have hierarchical relationships first emerge in any number of economic, social, or ideological institutions. For example, different early towns in prehistory may have been either economic, ideological, political, or social centers, or any combination of these dimensions (Quinn and Barrier 2014). At the Range site in the American Bottom, the settlement was integrated through ideological institutions of communal ceremonies and rituals in the central plaza, but it is unclear if there was any economic centralization above the level of lineages and house-courtyard groups (Kelly 1990; Quinn and Barrier 2014:2256). In contrast, it appears that the site of Real Alto in Ecuador quadrupled in size rapidly as most economic, ideological, and political institutions were centralized concurrently (Clark et al. 2010; Quinn and Barrier 2014:2257-2258). By allowing for inter-institutional articulations to vary, it is possible to better identify and characterize alternative developmental paths of social complexity while still conducting cross-cultural comparisons.

Finally, institutional approaches have the capacity to evaluate change. Interactions among human agents, feedback between agency and institutions, and broader environmental, geographic, and social contexts in which communities exist can, and will, change over time. With quantitative changes within institutional dimensions, and qualitative changes in inter-institutional configurations, these approaches can conceptualize large-scale social transformations as emerging out of individual choice and action. The next section will discuss how archaeologists can reconceptualize social change in middle-range societies through a multidimensional approach.

Rethinking Change in Middle-Range Societies

Studies of change in human societies encompass several different kinds of change. In this study, I distinguish between three processes of social change: (1) microevolutionary change, (2) macroevolutionary change, and (3) social transformations. With *evolution* defined as change over time, these three different processes of social change in human societies differ in the scope of change. I have chosen to use "evolutionary" terms instead of other comparable terms, such as "sociality" (e.g., Beck 2014), as my theoretical approach is more directly rooted in social evolutionary theory and complex adaptive systems theory, both of which commonly employ evolutionary terminology (e.g., Chatters and Prentiss 2005; Prentiss et al. 2009, 2014; Spencer 1997, 2009; Zeder 2009). *Microevolutionary change* includes changes in material culture and how institutional organization is represented in the material world with minimal or no effect on human agents, social relationships, and institutional structures (e.g., changes in stone tool haft style through time). *Macroevolutionary change* involves changes in how institutions are organized, or in how institutions articulate with each other, but with minimal change in the overall template of the social system (e.g., change in resource management strategies, such as between forager and collector strategies, within a particular social template, such as egalitarian bands). *Social transformations* are changes in how institutions are organized and how institutions articulate with each other. These transformations involve a fundamental shift in the social system towards a new template for how social, economic, political, and ideological identities and relationships are organized.

Microevolutionary change, macroevolutionary change, and social transformation differ in their (1) scale, (2) breadth across social realms, and (3) tempo. In this context, define the *scale of change* as the spatial and social scale at which the change occurs. I define the *breadth of changes across social realms* as the number of realms (e.g., economic, social, ideological) that change concurrently. I define the *tempo of change* as the speed and frequency of changes. These variables provide a way of developing testable models of quantitative and qualitative change that can allow archaeologists to better identify and characterize social transformations in the past.

Inter-institutional articulations will impact changes in the trajectories of social organization. In *Das Kapital*, Marx (1867) suggests that *contradictions* within capitalist systems would become increasingly acute over time and lead to a crisis within the system. For Marx, dissonance (to use the terminology of this study) generates instability and leads to social change. While this is one path to change, it is also possible that dissonance can promote stability and inhibit social change. Fortunately, determining what inter-institutional configurations made social transformations possible is an empirical problem for archaeologists. Exploring the social dynamics that lead towards coherent or dissonant social organization (through inter-institutional *convergence* or *divergence*) can be done by tracing the organization of different institutions through time.

The dynamic microevolutionary and macroevolutionary changes that set the social context for later transformative change are equally important to the larger historical narratives of social change in middle-range societies as transformations themselves. With an understanding of the institutional configurations prior to successful and unsuccessful social transformations, archaeologists can begin to answer a series of questions about the nature of large-scale social change: Are transformations in inequality preceded by periods of broader social institutional coherence or dissonance? Can institutional dissonance limit the breadth, scale, and speed of transformations in inequality? Do coherence or dissonance have an adaptive value that may have been fostered or co-opted by emerging elites to create or maintain their positions? Answering these questions is an empirical problem that requires building trajectories of community organization and monitoring change over time.

Tracing the relationship among different institutions over long periods of time can allow archaeologists to better understand both the social context and proximate mechanisms that instigate social change. Proximate mechanisms most likely immediately predate or are synchronic with broad inter-institutional changes in community organization. At the same time, archaeologists should be concerned with how broader institutional constellations make change possible, or fail to precipitate change. This framework allows us to combine history, process, agency, and structure to understand social change at multiple scales.

This approach is particularly useful for studying resource procurement zones for two main reasons. First, unlike models such as world systems theory (Sherratt 1993; Wallerstein 1984), it does not rely upon the pre-existence of elites and hierarchical social organization to explain community organization and social change in resource procurement zones. Second, it does not prioritize economic institutions over other realms. Work in procurement zones normally focuses exclusively on the organization of the key economic resources in the area. While the exploitation of these economic resources is undoubtedly important to community organization, they are not coeval with it. By considering procurement along with other economic, social, and ideological institutions, archaeologists can demonstrate, rather than assume, the importance (or lack) of procurement to how community organized themselves. With the addition of a long-term temporal dimension, this approach allows for procurement institutions to grow or decrease in importance within broader community organization over time.

Chapter Summary

In this chapter, I have situated my research within a long theoretical tradition of understanding increasing social complexity and procurement in middle-range societies. By conceptualizing community organization through articulating institutions, my approach focuses on understanding how rare qualitative transformations emerge out of ongoing quantitative changes. Focusing on coherence and dissonance of inequality across institutions may provide a way to more fully understand different types of change in the organization and evolution of middle-range societies. By focusing on potential *tensions* within social systems, it is no longer necessary to characterize groups as either egalitarian or hierarchical (Henry and Barrier 2016:102). Instead we can monitor variability within and across different forms of coherent and dissonant inter-institutional articulations. This approach allows anthropological archaeologists to better understand how coherent and dissonant social forms emerged from human interaction and how they affected the lifeways of communities as social complexity developed. This conceptualization of institutionalized inequality requires that archaeologists look holistically across multiple realms and institutions, and examine multiple lines of archaeological evidence. No single line of evidence or institution can be used to argue that inequality is institutionalized. Archaeologists need new models of community organization and social change that can remedy the tensions between dimensional approaches as a continuous spectrum and typological approaches that recognize that societies can undergo qualitative transformations.

Importantly for the study of Bronze Age Europe, this framework allows archaeologists to identify and discuss social changes without requiring that all changes within and between institutions transform society as a whole. The materialist aspect of this approach allows archaeologists to develop archaeological measures to explore a wide range of inter-institutional articulations (see Chapter 5). This theoretical foundation, combined with the archaeological and geo-environmental background of the Transylvanian case study, sets the agenda and informs models (see Chapter 5) for the study of community organization and social change in Bronze Age Transylvania.

PART II: BACKGROUND

Chapter 3 - The Geo-Environmental Background of Southwest Transylvania

Chapter Introduction

Testable archaeological signatures of anthropological models of community organization and social change must consider the constraints and opportunities of the physical landscape. Given the geo-environmental diversity of the European continent, the material expectations for these models will necessarily vary across time and space. This chapter introduces the geo-environmental context of the Bronze Age in southwest Transylvania. I begin by describing the physical characteristics of the Carpathian Macroregion with special attention paid to southwest Transylvania, where the case study is situated. I emphasize the topographic, climatic, geologic, hydrologic, and biotic attributes of the different analytical scales employed in this study. The constellation of natural resources available in southwest Transylvania shape both how local communities organize themselves and how they articulate to larger interaction networks. Due to the locally abundant resources, including metal, salt, fuel, and subsistence resources, southwest Transylvania can be characterized as a *resource procurement zone*. Anthropological archaeological investigations into the organization and evolution of Bronze Age societies resource procurement zones provides an important complement to studies in other resource-poor areas of the Carpathian Macroregion.

The Carpathian Macroregion

The Carpathian Macroregion is bounded to the north and east by the Carpathian Mountains, to the south by the Carpathian Mountains and Dinarides Mountains, and to the west by the Alps (Figure 3.1). The macroregion encompasses a wide range of topographic, geologic, and environmental settings. The high mountain ranges provide rugged alpine environments that contain a range of natural resources (primarily metal). Within the mountain boundaries there are three primary geophysical regions where most human settlement is located: Transdanubia, a hilly landscape to the west of the Danube; the Pannonian Plain, an extremely flat area between the Danube and Apuseni Mountains; and the Transylvanian Plateau, an intermontane upland depression enclosed by the steep Eastern and Southern Carpathians and the lower Apuseni Mountains to the west. Together, Transdanubia and the Pannonian Plain make up the Carpathian Basin. Transylvania is spatially and geophysically distinct from the Carpathian Basin, with the low Apuseni Mountains (sometimes referred to as the Western Carpathians) primarily separating the two regions (there is no mountain border between the northwestern Transylvania and northeastern Carpathian Basin).

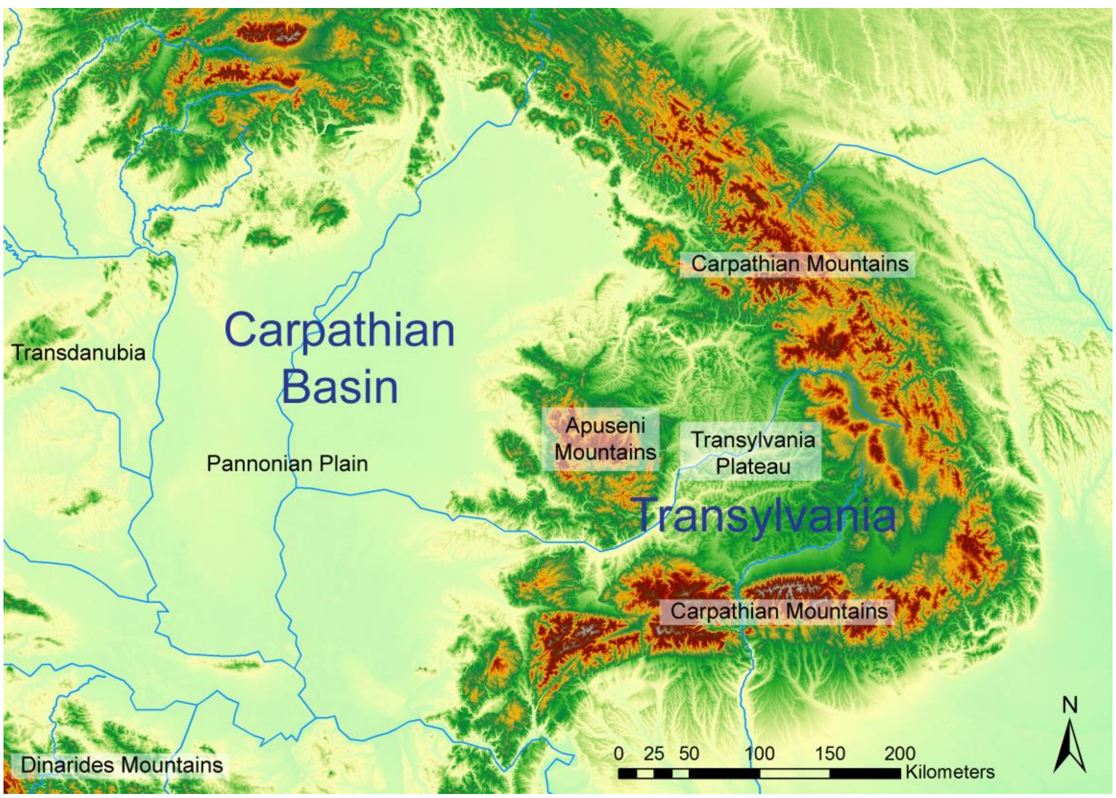

Figure 3.1 - Key geographic features in the Carpathian Macroregion.

Lowlands in the Carpathian Macroregion

Carpathian Basin. The Carpathian Basin originated as a large sea (Paratethys Sea) as the surrounding mountains formed in the Oligocene. Starting in the Middle Miocene and continuing to the Pliocene, the Basin subsided, was infilled with sediment from surrounding mountains, and receded to the Pannonian Sea, which covered the Pannonian Plain. Infilling continued and river systems formed as the Pannonian Sea disappeared (Földvary 1988; Nicodemus 2014; Sommerwerk et al. 2009). The Basin is now drained by the Danube River system, the second largest river in Europe, which passes through the Iron Gates from the Basin to southern Romania and northern Bulgaria and ultimately flows into the Black Sea. The resultant landscape is flat with braided river systems, fluvial and aeolian deposits, and strong seasonal flooding regimes. The Pannonian Plain (also referred to as the Great Hungarian Plain) extends across an area of about 100,000 km^2 and is one of the largest alluvial plains in Europe (Duffy 2010:80; Gábris and Nádor 2007:2761; Pecsi and Sarfalvi 1964:87). Within the modern-day territory of Romania, the Pannonian Plain makes up the geo-cultural regions known as the Banat and Crișana. For this study, the key attribute of the Carpathian Basin is the relative lack of natural resources when compared with neighboring Apuseni Mountains and Transylvanian Plateau. There are minimal deposits of copper (primarily in the foothills of the Carpathian arc and Southern Apuseni Mountains), and no substantial deposits of gold or salt. Bronze Age communities living in the Carpathian Basin would have had to have relied on long-distance exchange or procurement forays to acquire these key resources.

Transylvanian Plateau. The Transylvanian Plateau (also referred to as the Transylvanian Depression, the Transylvanian Plain, and the Transylvanian Basin) is a 25,029 km^2 intermontane sedimentary basin in central Romania surrounded by the Apuseni Mountains to the west, the Eastern and Southern Carpathians to the east and south, and the Maramureș geo-cultural region to the north (Haggard 2012; Huismans et al. 1997) (see Figure 3.1). The Transylvanian Plateau was formed through low heat flow and has a thick geologic crust (Horvath 1993; Huismans et al. 1997:250; Visarion and Veliciu 1981). Unlike the Pannonian Plain, the Transylvanian Plateau has considerable topographic variability due to Pleistocene river systems and erosion. The hilly region is a major agricultural zone within Romania (Haggard 2012:1).

Uplands in the Carpathian Macroregion

Carpathian Mountains. The Carpathian Mountains originated as the result of the Mesozoic-Cenozoic continental collision and subduction of the European plate beneath the Pannonian continental block (Dallmeyer et al. 1999). Ongoing technothermal events through the Late-Jurassic-Cretaceous (Cambel and Kral 1989; Dallmeyer et al. 1996; Frank et al. 1987; Krist et al. 1992; Maluski et al. 1993; Thoni and Jagoutz 1993) and Paleogene (Burchflel 1980; Tollman 1987; Trümpy 1988) resulted in the upthrusted and folded ridges that make up the Carpathian arc (Dallmeyer et al. 1999). The strong uplift that helped produce the Carpathian Mountains is still ongoing (Huismans et al. 1997). The Carpathian Mountains stretch 1600km in length and cover an area of 17,000km^2, making it the largest mountain chain in Europe (Cioacă and Dinu 2010). Combined with the Apuseni Mountains, the chain resembles a D-shape as it hooks around the Transylvanian Plateau. The Carpathians are normally divided into two or three sections based on geography, particularly the Eastern Carpathians and Southern Carpathians. Sometimes the far western end of the arc is referred to as the Western Carpathians (see Duffy 2010), though this term is normally employed for the Apuseni Mountains (see Figure 3.1). The Carpathian Mountains would have posed a significant, but not impermeable, boundary between Transylvania and the Lower Danube and Moldovan regions closer to the Black Sea (e.g., Olt River passes through the Southern Carpathians). Within the territory of modern day Romania, the Carpathians combine rugged peaks reaching heights over 2500 m asl, with rounded highlands, narrow valleys, and intra-montane hilly depressions to form a complex landscape of varying topography and ecosystems (Cioacă and Dinu 2010:257). The uplands are an alpine environment and peaks of the Carpathians can remain snow-covered well into June. The Carpathian Mountains are some of the most rugged and “pristine” (not impacted by human habitation) landscapes in continental Europe, as evidence by the largest populations of wolves (40% of all of Europe’s wolves) and bears (60% of all of Europe’s brown bears) in Europe (Bartók 2008). Owing to ecological and topographic variability, as well as minimal modern impact, the mountains have an extremely high level of both plant and animal biodiversity (Bartók 2008).

Apuseni Mountains. The Apuseni Mountains (also referred to as the Transylvanian Alps and Western Carpathians) separate the Pannonian Plain and Carpathian Basin from the Transylvanian Plateau. The Mountains cover roughly 25,500km^2. While the highest peak (Cucurbăta Mare) reaches 1849m asl, most of the Apuseni Mountains are significantly lower than the Eastern and Southern Carpathians, with much of the landscape ranging from 400-1200m asl.

Southwest Transylvania: The Geo-Environment of the Trascău-Mureș Zone

Southwest Transylvania encompasses, in a very small geographic area, upland mountainous landscapes with significant mineral deposits, forests, and pastures, lowland agro-pastoral landscapes with rich salt springs, and a major interregional riverine corridor (Figure 3.2). This constellation of geo-environmental attributes is unique within the broader Carpathian Macroregion.

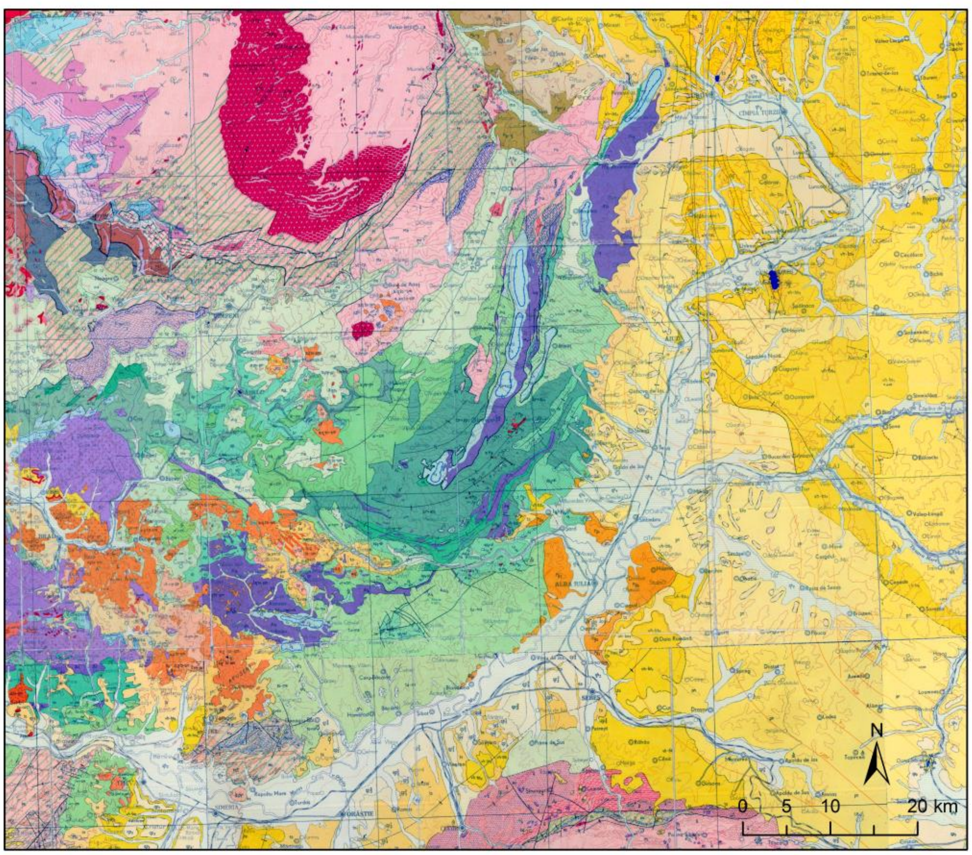

Figure 3.2 - Geomorphology of southwest Transylvania.

Terrain and Geology

Apuseni Mountains. The Apuseni Mountains have been formed through igneous and metamorphic basement rocks with Permian-Tertiary sedimentary cover sequences (Dallmeyer et al. 1999:331). Later rifting processes at the Transylvanian-Panonic interplate and pre-alpine Cristalino-Mezozoic deposits with flysch deposits resulted in Neogene volcanic activity (which bears the richest mineral deposits in the region) (Ilieș and Josan 2007:55). The Apuseni Mountains can be divided into two regions, based on distinct tectonic units, composition, lithostratigraphy, geological history, and origin – the Southern Apuseni Mountains and the Northern Apuseni Mountains (Ionescu et al. 2009:9) (Figure 3.3). The complex geological structure within and between these regions has been well documented (see Balintoni 1997; Bleahu 1976; Burchfiel 1976; Dallmeyer et al. 1999; Ianovici et al. 1976; Ionescu et al. 2009; Săndulescu 1984).

The Southern Apuseni Mountains (where the archaeological study is located) are made up of a series of smaller mountain chains, including the Trascău Mountains (Munții Trascăului), Metal Mountains (Munții Metaliferi), Zarand Mountains (Munții Zarandului) (see Figure 3.3). The underlying geology is generally Middle Jurassic ophiolites, Late Jurassic limestones and volcanics (including Island Arc Volcanics), covered with Upper Cretaceous limestone and flysch-type sediments, and subjected to later Neogene hydrothermal volcanic activity and significant folding and uplift (Ionescu et al. 2009; Săsăran 2006; Săsăran and Bucur 2006; Schuller et al. 2009). The terrain is marked by rolling uplands, relatively flat valleys, and both volcanic and limestone domes and bluffs marking the uplands. Caves (many inhabited in prehistory) have formed at the base of many of the limestone features. Some steeper portions of the mountains have evidence of significant erosional features, suggesting a relatively volatile localized geomorphology which may have covered and/or destroyed evidence of prehistoric occupation in the region.

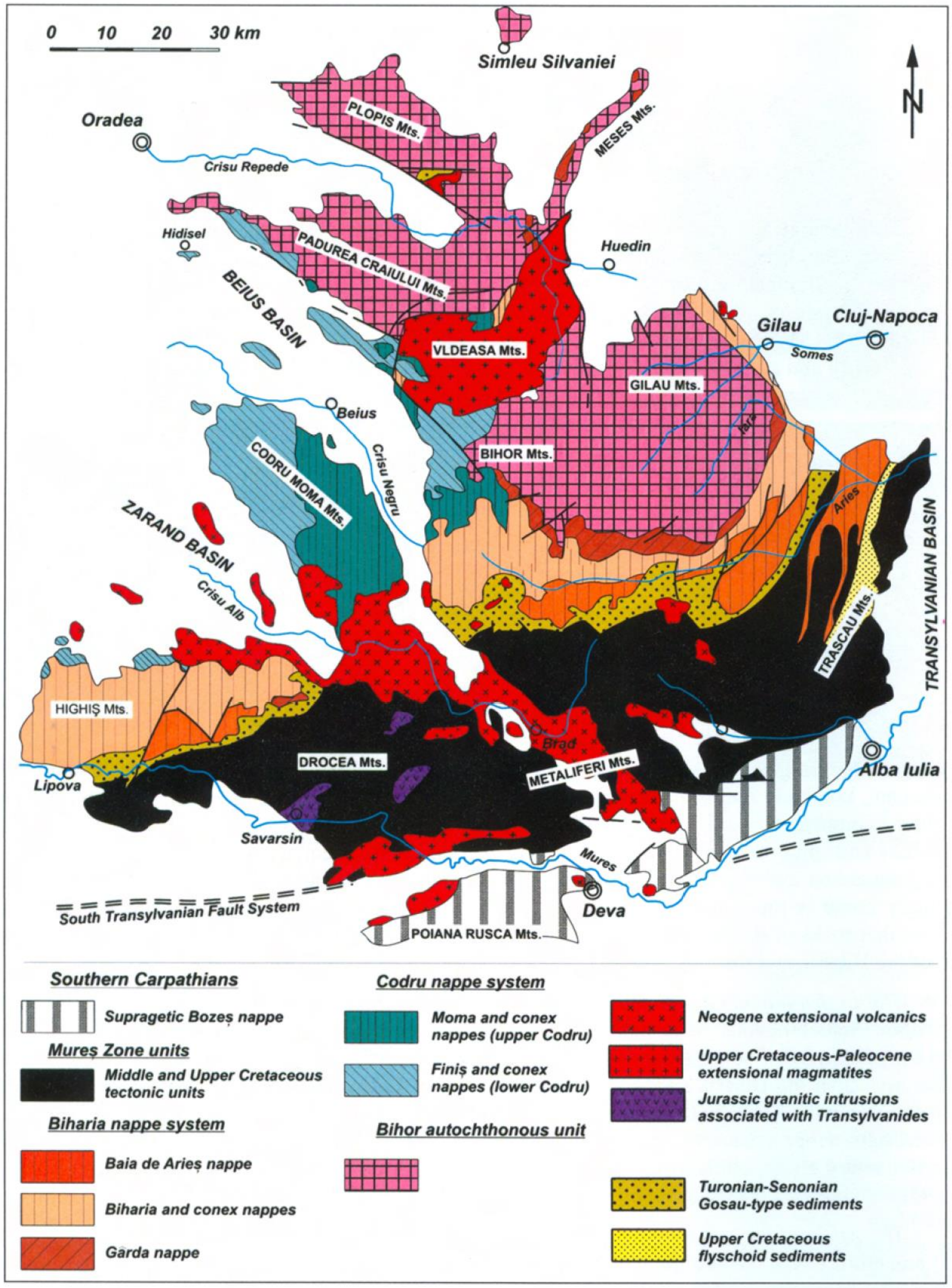

Figure 3.3 - Geology of the Apuseni Mountains (from Ionescu et al. 2009:10, Figure 3).

The most important mountain range within the Southern Apuseni Mountains for metal mining is the aptly named Metal Mountains. The mountains are home to some of the richest copper and gold deposits in the entire world. As a result, they have been well studied geologically (see Sîntimbrean 1989). Most of the metal mineralization in the Metal Mountains can be attributed to Neogene igneous rocks which formed in response to plate collision and subduction during the final stages of the development of the Carpathian-Alpine orogen (Alderton et al. 1998; Csontos 1995; Mitchell 1996; Seghedi 2004). These flows are intrusive into and through Lower Carboniferous low-grade metamorphic, Mesozoic sediments (sandstone and limestone), volcanic rocks (basaltic and pyroclastic rocks), and Neogene sediments (sandstone and shale) (Alderton et al. 1998). The widespread nature of the hydrothermal deposits in the Metal Mountains has received most of the focus of geologists and archaeologists alike. The Trascău Mountains, perhaps due to their perceived lack of metal deposits, have not received as much attention.

Trascău Mountains. The Trascău Mountains are located along the southeastern edge of the Apuseni Mountains (see Figure 3.3). They are bounded on the north by the Arieș Valley, the south and east by the Mureș Valley, and to the west by the Metal Mountains. While geologists have defined the Trascău Mountains as containing karstic topographic elements of the Cretaceous-Miocene limestone and flysch deposits (see Lazar 2011), the geology is actually more complex (Figure 3.4).

The most comprehensive geo-environmental descriptions of the Trascău Mountains can be found in Popescu-Argeșel (1977) and Lazar (2011). The range encompasses steep limestone massifs (e.g., near Râmeț), smaller isolated limestone blocks (e.g., Piatra Craivii, Ampoița), numerous NW-SE valleys with smaller streams (e.g., Ampoița), narrow gorges (e.g., Cheile Turzii, Cheile Mănăstirii, Cheili Râmețului, Cheile Cetii, Cheile Întregalde, Cheile Aiudului), and wide upland depressions (e.g., Trascău Depression). Two larger valleys (Ampoi and Aiud) stretch up into the mountains. At the top of these valleys (particularly the Ampoi Valley), there are rich hydrothermal volcanic vents that have produced extremely rich mineral deposits. There are major copper mines (modern) and gold mines (ancient) near Zlatna and the headwaters of the Ampoi River.

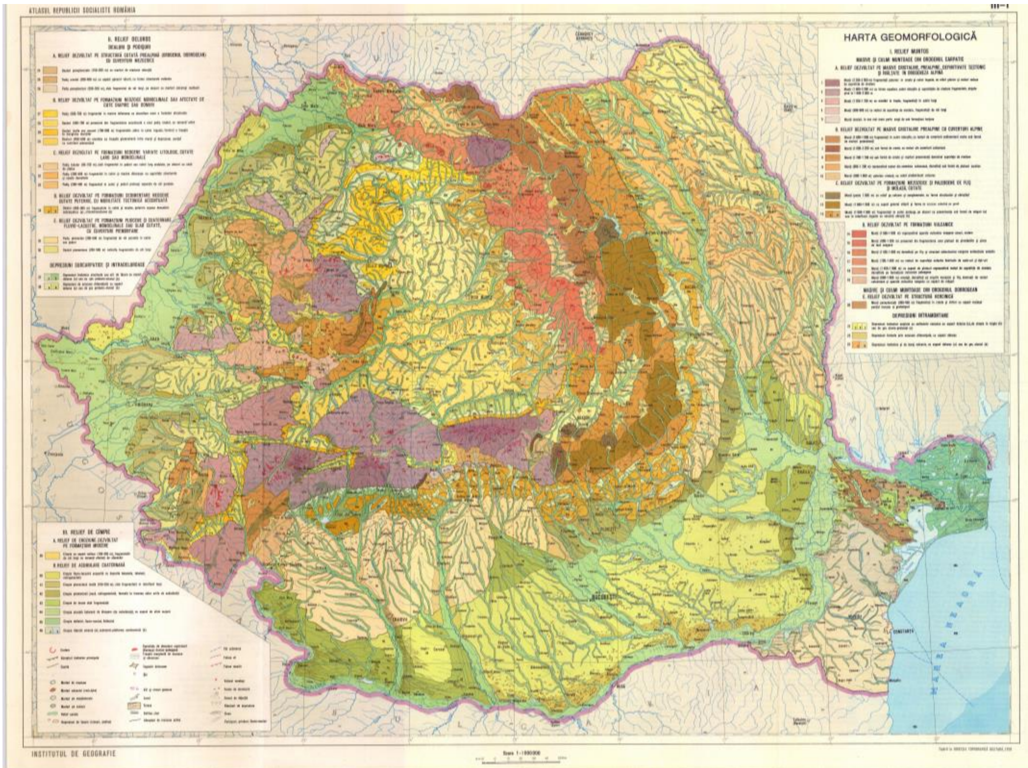

Figure 3.4 - Geomorphology of Romania (after Badea et al. 1976).

Metal outcrops have not been recorded in recent geologic surveys throughout much of the Trascău Mountains. However, there are likely many smaller hydrothermal vents that would have provided prehistoric peoples sufficient copper and gold. The primary reason these have not been well documented is that they do not offer potential for significant modern mining. To illustrate the presence (and lack of modern documentation) of mining in the Geoagiu Valley, I draw attention to the limestone dome of Măgura Geomal (Figure 3.5a). Măgura Geomal is home to a modern limestone quarry. However, interviews with village elders in Geomal, and careful survey of the top of the hill suggests the presence of extensive hydrothermal vents. First, at multiple locations we identified quartz veins within the limestone exposed on the surface (Figure 3.5c). Quartz is associated with hydrothermal vents and copper and gold metals within the region. We would not have found quartz if there had not been hydrothermal vents through the Cretaceous limetone. Second, an old woman from Geomal brought us to a location on top of Măgura Geomal that appears to be a mine. She described a tunnel with a larger gallery at the end within the hill that was open when she was a child. The tunnel has since filled in, but we were able to find the entrance (Figure 3.5b). Additionally, we found evidence of surface pits placed along an east-west line of the tunnel. Together, these suggest that there was a metal mining gallery (rather than a natural tunnel or excavating for flint). Finally, we identified several historic air vents (weathered iron pipes sunk into what were presumably subsurface galleries) near the modern limestone quarry (Figure 3.5d). The most likely reason there are underground galleries with supplemental air vests is for metal mining. There is no documented evidence of this activity within the local records (Florin Bota, personal communication). However, the material evidence suggests that the area must have several metal-bearing hydrothermal vents. Extrapolating across the Trascău Mountains, it is likely that the entire range is dotted with small hydrothermal vents that would have provided sufficient ore for prehistoric communities. Much more fieldwork is needed to fully document this phenomenon. At the very least, it highlights the complex geologic history of the Trascău Mountains.

Figure 3.5 - Potential gold mine at Magura Geomal. (a) View of limestone dome and modern limestone quarry, (b) C. Papalas and C. Quinn at entrance to potential mine, (c) broken hydrothermal quartz near entrance, (d) historic vent suggesting undocumented sub-surface shaft.

Transylvanian Plateau. The formation of the Transylvanian Plateau began in the Late Cretaceous, following the primary formation of the Carpathian and Apuseni Mountains (Ciulavu et al. 2000:1593; Csontos et al. 1992; Huismans et al. 1997). Sediment began filling the intermontane basin associated with Senonian shallow-water sediments (as opposed to Cenomanian deep-water sediments that filled the Carpathian Basin) (Ciulavu et al. 2000; Săndulescu and Visarion 1976). Alternating sedimentary cycles resulted in several geological strata of varying depths being deposited across the Basin and ongoing volcanic activity continued the upthrust of the surrounding landscape throughout the Miocene (Ciulavu et al. 2000). In particular, Badenian Dejj Tuff deposition was overlain by a thick layer of Early Badenian evaporates (salt) and then a succession of thick, repetitively deposited, layers of clays and sandstones deposited from the Badenian to the Pliocene (Huismans et al. 1997:3-4). As a basin, deposits are deepest (over 4,000m) in the central area of the Plateau and shallowest along the margins (see Ciulavu et al. 2000:Fig 6). A key aspect of the regional geology (and one that is significantly different than the neighboring Carpathian Basin) is the formation of thick (~500m) deposit of solid rock salt that covers the entire Plateau. Again, due to the basin structure and Pliocene volcanic uplift of surrounding mountains, the salt is closer to the surface at the margins of the basin, and many of the important locations for historic and historic salt mining (e.g., Băile Figa, Turda, Ocna Mureș) are located at the contact between the Transylvanian Plateau and the Carpathian and Apuseni Mountains. While there is natural gas and oil in the region (see Ciulavu et al. 2000), there are no other natural mineral resources in the area (e.g., copper and gold) that would have been important to Bronze Age communities. The topography of the Transylvanian Plateau has been significantly affected by river erosion, which has resulted in a landscape marked by rolling hills (at a stark contrast to the flat Pannonian Plain of the eastern Carpathian Basin). The elevation ranges from 200-700m asl.

Hydrology

The entire study region is part of the Danube catchment system. Many of the rivers out of the Apuseni Mountains are low volume with narrow valleys at the headwaters, but often extend to valleys with wide plains towards the margins of the mountain ranges. The Mountains drain to the west into the Criș River, the south and east to the Mureș River, and the North into the Someș River (all of these rivers meet and enter the Danube). The Mureș River valley, with its low grade meandering river wide flood plain and flat terraces, separates the Southern Apuseni Mountains from the Southern Carpathians. The Transylvanian Plateau is divided into three smaller catchments. The majority of the Plateau is drained by the Mureș River. The headwaters of the Mureș River are in the Eastern Carpathians (Bistrița Mountains). The main tributary of the Mureș in Transylvania is the Târnava River. The Târnava, which is split into the Târnava Mica and Târnava Mare, runs parallel to the Mureș from east to west across the Transylvanian Plateau. The confluence of the two rivers is near the modern town of Teiuș, in Alba County, within the study region. In total, the Mureș River covers 761km and has a catchment of 28,310km^2 before its confluence with the Tisza River in Hungary (Kiss and Sipos 2007; Sandu and Bloesch 2006). In addition to the Mureș, there is a small catchment of the Olt River, which flows directly through the Southern Carpathians to the Danube and the much larger catchment of the Someș River, which drains much of the northern portion of the Transylvanian Plateau into the Tisza River.

The smaller rivers of the Trascău Mountains, including the Ampoi, Aiud, and Geoagiu Rivers, are too small to be navigable by boat. In many cases, there are terraces along the banks of these rivers that would have provided opportunities for people to place their settlements out of normal seasonal flooding zones as well as overland travel. The terraces of the Mureș River would have provided similar opportunities, plus the potential for overland roads and tracks away from seasonally inundated wetlands. The area between Teiuș and the hill of Bilag, however, would have been a highly difficult landscape to traverse in the Bronze Age, and overland transport may have had to hug the higher terrace away from the Mureș and closer to modern towns of Cricău, Ighiu, and Șard.

Climate

There have been no paleoclimatic studies of the Bronze Age in southwest Transylvania (see Daróczi 2012). However, work conducted elsewhere in Transylvania and the Apuseni Mountains can provide a broad picture of the paleoclimate within the region. Daróczi (2012) has recently synthesized the current state of research on Holocene climatic conditions. In his synthesis, he has identified three "archeco-zones": (A) the Eastern Carpathians (including the Maramureș Depression, Gheorgheni Depression, Ciuc Depression, and Brașov Depression); (B) the Transylvanian Plateau (divided into northwestern, central, and southern sections); and (C) the western and southern mountains (divided into the Apuseni Mountains and the Southern Carpathians). The Apuseni Mountains are dominated by high altitude flora, has temperatures lower than surrounding regions in the warmest and coolest months, and has slightly lower humidity than northwestern Transylvania (Daróczi 2012:41). The portion of the Transylvanian Plateau within southwest Transylvania is dryer and warmer than northwestern Transylvania in several periods, though not as dry and warm as the central Transylvanian plain, which is a meadow steppe environment (Daróczi 2012:41).

The Apuseni Mountains have been relatively well studied through palynological research (Daróczi 2012:38). There was a period of rapid cooling at the start of the Atlantic phase (~6200 BC). Common Beech (*Fagus sylvatica*), a local refuge plant since the last Ice Age (Magri et al. 2006:205-206), was joined by hazel (*Corylus gen.*) and elm (*Ulmus gen.*) as common plants at the start of this period. Throughout the Atlantic phase, hazel (*Corylus gen.*) was replaced by spruce (*Picea gen.*) and beech (*Fagus gen.*), alder (*Alnus gen.*) hornbeam (*Carpinus gen.*) and fir (*Abies gen.*) appeared in low quantities in the region (Daróczi 2012:38; Bodnariuc et al. 2002:1475-1482). From the middle Subboreal phase (~2500 BC), the Apuseni Mountains were mostly covered by forests primarily composed of Common Hazel (*Corylus avellana*), European Spruce (*Picea abies*), with significant quantities of Common Ash (*Fraxinus excelsior*), oak (*Quercus gen.*), and lime (*Tilia gen.*). By the end of the Subboreal phase (~1000 BC), the forests were primarily composed of European Spruce (*Picea abies*), Common Hornbeam (*Carpinus betulus*), Common Beech (*Fagus sylvatica*) and European Silver Fir (*Abies alba*) (Daróczi 2012:38; Feurdean et al. 2009:975). Down in the Transylvanian Plateau, scant data suggest the region was a meadow steppe throughout the Middle-Late Holocene, with wormwood (*Artemisia gen.*), true grasses (*Poaceae gen.*), alder (*Alnus gen.*), and birch (*Betula gen.*) (Daróczi 2012:38; Pendea et al. 2009:108; Pendea et al. 2002:3-4).

In general, the climate was temperate during the Bronze Age (~3000-1000 BC) (Daróczi 2012:40) (Table 3.1). From ~3000-1500 BC the climate was wetter and slightly warmer than preceding periods (Magyari et al. 2009b:243-244). Despite this general warming trend, the period had a few small intervals of rapid cooling around 2900-2700 BC and 2100-1600 BC. The climate became slightly warmer and dryer from 1500-1000 BC. A similar warming trend and increased aridity was documented at the end of the Middle Bronze Age through aeolian deposition at Pecica-*Șanțul Mare* (Sherwood et al. 2013). These periods of environmental fluctuation correspond with transitions to both the Early and Middle Bronze Age, but it is unclear how environmental change may have contributed to the social, economic, ideological, and political shifts materialized in the archaeological record.

Table 3.1 – Climate and humidity changes in the Holocene in Transylvania (after Daróczi 2012:Figure 9; Feurdean 2004:37-38; Feurdean et al. 2008:Figures 3-4; Feurdean et al. 2010:2204-2205).

<table>
<tr><th colspan="2">Temperature</th><th colspan="2">Humidity</th><th rowspan="3">Holocene Phases</th><th rowspan="3">Year (BC)</th></tr>
<tr><th colspan="4">Transylvania</th></tr>
<tr><th>SW</th><th>NW</th><th>SW</th><th>NW</th></tr>
<tr><td colspan="2">warm?</td><td colspan="2">wetter</td><td>Subatlantic</td><td>100</td></tr>
<tr><td colspan="2">warm</td><td colspan="2">dry</td><td rowspan="4">Subboreal</td><td>1500</td></tr>
<tr><td colspan="2">cool summers</td><td colspan="2" rowspan="2">wetter</td><td>2000</td></tr>
<tr><td colspan="2">mild winters</td><td>2800</td></tr>
<tr><td rowspan="4">warm</td><td rowspan="4">rapid cooling</td><td rowspan="4">dry</td><td rowspan="4">dry (wetter than SW)</td><td>3000</td></tr>
<tr><td rowspan="4">Atlantic</td><td>3500</td></tr>
<tr><td>3700</td></tr>
<tr><td>6000</td></tr>
<tr><td colspan="2">rapid cooling</td><td colspan="2" rowspan="2">driest</td><td>6200</td></tr>
<tr><td colspan="2">high summer temperatures</td><td rowspan="3">Boreal</td><td>6600</td></tr>
<tr><td colspan="2">warm (rapid cooling event)</td><td colspan="2" rowspan="2">decrease in moisture</td><td>7200</td></tr>
<tr><td colspan="2">warm (rapid cooling event)</td><td>8300</td></tr>
<tr><td colspan="2" rowspan="2">high summer temperatures</td><td colspan="2">dry summers</td><td rowspan="4">Preboreal</td><td>8600</td></tr>
<tr><td colspan="2">lower precipitation</td><td>8700</td></tr>
<tr><td colspan="2">warmer</td><td colspan="2" rowspan="2">wet</td><td>9300</td></tr>
<tr><td colspan="2">Warm (+10 degrees C)</td><td>9500</td></tr>
</table>

There was a period of environmental disturbance post 1000 BC. This was a cooling period in which the mean annual temperature dropped 2 degrees Celsius, winter temperatures dropped 4 degrees Celsius, summer temperatures dropped 1 degree Celsius, and precipitation increased by 100mm per year (Daróczi 2012:40; Feurdean et al. 2008:500). This environmental disturbance may have affected the economy of Late Bronze Age communities (as this transition co-occurs with the emergence of large fortified sites in Transylvania).

Natural Resources in the Carpathian Macroregion

Bronze Age communities relied on a variety of natural resources as part of their economic, social, and political systems. In particular, metal, salt, and land for both agricultural and animal pasture were necessary for all communities (O'Shea 2011). However, these resources are unevenly distributed throughout the Carpathian Macroregion (Figure 3.6).

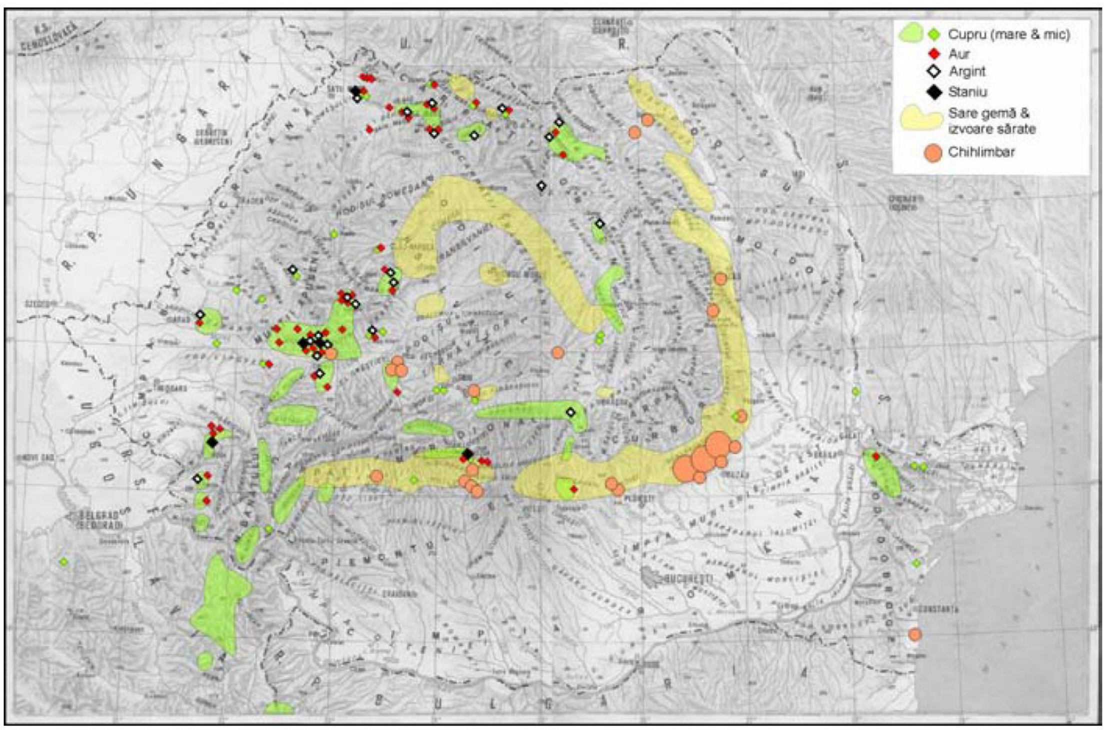

Figure 3.6 - Distribution of copper (cupru), gold (aur), silver (argint), tin (staniu), and salt (sarii) (from Boroffka 2006:88, Figure 1).

Metal

As to be expected from a time period called "The Bronze Age", metal was a key part of the economy. The metal deposits in western Transylvania are some of the richest in the world. For Bronze Age communities, particular importance was placed on copper, tin, and gold.

Copper. Copper is the most widespread metal within the Carpathian Macroregion (and indeed across Europe and Eurasia as well) (see Figure 3.6). As yet, however, no definitive Bronze Age copper mines have been found in the Apuseni Mountains (Papalas 2008:21). To the south, significant early copper mining evidence has been discovered at several sites, including Aibunar (Bulgaria) and Rudna Glava (Serbia) (Chernykh 1978; Jovanovic 1979, 1980; Jovanovic and Ottaway 1976; Pernicka et al. 1993). Beyond the Carpathians to the northeast – in Eurasia – there is also significant evidence of prehistoric mining (Chernykh 1992). The deposits of copper in the southern Apuseni Mountains come from polymetallic deposits, often co-occurring with silver and other elements (such as arsenic). In southwest Transylvania, porphyry copper mineralization is hosted primarily by subvolcanic andesitic bodies, and the main ore materials are chalcopyrite and bornite (though higher quality ores are known within the region – see Papalas 2008) (Ianovici et al. 1977; Neubauer et al. 2005). Despite its abundance in locations where it is present, there are large swaths of the Carpathian Macroregion that did not have local copper deposits. This includes most of the Carpathian Basin and Transylvanian Plateau.

Tin. The presence of tin in the Apuseni Mountains is a hotly debated issue. Fieldwork by Papalas (2008) identified a potential tin source in the Apuseni Mountains. For many reasons (including the fact that the tin co-occurs with a deposit of uranium and access is highly monitored by the Romanian state), we do not know if this source was exploited in the past. Traditionally, archaeologists have identified the main sources of tin in the Bronze Age as Cornwall and Devon (England), Erzgebirge (Germany/Czech Republic), and the Iberian Peninsula (Benvenuti et al. 2003; Gerrard 2000; Haustein et al. 2010; Ling et al. 2014; Rapp 2009; Valera and Valera 2003). Older geologic and archaeological maps published in Romania also vary in whether or not tin can be found in the region (see Boroffka 2006, 2009). The presence of tin in Romania would significantly impact reconstructions of long-distance exchange and transcontinental connections for all of Central and Eastern Europe. Much more work is needed to better understand the distribution and potential ancient extraction of tin in the Apuseni and Carpathian Mountains. If tin is present in the region, it is likely highly localized, within the Apuseni or Carpathian Mountains, and not present in the Carpathian Basin or Transylvanian Plateau.

Gold. Southwest Transylvania is home to the richest gold deposits in Europe (over 2500 tons), which has helped give the region the nickname: the "Golden Quadrangle" (Ciugudean 2012a:219; Cook and Ciobanu 2004; Ghițulescu and Sololescu 1941; Ianovici et al. 1976; Leary et al. 2004; Neubauer et al. 2005). The gold also formed during Neogene volcanic activity that formed the copper in the region (Alderton et al. 1998; Neubauer et al. 2005). However, mineralization processes across the Carpathian Basin were highly affected by local geology, timing, and topography (Neubauer et al. 2005). As a result, each area of Neogene mineralization has a different distribution of different metals and minerals. Therefore, gold has a much more restricted distribution within the Carpathian Macroregion (see Figure 3.6). In southwest Transylvania, the high density of epithermal vein deposits related to copper and gold bearing deposits helped produce large quantities of gold and copper also containing zinc and plumbum. Gold is available in a variety of different contexts, particularly through placer deposits (in streams and rivers) as well as in hard rock deposits that would have required mining to extract.

Salt

As mentioned above, salt covers the entirety of the Transylvanian Plateau (see Figure 3.6). Along the margins of the Transylvanian Plateau, solid rock salt deposits can be found within the first 1-10 meters below the surface (Harding and Kavruk 2010). In many places, springs through these deposits have made salt springs and flats where salt can be acquired without mining. There are also salt springs all along the north and eastern margin of the Eastern Carpathian Mountains (in Ukraine and Moldova). Salt does not occur in significant quantities in the Carpathian Basin, and communities there would have relied on trade and exchange to acquire salt from Transylvania (see O'Shea 2011).

The importance of salt to Bronze Age communities is a source of debate within the Carpathian archaeological community (Harding 2013). The importance of salt within the evolution of human societies, particularly in later complex societies (e.g., Flad 2011), is well established. It is important for preserving and storing food, provides important dietary supplements to animal diets that can help livestock grow larger, is important in tanning and cheese-making and is highly desired by humans (Nicodemus 2014). However, because salt is water soluble, it has remained difficult (if not impossible) to trace archaeologically away from the source. Recent fieldwork by Harding and Kavruk (2010) at Băile Figa in northeastern Transylvania is providing important evidence for prehistoric salt mining that adds to a long body of evidence within Transylvania (see Maxim 1971; Wollman 1996; Wollmann and Ciugudean 2005). Harding and Kavruk have established that salt exploitation can be dated back to the Middle Bronze Age, though it was significantly expanded in the Late Bronze Age. Evidence at salt springs and mines remain the most important loci for understanding the importance and organization of salt procurement in the Bronze Age.

Agro-Pastoral Land

Within the Carpathian Macroregion, there are few areas that are not suitable for agro-pastoral development. Lowland floodplains and mountainous uplands are well suited for animal pasture, but poor for agriculture (Nicodemus 2014). Unlike the minerals described above, there would have been little restrictions across the Carpathian Basin on agro-pastoral activities. Indeed, Bronze Age sites in the Carpathian Basin may have invested in specialized agro-pastoral activities (including horse-rearing – see Pecica-*Şanțul Mare* – Nicodemus 2014). However, even in southwest Transylvania, there would have been sufficient land for both agriculture and animal pasturing for local needs. Agricultural land would only have been restricted deep in the mountainous zones of the Carpathians and Apuseni Mountains.

The Geoagiu Valley: A Cross-Section of Geo-Environments

The Geoagiu Valley, including where it connects to the Mureș River, is the primary survey region in this study. The Geoagiu Valley intersects the major resource distributions in southwest Transylvania (Figure 3.7), all within a 20x3 km transect from the Trascău Mountains to the Transylvanian Plateau. The Geoagiu River cuts through folds of alternating geologic origins, from Baia de Arieș metamorphics, to Late Cretacous flysch, Tithonian limestone, Late Jurassic Island Arc Volcanics, Barremian-Aptian flysch, Aptian-Albann flysch, and finally into the Neogene sediments of the Transylvanian Plateau.

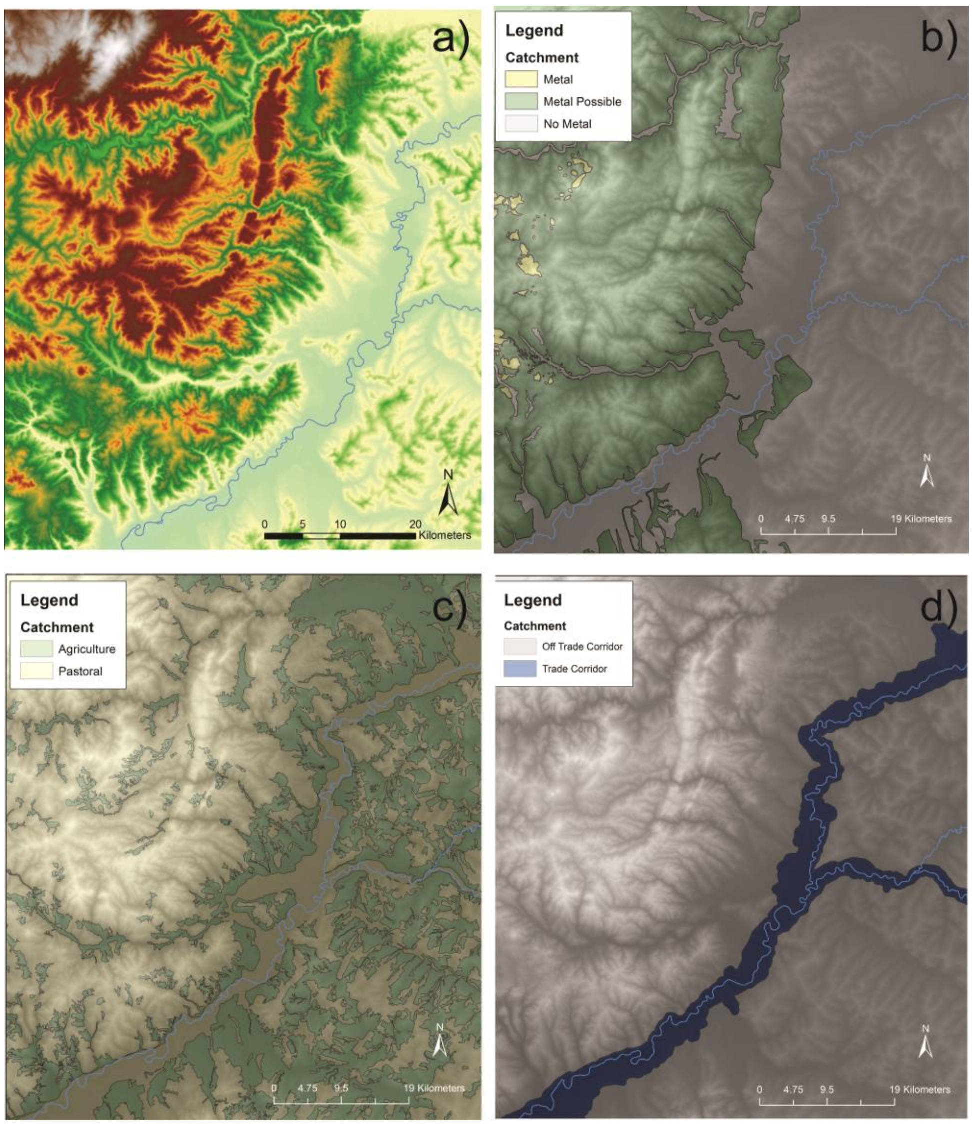

Figure 3.7 - Southwest Transylvanian topography and resources: (a) Digital Elevation Model, (b) distribution of metal resources in the region based on underlying geology, (c) distribution of agricultural and pastoral land based on land slope, and (d) access to international trade routes along the Mureș River and Târnava Mare River.

Throughout this landscape, but not adequately mapped by geologists, are countless Neogene hydrothermal volcanic vents that have produced extrusive deposits of quartz, copper, gold, and other minerals. The availability of metal from these hydrothermal vents is highest at the top of the valley, and more sporadic towards the mid-valley (near the modern town of Geoagiu de Sus). To the southeast of Geoagiu de Sus, the valley becomes less restrictive (for inter-valley movement to the Ghîrbova and Cetea Valleys) and the steep valley walls are replaced with larger flat sedimentary plains. This sedimentation would have made any possible hydrothermal vents bearing metal in the lower half of the valley inaccessible to Bronze Age communities.

Major salt springs and outcrops are not present in the Geoagiu Valley proper (compared with those at nearby Ocna Mureș and Pănade, for example). It is possible that there are smaller salt springs and depressions in the region (particularly near Pețelca and Căpud on the Transylvanian Plateau) that have not been recorded. Additionally, routes along which salt would have been exchanged, particularly the Mureș River and its confluence with the Târnava River, are located within this region.

The Geoagiu Valley also is made up of different land cover zones. The upper part of the valley is made up of very steep slopes. These slopes are alternatively covered in forest and pastures. This upland landscape would have had very few locations that would have been appropriate for large-scale plant cultivation. Agricultural activity in the mountains would have necessarily been small-scale horticulture. The upland forests and pastures would have been excellent locations for pasturing livestock (sheep/goat, cattle) and hunting wild game. The ecology and land cover practices in the Geoagiu Valley transition near Geoagiu de Sus. The wide terraces near Geoagiu de Sus would have represented the furthest up the valley that larger-scale agriculture could have been reliably practiced. These landscapes would also have had potential for both forests and animal pasture (localized environmental reconstruction, including palynological work, is needed). The highly productive agricultural land would have extended from Geoagiu de Sus down to the high terraces near Teiuș. The flood plain between Teiuș and Căpud/Pețelca on the opposite side of the Mureș River would have provided good opportunities for lowland grazing, plus fishing and hunting (including waterfowl). The seasonal inundations and larger-scale flooding that preceded Austro-Hungarian channelization of the Mureș River would have made it poor land for both settlement and agriculture, particularly prior to the onset of a drier climate post 1500 B.C. To the east of the Mureș, the low rolling hills of the Transylvanian Plateau would have provided rich agricultural and pasture land – similar to the western banks up to Geoagiu de Sus.

The Mureș River provides an important transportation and communication corridor to connect resources from the southern Apuseni Mountains to the west; to the Carpathian Basin and beyond (O'Shea 2011). Additionally, the river and river terraces would have provided pathways for Bronze Age people, by water, on foot, or by ox-cart, to be able to travel eastward into the Transylvanian Plateau. Because central and western Transylvania lack metallurgical deposits. but they also have likely relied upon metal from southwest Transylvania. The Geoagiu Valley is one of the easternmost access points to the rich metal deposits of the Metal Mountains. When discussing how the Geoagiu Valley connects to interregional trade and exchange along the Mureș River corridor, it is necessary to consider both eastward and westward interactions.

Together, the geo-environment of the Geoagiu Valley is a microcosm of the entire Transylvanian-Carpathain region, packed within a single valley. Most key natural resources (e.g., metal) for Bronze Age economies, land for plant and animal domestication, wild plant and animal resources, and fuel for metallurgy are locally abundant. Additionally, the distributions of these natural resources are somewhat discrete rather than completely overlapping; portions of the landscape that are good locations to procure metal area also poor places to grow crops (and vice versa). As such, it is an ideal geographic context in which to understand how Bronze Age communities utilized the landscape, oriented themselves in relation to these resources, and ultimately how their social, economic, and political systems were organized.

Chapter Summary

In this chapter I have described the geo-environmental context of southwest Transylvania. Southwest Transylvania offers a unique constellation of natural resources that would have been critical to Bronze Age economies. The abundant copper, gold, tin, salt, and lumber resources available in the region would have been critical to both local communities as well as communities across the Carpathian Macroregion in regions where these resources were not available. The Geoagiu Valley – the focus of more intensive archaeological survey and test excavation as part of the BATS Project – is an ideal cross-section of the microenvironments and natural resources in the southwest Transylvanian landscape. The geoenvironment of southwest Transylvania plays an important role in developing the models for the organization and evolution of communities in this resource procurement zone in Chapter 5.

Chapter 4 - The Archaeological Context of Bronze Age Southwest Transylvania

Chapter Introduction

This chapter situates the study of community organization and social change in southwest Transylvania within broader European Bronze Age and Romanian research traditions. I begin by framing the study of social complexity in Bronze Age Europe. The emergence of complex regional polities with institutionalized inequality is an issue that has been at the core of Bronze Age research since its inception. I discuss the history and importance of this issue to European archaeology today. I then discuss key issues in metal and other natural resource procurement, mining, mining districts, and how mining communities articulate with other regions in Bronze Age Europe. I draw particular attention to the few studies of procurement zones across the continent, and how local resources come to dominate local histories and affect broader models for social change in the Bronze Age.

Turning to the Carpathian Macroregion, I present current themes within Carpathian Basin Bronze Age research. Based on recent research on the organization and evolution of communities across in the Carpathian Basin, a new synthetic picture of a complex mosaic of communities, variably organized across space, and following locally specific historical trajectories has emerged. Given the heterogeneity in organization and development of communities across the macroregion, the lack of systematic studies in resource procurement zones is a critical gap that this study seeks to address. The historical trajectories in Transylvania likely will differ from those in other parts of the Carpathian Basin, but in as yet unknown ways.

The final portion of the chapter contextualizes issues of metal procurement and social change within the Transylvanian Bronze Age archaeological record. Based on previous work, it is possible to identify what types of data can be marshalled to examine dynamic community organization in the Bronze Age, and what additional work must be done to transform the unsystematic regional research into systematic models of social organization and change. I finally present a range of models from the archaeological literature for the organization and evolution of social complexity in Bronze Age Transylvania. Together with the geo-environmental background (Chapter 3), the archaeological context presents the physical and cultural context to which the broad anthropological models of community organization and evolution must be tailored (see Chapter 5).

Complexity and Social Transformation in Bronze Age Europe

Understanding when, how, and why complex regional polities developed remains at the core of Bronze Age research. These questions have been central to Bronze Age research for almost a century (Childe 1930, 1951, 1954). While there have been many case studies and significant advances in methodologies, technologies, theories for studying the Bronze Age, the questions remain relevant and continue to be contested (see Duffy 2015; Earle and Kristiansen 2010; Kristiansen and Earle 2015; Nicodemus 2014).

There are several (often competing) perspectives on how complex community organization was in Bronze Age societies. The most commonly held view of the Bronze Age over the past century is that it was the period when more autonomous lifeways of village and house societies of the Neolithic were replaced with permanent regional leadership and social hierarchy (see Childe 1951; Coles and Harding 1979; Earle and Kristiansen 2010; Harding 2000, 2011; Kristiansen and Larsson 2005; Pare 2000). Archaeologists who share this view suggest that the start of the Bronze Age corresponded with a transformative event in which local autonomy was superseded by the emergence of elite-run complex regional polities. This transformation followed episodes of “cycling” and “false starts” in complexity and the collapse of Late Neolithic (Copper Age) centers and networks (see Parkinson 2002; Parkinson and Duffy 2007; Parkinson and Gyucha 2012; Parkinson et al. 2004; Yerkes et al. 2009). In the British Isles, archaeologists have pointed to the shift from communal graves to individual graves as reflecting the emergence of ‘an ideology of the individual’ and social stratification (e.g., Clark et al.

1985; Renfrew 1974, Shennan 1982; Thorpe and Richard 1984) (Brück 2004b). In the Carpathian Basin, Earle and Kristiansen (2010; Kristiansen and Earle 2015) have pointed to settlement site-size hierarchies and the expansion of metal technology and warfare as evidence of social hierarchies throughout the Bronze Age.

At the other end of the spectrum, some archaeologists question whether there was any increase in complexity from the Neolithic to the Bronze Age. For example, in comparing tell communities in the Neolithic and Bronze Age of the Carpathian Basin, Kienlin (2015) argues against a qualitative shift in scale and social complexity between the two periods (also see Kienlin 2012a, 2012b). Rather than focusing on differences, Kienlin emphasizes commonalities in settlement, economic complexity, and identity in both Neolithic and Bronze Age societies in the Carpathian Basin. While Kienlin does suggest that regional political centers did emerge in Mycenaean societies (following on Galaty and Parkinson 2007), he suggests that these transformations were restricted to the Mediterranean (Kienlin 2015:64-65).

Between these two perspectives has emerged a third: the mosaic approach (see Duffy 2010; Nicodemus 2014; O'Shea 2011). The mosaic approach suggests that there are multiple different trajectories of complexity co-occurring between and within different macroregions of Europe. With the mosaic view, at any one time, different communities and regions were more and less hierarchically integrated. These emerging approaches require detailed regional histories along with inter-regional comparisons of the scales of social complexity and tempo of change; and challenge grand continent-wide narratives (e.g. Childe 1951) of the timing, nature, scale, and mechanisms of social change in prehistoric Europe.

The study of metal procurement and social change in the procurement zone of southwest Transylvania provides a means of examining what roles metal may have had in the emergence of regional polities in the Bronze Age. It also will allow for a better understanding of the tempo and mechanisms of social change, and whether continental-scale explanatory frameworks hold for the Carpathian Macroregion, or if community organization across the Macroregion is better conceptualized as a mosaic of contemporaneous societies with higher and lower degrees of centralization and inequality.

Roles of Metal in Organization of Bronze Age Societies

There has been a long history of archaeological investigations of prehistoric mining in Europe (Shennan 1998; Weisgerber and Pernicka 1995), including work at Rudna Glava in Serbia (Jovanović 1971, 1979, 1982; Jovanović and Ottaway 1976), Mitterberg in the Alps (Bartelheim 2009; Krause 2009; Shennan 1995, 1998, 1999), Iberia (Chapman 1990; Ruiz 1993), Sardinia, Cyprus (Kassianidou 1999, 2012a, 2012b; Kassianidou and Knapp 2005), the Caucuses (Stöllner 2016; Stöllner and Gambashidze 2014; Stöllner et al. 2014), and Ireland (O'Brien 1990, 2003, 2007). Throughout early antiquarian archaeology of the late 18th-early 19th century, the cataloging and classification of bronze objects shaped the understanding of prehistory (Ottaway and Roberts 2008:193; Trigger 1989). Today, the study of mining and metal production is primarily rooted in the rich field of archaeometallurgy (e.g., Chernykh 1992; Childs and Killick 1993; Killick 2001; Killick and Fenn 2012; Levy, et al. 2002; Müller and Pernicka 2009; Thornton 2009; Weisgerber and Pernicka 1995). Archaeometallurgists have focused on monitoring the development of metallurgical and mining technologies primarily through specialized analysis of ores, slags, and finished objects designed to reconstruct ancient technologies and identify archaeological sources and distribution networks of metallurgical products (see Papalas 2008).

Increasingly, there have been renewed calls for integrating archaeometric perspectives with more socially-oriented anthropological models (e.g., Hanks 2009; Kassianidou and Knapp 2005; Killick and Young 1997; Kuijpers 2012; O’Brien 2015; Ottaway 2001, 2002; Ottaway and Roberts 2008). Ottaway and Roberts (2008:194) have noted that the study of European prehistoric metallurgy has lagged behind other contexts in which technological organization has been studied through socially-embedded perspectives (e.g., Dobres and Hoffman 1999; Ehrhardt 2005; Gosden and Marshall 1999; Lechtman 1996a, 1996b; Lemmonier 1993; Schiffer 2001; Sillar and Tite 2000), with some notable exceptions (e.g., Doonan 1999; Ottaway 2001; Sofaer-Derevenski and Sørensen 2002; Vandkilde 1996). Archaeologists need to understand the social contexts in which technological processes and innovations in mining and metallurgy develop. This requires more archaeological projects in mining districts with a focus on community organization rather than just on metallurgical and mining technologies (see Shennan 1995).

The Development of European Metallurgy

Ottaway and Roberts (2008) have written a succinct overview of the emergence of metalworking in Europe. More recently, O'Brien (2015) has provided a more robust consideration of the development of copper mining and metallurgy in Europe. Current evidence suggests the earliest metallurgy in Europe took place in southeast Europe, from Anatolia, through the Balkans, to the southern Carpathians. Worked native copper (as beads) has been dated as early as the 8th millennium B.C. at Cayonu Tepesi (Maddin et al. 1999; Ozdogan and Ozgodan 1999). O'Brien (2015:38) is more conservative, eliminating Anatolia from the discussion, and places the start of copper metallurgy in southeast Europe at approximately 6000 BC.

The exact origin of southeastern European copper and bronze metallurgy remains contested despite being an important focus of research since Renfrew (1969) challenged Mesopotamia-to-Europe diffusionism as the origins. Renfrew (1969) argued for independent innovation of metallurgy in Europe, noting that the pyrotechnical knowledge necessary for smelting copper was already present in the ceramic traditions of the Neolithic (O'Brien 2015:39). While there are earlier dates for metallurgy in the Near and Middle East than anywhere in Europe, O'Brien argues that there is a lack of direct evidence to establish links between the two areas. Based on this, O'Brien concludes that early copper metallurgy was autonomously developed in the Balkans (O'Brien 2015:54). Ottaway and Roberts (2008:195-197) note the uneven dates for the appearance of copper objects, mines, and remains of smelting and production does not fit a uniform 'spread' distribution that might be expected with diffusion. At the same time, Ottoway and Roberts (2008:1997) note that there is no direct indication whether Renfrew's (1969, 1973) assertion of independent origins of metallurgy in southeast Europe still stands. It is possible that the earliest evidence of metallurgy in southeast Europe, in close proximity to the Near and Middle East, is not coincidental, but that additional episodes of independent invention of metallurgy took place elsewhere, such as in Iberia (see Renfrew 1967, 1973).

During the fifth millennium B.C., there was a marked increase in the amount of copper in circulation in southeast Europe (O'Brien 2015:53; Pernicka et al. 1997; Pernicka and Anthony 2010). During this time, the casting of smelted copper, often in copper-arsenic alloys, increased (O'Brien 2015:53; Ottaway and Roberts 2008:197). O'Brien (2015:54) argues that by the late fifth millennium B.C., the center of metallurgical innovation had gradually moved to the central Balkans and Carpathian Basin associated with the late Vinča and Bodrogkeresztur cultural groups (Kienlin 2012a). By the start of the Early Bronze Age in Transylvania, the technologies for surface and sub-surface mining, benefication, smelting, alloying, and casting would have been well established within the technological repertoire of communities in Transylvania.

Gold metallurgy was established in southeastern Europe by the mid-fifth millennium BC (Jovanović 1996; Makkay 1996; Ottaway and Roberts 2008:197). The importance of gold is most spectacularly demonstrated in the Varna cemetery in eastern Bulgaria (Ciugudean 2012a; Makkay 1991; Renfrew 1986a). Much of the earliest gold was likely collected from alluvial deposits (Ciugudean 2012a:220). By the Bronze Age, it is possible that communities had begun gold mining at large sources, such as the Wicklow Mountains in Ireland and the Metal Mountains in southwest Transylvania (Harding 2000:199-200).

Metal and Elites

Traditional models of the rise of inequality often relied on singular causal mechanisms, primarily the control, distribution, and production of metal, to explain the development of social organization in Bronze Age Europe (Childe 1930; Pare 2000). V. Gordon Childe (1930, 1944) placed metallurgical technology at the forefront of explanations for the rise of social elites and complex societies (see Wailes 1996, Thornton and Roberts 2009). In his book *The Bronze Age*, Childe introduced a theory of the "itinerant smith" to try and explain how metallurgy expanded so widely and quickly throughout Europe from its perceived core in the Near East (Kuijpers 2008:36). For Childe, metallurgy was such a complex process that he found it "fantastically improbable" to have been invented in several places independent of each other (Childe 1930:10, Kuijpers 2008:36). Given the complexity of metalworking, according to Childe, craftsmen and smiths must have been full-time specialists; experts with little time to dedicate to other economic pursuits (Childe 1930:4, 1965:136; Kuijpers 2008:36). These full-time smiths would have required some form of elite patronage to be able to meet basic needs (Childe 1930:4, 1965:136; Kuijpers 2008:36). This is a major reason why Childe considers the Bronze Age to be a period in which massive social changes took place (Childe 1951:24-25; Kuijpers 2008:36); elite patronage of some form is needed to support smiths.

The causal link between metal and the emergence of complex societies in Europe continues to be a major part of European Bronze Age archaeology (Ottaway and Roberts 2008:194). This is most explicit in Pare's (2000:24) "Bronze Age Hypothesis" which states that (1) because bronze is essential to social and economic (re)production, and (2) most societies could only obtain these geographically restricted resources through exchange networks, (3) there was a major intensification in regional trade that (4) was able to be controlled by emerging elites. Strahm (2005), building on work in central Europe (Strahm 1994; Strahm and Hauptmann 2009), has argued that there is an evolutionary model to the adoption and expansion of metallurgy in France. Krause (2009) has argued that even the small-scale seasonal mining characteristic of the Early Bronze Age (2200-1800 BC) must have been coordinated by individuals or groups that acquired higher status due to this coordination (O'Brien 2015:292).

There is growing consensus that metal alone cannot be single causal mechanism for the emergence of institutionalized social inequality in Bronze Age societies **(**cf. Kienlin and Roberts 2009; Kristiansen and Earle 2010; Shennan 1998). This consensus is based on several factors. First, mining and metallurgy pre-date other social, economic, political, and ideological markers of institutionalized inequality (see Tincu 2011). The presence of mining and metallurgy has been found dating back to the Neolithic and Copper Ages in various locations around southeast Europe (O'Brien 2015; Ottaway and Roberts 2008). There is minimal evidence that permanent complex regional polities with institutionalized inequality were present in Neolithic and Copper Age societies (see Parkinson 2002).

Second, the core principles of Pare's model do not apply to resource procurement zones. Pare assumes metal had to have been imported through exchange networks. This assumption does not hold true for southwest Transylvania. The vast copper and gold deposits in the southern Apuseni Mountains provided access to metal for local communities. Work in procurement zones in the eastern Alps by Shennan (1998), Bartelheim (2009), and Kienlin and Stöllner (2009) have shown that social complexity is not directly linked to metal production systems where resources are locally available. Using evidence from Mille and Carozza (2009), O'Brien suggests that both the importance of copper, and social complexity itself, varied across regions and not simply temporally (O'Brien 2015:291-292). Based on research at the fortified Klinglberg settlement near St. Veit, Shennan (1995) concluded that the community at the site was independently engaging in copper production, with some evidence for interregional interaction but no evidence of external coercion or control. Even with the expansion and intensification of mining and metallurgy from 1800 to 1300 BC, Stöllner et al. (2011) have argued that the distribution of smelting activities across the region does not match expectations for centralized organization.

Third, it is likely that other factors, such as subsistence production and non-metal crafts and exchange networks were also major factors in the emergence of elites in prehistoric Europe. Bartelheim (2009) argued that agricultural productivity associated with the emergence of settlement centers in Alpine areas with fertile soil and good agricultural potential stimulated the development of metal production. O'Brien argues that "[i]t was agricultural surplus generated by [settlements in the agrarian lowlands] that provided the means to acquire metal and so acted as the main driving force behind this mining 'industry'" (O'Brien 2015:295). However, archaeologists must take care to not replace one single causal mechanism (metal) with another (agriculture). Instead, focusing on social process (e.g. Earle et al. 2015) rather than the materials or products themselves holds great promise for understanding the nature of the link between metals and the development of institutionalized inequality.

In the Carpathian Basin, recent work by Papalas (2008) at the Early and Middle Bronze Age sites of Klárafalva-*Hajdova* and Kiszombor-*Új Élet*, along the Hungarian section of the Mureș River, has shown that the scale of metallurgical production does not match expectations for a highly centralized economic system. Instead, metalworking in these sites appears to be organized at the household level with no evidence of elite control (Papalas 2008). Upriver from these sites, recent work at the Middle Bronze Age fortified center of Pecica-*Şanţul Mare* suggests that metallurgical production intensified as the site grew in size, complexity, and regional prominence (cf. Nicodemus 2014; Nicodemus and O'Shea 2015; Nicodemus et al. 2015; O'Shea et al. 2005, 2006, 2011). Despite the importance of metallurgical craft production within the political economy, no evidence at Pecica has been found of specialized, elite-attached metallurgical workshops (Nicodemus 2014:430). At the same time, Nicodemus has also noted that the lack of specialized workshops does not necessarily mean that all households were equally engaged in metallurgical production (Nicodemus 2014:430). The majority of metallurgical evidence comes from the central tell, which suggests it was under direct elite supervision. Starting with the initial founding of the site at approximately 1950 cal. BC, the principle economic activity was metalworking, including processing ores (O'Shea and Nicodemus 2017). Prior to the site's collapse starting in the 17th century BC, there was a shift from primary ore-processing and smelting to casting metal objects and an increased emphasis on controlling the movement of metals from sources in the Apuseni Mountains to the west to communities in the Carpathian Basin to the west along the Mureș River (O'Shea 2011; O'Shea and Nicodemus 2017). There is strong evidence that elite status at Pecica was also tied to non-metal economic dimensions, including horse-breeding and feasting (Nicodemus 2014:430-431). With the fine-grained site history from Pecica, at a higher resolution than any other Bronze Age site excavated in the eastern Carpathian Basin, archaeologists have been able to monitor fluctuations in the intensity and centralization of craft production and interregional exchange.

Găvan (2012, 2013a, 2013b) has recently synthesized much of the regional metallurgical data for the Romanian territory of the eastern Carpathian Basin. Găvan's work focused on metallurgical evidence in tell settlements, but included evidence from other sites (e.g., flat settlements, hoards, chance finds). Based on distributions of metallurgy activities that spread beyond centralized tell settlements, Găvan concludes that while tell settlements played an important role in metal production, there was no centralized control over specialized metallurgical crafts (Găvan 2012, 2013a). Together with the work by Papalas in the Lower Maros, work in the eastern Carpathian Basin has underscored that any investigation of the dynamics of social complexity in the metal ore-rich region of southwest Transylvania must document and demonstrate, rather than assume, the degree to which metal was of central importance to community organization, along with other social, ideological, and economic institutions (cf. Earle 2002).

Due to the spatial restriction of metal resources, the majority of studies of social organization in Bronze Age Europe occur in contexts where metal is not locally abundant. This is particularly true for studies of social complexity in the Carpathian Basin, including work from the Danube (Bóna 1965, 1992; Kiss 2012; Kiss et al. 2015; Kovacs 1977; Kristiansen 2000; Kristiansen and Earle 2010; Poroszlai 2000; Poroszlai et al. 2003; Uhnér 2010, 2012), Körös Valley (Duffy 2010), and Lower and Middle Maros Valley (O'Shea 1996, 2011). Some notable exceptions are work from Ireland (O'Brien 1990, 2003, 2007) and the Alpine region of Central Europe (Bartelheim 2009; Kienlin and Stöllner 2009; Krause 2007, 2009; Shennan 1992, 1995, 1998, 1999). Mille and Carozza (2009) have argued that metallurgy had a profound impact on community organization in the procurement zone of Cabriéres, France. In Cabriéres, copper extraction and exchange was linked to significant social changes during the mid-third millennium BC, including the emergence of social hierarchy documented through the rise of fortified settlements that had a central role in resource control and economic competition (Mille and Carozza 2009; O'Brien 2015:291). Mille and Carozza (2009) have suggested that these social changes were isolated to copper-rich Cabriéres, and did not occur in surrounding regions. However, they argue the changes were the product of communities in mining regions articulating to surrounding areas through long-distance exchange. In the Carpathians, the lack of a historical trajectory from a metal-rich area, such as southwest Transylvania, remains a significant gap in the macroregional picture that this project seeks to address.

As evidenced by this diversity of viewpoints, there is no consensus on the relationship among metal, elite control, and development of social inequality in prehistoric Europe. These perspectives, however, can be separated into a few groups: (1) that there is a strong link between elites and metallurgy, (2) that there is no link between elites and metallurgy, (3) that the nature of the link between elites and metallurgy will vary based on access to resources (with either procurement zones or non-procurement zones being more strongly affected), and (4) that there is some relationship between metal and elites, but that it is highly case and context specific, and must be considered along with other non-metal economic, social, and ideological factors. These various perspectives will inform the models for community organization and social change in southwest Transylvania in Chapter 5.

Interregional Interaction and the Flow of Metal in the Bronze Age

Bronze Age archaeologists have focused on connecting procurement with consumption zones by monitoring the development of interregional interaction during the Bronze Age. Sherratt's (1993) discussion of a potential Bronze Age world system highlights the continental scale of movement and interaction during the Bronze Age. Ling and colleagues have recently published a series of articles focusing on the origins of metal that has ended up in Nordic archaeological sites (Ling et al. 2013, 2014; Rowlands and Ling 2013). Using lead isotopes, Ling et al. have traced Nordic metal to sources across Europe, including Iberia, Sardinia, Greece, and Cyprus. None of the metal has been sourced to Carpathian sources, but this may only be because Ling et al. have not included Transylvanian sources in their sample. Given how lead isotopic source attribution is conducted (based on best fit), the lack of comparative samples from Transylvania is a significant issue. More work in Transylvania is needed, as the incorporation of these samples may challenge the Mediterranean-Nordic maritime connections currently supported by the data published by Ling et al.

There are important technological innovations in the Bronze Age that affected interregional interaction. First, maritime capabilities appear to have expanded during this time period (Henderson 2007; Earle and Kristiansen 2010:226-230; O'Shea 2011). Biró (1998) has demonstrated the importance of waterways in the Carpathian Basin by tracing the distribution of lithic raw materials from the earliest Neolithic through the Copper Age (O'Shea 2011:163-164). In Scandinavia, rock art depicting swords and ships from the Early Bronze Age has been interpreted as reflecting the maritime trade of metal (see Kaul 1998; Earle et al. 2015; Ling 2008; Ling et al. 2013:13). In addition to metal, other resources, such as Baltic amber, flowed through Atlantic and Northern European maritime networks during the Bronze Age (Beck and Shennan 1991; Earle and Kristiansen 2010; Kristiansen 1998; Ling et al. 2013, 2014). Increased sophistication of boating technology affected the pathways and intensity of exchange along waterways in Bronze Age Europe (Van de Noort 2004, 2013; Wright et al. 2001). The strong riverine-orientation of Early and Middle Bronze Age exchange in Transylvania and the Carpathian Basin emerged from, and contributed to, the rise of large towns along rivers – at key confluences, fords, and 'choke points' (O'Shea 2011).

Second, the expanded role of the horse changed traction, travel, and warfare (see Nicodemus 2014). Horses were originally domesticated in the Eurasian Steppe and moved into the Carpathian Basin and beyond through constant though low-level interregional interaction and population movement by at least the 4th millennium cal. BC (Heyd 2011:544). Purported evidence of domestic horse from Baden Culture settlements in Hungary (Bökönyi 1978; Benecke 1998) and Bernberg Culture settlements in Germany (Becker 1999; Benecke 1999) show that the horse was present, though likely not in sufficient quantities to maintain a breeding population (Heyd 2011:544). Within the eastern Carpathian Basin, Pecica-*Șanțul Mare* emerged during the Middle Bronze Age as a major center for horse breeding (Nicodemus 2014:431). Nicodemus argues that large-scale horse breeding at Pecica provided bottlenecks for local elites to control the regional exchange of horses, influencing the extent to which other communities had access to horses (Nicodemus 2014:431). By more strongly articulating with regional exchange networks, elites were also able to create differential access to metal, which had to be moved to the site along the Mureș River (see O'Shea 2011), and convert economic asymmetries into political authority (Nicodemus 2014:431). Pecica has produced early evidence for horse chariotry in the Carpathian Basin (clay modeled chariot wheels and bridle pieces) which suggests that the ways in which people entered into violent conflict was changing during the Middle Bronze Age.

Bronze Age Archaeology in the Carpathian Macroregion

In the Eastern Carpathian Basin, the Bronze Age spans two millennia, divided into Early (2700-2000 BC), Middle (2000-1400 BC), and Late (1400-750 BC) (Ciugudean 2010; O'Shea 1991; Poroszlai, et al. 2003). During this time, the Carpathian Basin and Transylvania were inhabited by multiple cultural groups that are identifiable based on shared material culture, primarily ceramic fabric and decoration (Figures 4.1, 4.2, 4.3, 4.4). Research has shown that the level of social complexity and the tempo of cultural development was highly variable across space and time (Dietrich 2010; Duffy 2010; Earle and Kristiansen 2010; O'Shea 2011).

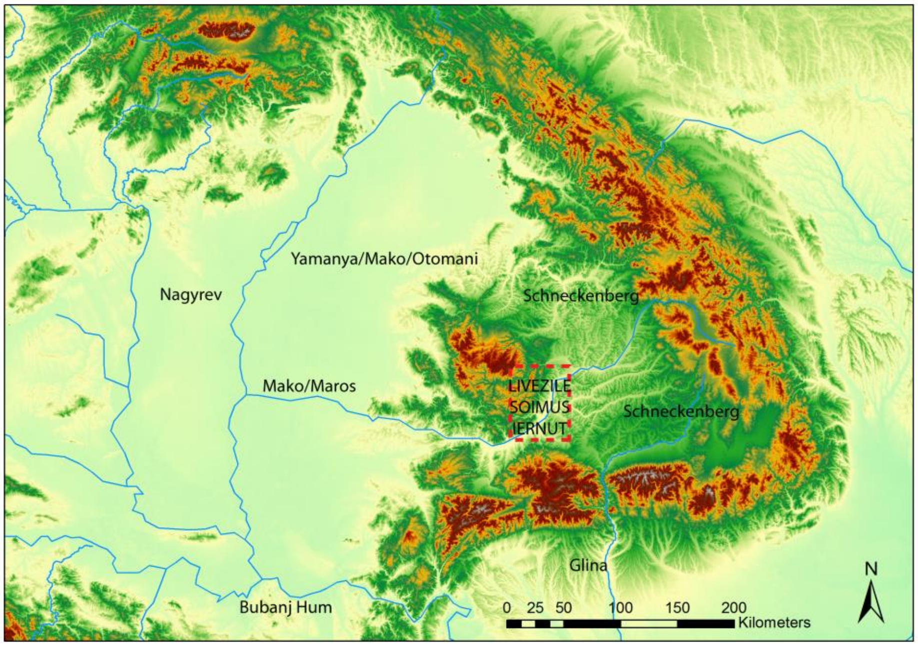

Figure 4.1 – Early Bronze Age archaeological cultures in the Carpathian Macroregion.

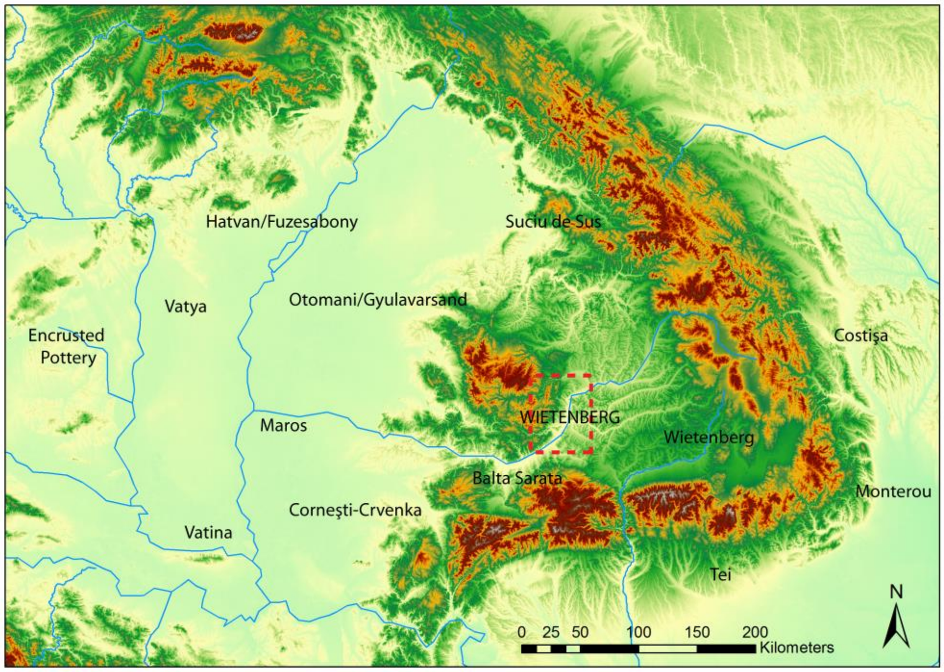

Figure 4.2 – Middle Bronze Age archaeological cultures in the Carpathian Macroregion.

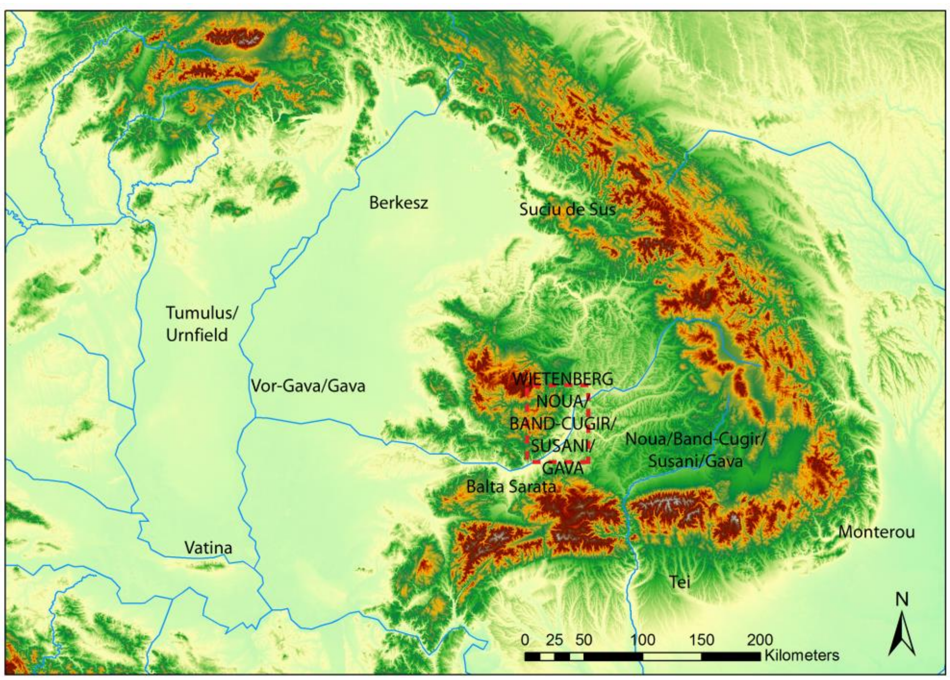

Figure 4.3 – Late Bronze Age archaeological cultures in the Carpathian Macroregion.

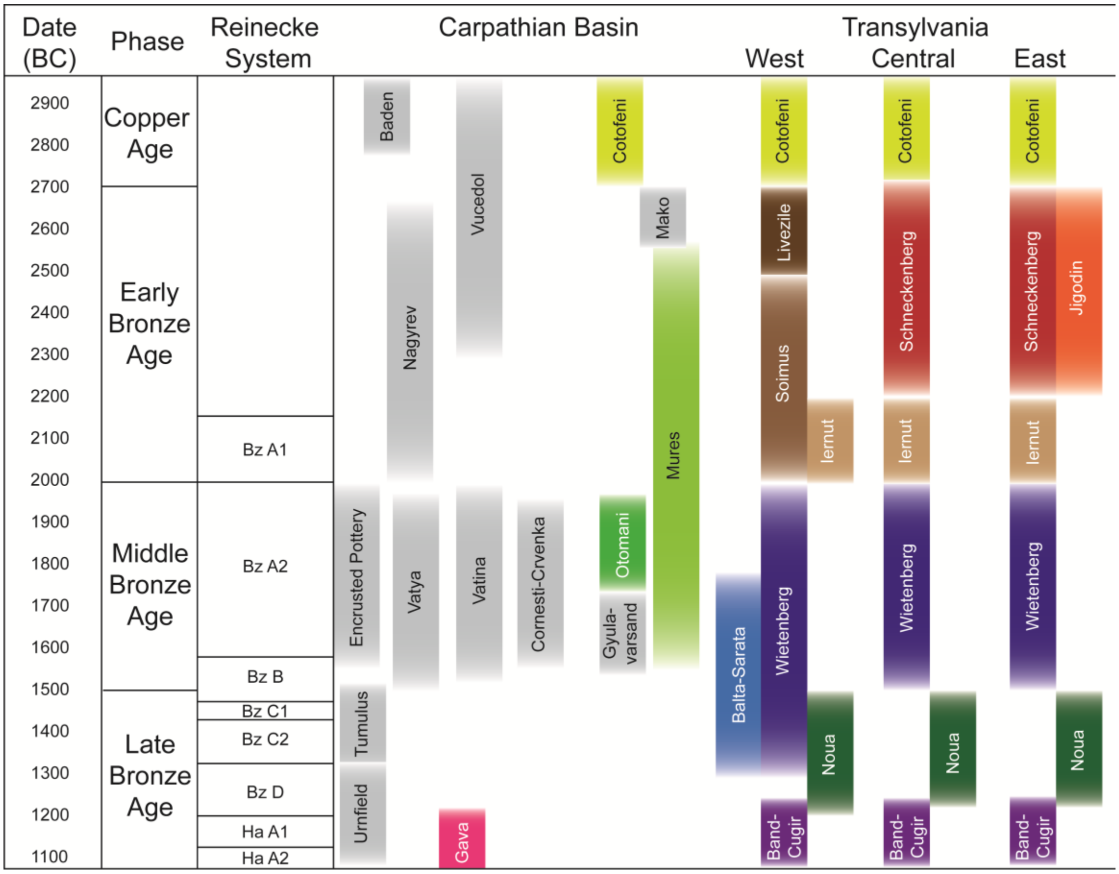

Figure 4.4 – Spatial and temporal relationships of key cultural groups in the Carpathian Macroregion. Distribution of cultures in western Transylvania reflect new absolute chronologies presented in Chapter 7. Non-grey distributions reflect cultural groups of most importance in this study.

There are several major questions about social complexity and cultural diversity that continue to frame Bronze Age archaeological research in the Carpathian Basin. First, what social processes were factors in the crystallization of regional cultures during the Bronze Age? Geographically bounded cultural groups emerged throughout the Early Bronze Age, and reaching its peak at the transition to the Middle Bronze (see Duffy 2010; Parkinson 2006b; Parkinson and Gyucha 2012). Communities within these cultural groups signaled membership through a highly regimented system of material culture production and mortuary practices. While ceramic standardization is often seen as a mark of centralized production, work by Michelaki (1999, 2006, 2008; Michelaki et al. 2002) has demonstrated that ceramics were produced locally by each community, not at one regional center. Villagers in the Maros Culture followed a rigid template for ceramic production not because it was imposed by regional elites, but because individual households and communities sought to signal community membership. Mortuary practices also marked cultural boundaries for the Maros Culture (see O'Shea 1984, 1996). For example, the normative body treatment for Maros communities was inhumation, while Nagyrév groups to the north cremated and buried their dead in urns (O'Shea 1996:357). O'Shea (1996:357) argues that the material and behavioral differences between Maros and Nagyrév communities were intentionally drawn and exaggerated as a boundary-marking phenomenon. The development of these shared materials and practices is an example of *ethnogenesis* – the process by which a new and distinctive ethnic or cultural identity comes into being (O'Shea 1996:362-367). For Transylvania, the origins and development of the Wietenberg Culture identity may also be an example of ethnogenesis at the transition to the Middle Bronze Age. Documenting when and how shared Wietenberg materials and practices emerged in southwest Transylvania can provide new insights into Bronze Age ethnogenesis.

Second, what processes led to population aggregation in large settlements and, in some cases, to the establishment of centralized regional polities? Trends towards demographic centralization began in the Neolithic in the Carpathian Basin (Duffy et al. 2013; Parkinson 2002; Parkinson and Gyucha 2012). This was not a linear process, rather occurring in fits and starts as settlement systems cycled between dispersed and aggregated structural poses throughout the Neolithic and Copper Ages (Parkinson 2002; Parkinson and Gyucha 2012). Parkinson, Gyucha, Duffy, and colleagues have demonstrated that pre-Bronze Age centers that emerged from aggregations in the Körös River Valley were not integrated into regional polities with centrally positioned elites exerting control over surrounding areas (Duffy 2015; Gyucha et al. 2009; Gyucha et al. 2011; Parkinson 2002, 2006a; Parkinson et al. 2010; Parkinson and Gyucha 2012). Population aggregation, however, is a result, not a cause, of social change (O'Shea and Nicodemus 2017). O'Shea and Nicodemus have argued that Pecica-*Şanţul Mare* was a regional center, though the rise of Pecica corresponds with the abandonment of surrounding settlements such as Semlac (see Nicodemus 2014; O'Shea and Nicodemus

2017; O’Shea et al. 2006). More survey in the area around Pecica is required to establish contemporaneity of other settlements with Pecica, and any sites would be needed to establish asymmetry in the interactions between settlements. Duffy has argued that despite increased connectivity and interaction among Middle Bronze Age settlements the Körös River Valley, regional hierarchies remained absent (Duffy 2010, 2015; Duffy et al. 2013:57). On the other side of the Carpathian Basin, Earle, Kristiansen, and colleagues working at Százhalombatta and its surroundings in the Benta Valley have argued for a very different view of social complexity and regional hierarchy during the Early and Middle Bronze Ages (Earle and Kristiansen 2010; Earle et al. 2011; Earle et al. 2015; Kristiansen 2000; Uhnér 2012). Based on settlement patterns where all sites for each of the subphases of the Bronze Age are considered contemporaneous, these researchers have argued for the presence of two simultaneous chiefly polities (three-tier settlement hierarchies) within the 20km long Benta Valley during the Middle Bronze Age (Earle et al. 2011, 2015; Earle and Kristiansen 2010). Duffy’s (2015) recent examination of equifinality in settlement patterns that produce site-size hierarchies should call the interpretations of settlement in the Benta Valley into question until more fine-grained chronologies are available. This study presents a fine-grained chronology of settlement in the Geoagiu Valley (also a 20km long valley) and shows how contemporaneity in site occupations must be *demonstrated* rather than *assumed* (see Bailey 2007). The archaeology of southwest Transylvania can provide new insights into the processes by which towns emerged in the Bronze Age.

Third, what processes led to the collapse of Middle Bronze Age cultures and how did this impact the organization of Late Bronze Age communities? The changes within the Carpathian Macroregion at the transition from the Middle to Late Bronze Age are subject to much debate (Dietrich 2014a; Gogâltan and Sava 2010; O’Shea 2011; Sava et al. 2011; Szentmiklosi et al. 2011). O’Shea (2011) has noted the end of the Middle Bronze Age Maros Culture coincides with the decline of the town at Pecica. More recently, O’Shea and Nicodemus (2017) have suggested that during the initial stage of Pecica’s decline, one of its potential secondary centers, Klárafalva-*Hajdova*, peaked in metallurgical production and perhaps regional importance. Very rapidly, and prior to 1545 cal. BC, Pecica, Klárafalva, and the other remaining Maros settlements and cemeteries were abandoned. The decline of Pecica was likely caused by, or contributed to, the decline in riverine exchange and expansion of overland trade in the Late Bronze Age. The expansion of overland trade routes is best seen in the rise of large fortified sites at Șagu, Sântâna, and Cornești, positioned north-south along the western edge of the Apuseni Mountains between river drainages rather than along major rivers (which had been the pattern throughout the Neolithic, Copper Age, and Early and Middle Bronze Ages). While encompassing large areas, these sites lack evidence of substantial residential features within the fortifications, suggesting they did not support substantially larger population sizes than sites in preceding periods. It is unclear what may have contributed to the reorientation of exchange routes at the start of the Late Bronze Age. The most common explanation has been through the migration of new populations from the Eurasian steppe into the Carpathian Macroregion. While there is evidence of early chariotry during the Middle Bronze Age at Pecica (Nicodemus 2014), the large fortified sites near the foothills of the Apuseni Mountains reflects a new emphasis on protecting stock, including horses, likely associated with increased sophistication in warfare. In southeast Transylvania, Dietrich (2014b) has demonstrated that the Wietenberg community at Rotbav was rapidly replaced by a Noua community from the Eurasian Steppe. Based on these data, Dietrich (2014b:341) has argued for a rapid population influx of Noua migrants at the start of the Late Bronze Age that washed westward across the Transylvania Plateau, pushing Wietenberg communities to the west. This dynamic has also been suggested by Boroffka (1994a). Southwest Transylvania is a key location in which these macroregional migration dynamics can be explored. Through absolute dating, it is possible to monitor whether Wietenberg communities persisted in southwest Transylvania longer than in eastern Transylvania, whether Noua communities rapidly replaced Wietenberg communities or they co-existed for a period of time, and how the impact of new highly mobile, hierarchically organized pastoral communities from the Eurasian steppe may have disrupted the established trade of metal, salt, and other reasons to the Carpathian Basin. The tempo of social change in southwest Transylvania, therefore, can help archaeologists better understand the nature and consequences of the Middle-Late Bronze Age transition.

Bronze Age Archaeology in Transylvania

The archaeology of Bronze Age Transylvania has a long, though not expansive history. While previous research was well conceived and executed, it has suffered in two key ways. First, there has not been much of it. This is a product of greater interest among Romanian archaeologists on earlier (Neolithic) and later periods (Dacian, Roman, and post-Roman) and a lack of funding for large-scale research. Second, the work has been piecemeal, mostly done through salvage work or through the reporting of chance finds. When compared with surrounding regions and most countries across Europe, the lack of systematic work in Romania is a stark contrast. In Hungary, for example, the MRT Survey, which provided full coverage coarse-grained survey for large swaths of the Carpathian Basin (see Duffy 2010), and efforts to develop absolute radiocarbon databases for the Bronze Age (O'Shea 1991; Jaeger and Kulscar 2013; Jaeger 2010), have provided the accurate culture historical base that is necessary to begin to ask more anthropologically oriented questions. In Romania, however, there have been few survey projects (though see Molnár and Nagy 2013), and radiocarbon databases are significantly underdeveloped. More than anything else, it has been a lack of resources (time and money) available for, and dedicated to, Bronze Age research that has hampered attempts by Romanian archaeologists to develop a comprehensive, scientifically-based, culture history.

Since 1989 and the end of Socialist rule, the vast archaeological potential of the region has been explored in much greater depth. There have been major contributions to the understanding of Early Bronze Age (e.g., Ciugudean 1996; Gerling and Ciugudean 2013; Popa and Totoianu 2010) and Middle Bronze Age (e.g., Andrițoiu 1992; Boroffka 1994a; Dietrich 2010, 2014a, 2014b; Dietrich and Dietrich 2011; Molnár and Nagy 2013; Motzoi-Chicideanu 2011; Palincaș 2014) over the past twenty-five years. In the past five years, development-led salvage projects, including the expansion of motorway construction, has resulted in a large influx of archaeological evidence that has, and will continue to, transformed our understanding of the Bronze Age (e.g., Bălan 2014a, 2014b; Bălan et al. 2014). In Chapter 7, I discuss the history of archaeological research on the Bronze Age in much more detail through the lens of contributions to chronological development. Owing to the close disciplinary association with history in European archaeological traditions, the archaeology of Bronze Age Transylvania is nearly synonymous with culture historical emphases on developing a chronology and identification of archaeological cultures. Romanian archaeologists are just beginning to explore issues of identity, social complexity, ideology, and economic production in more detail. In this section, I introduce the current state of research on several of these topics central to this study.

Bronze Age Transylvanian communities engaged in crop cultivation and animal husbandry, incorporating domesticated cereals (including emmer and einkorn wheat and barley) and animals (including sheep, goats, pigs, cattle, and horses) into their diet (Ciută 2008, 2009, 2012:54-55; Gyulai 1993). Domesticated animals were also important for secondary products, including traction, transportation, milk, wool, and hides. There are very few zooarchaeological analyses of assemblages from Bronze Age Transylvanian sites. At Rotbav, Dietrich has documented that Middle Bronze Age Wietenberg deposits have an equal representation of bovid and ovicaprine remains (Dietrich 2014b:340). Mortality profiles of fauna suggests Wietenberg communities were slaughtering young animals for meat (Dietrich 2014b:340). In contrast, Late Bronze Age Noua deposits are primarily associated with bovid remains, and the abundance of full adults suggests significant reliance on secondary products in the forms of hides and wool (Dietrich 2014b:340). This work suggests that Wietenberg and Noua communities engaged in different subsistence economies. By the start of the Early Bronze Age, domestic cereals and plough agriculture characterized Transylvanian economies (Ciută 2012:55). The large-scale agriculture, along with fuel needs for settlements and metallurgy, contributed towards localized deforestation and limited availability of indigenous vegetation (Ciută 2012:54-55). The Late Bronze Age saw a change in agro-pastoral economies, with an increase in pastoral resource and sophistication in plant cultivation (Ciută 2012:55-56).

The settlement systems of the Bronze Age in Transylvania are mostly known from chance finds over the past century. For most sites, archaeologists know that there is a site, but very little information about the horizontal or vertical extent of the sites is known and radiocarbon dates are almost non-existent. Our knowledge of the existing patterns comes from a few significant studies over the past half-century. Bronze Age settlements have been found in many different environments, from high in the mountains to along the Mureș Valley (Boroffka 1994a; Ciugudean 1996). At the Early Bronze Age site of Livezile-*Baia*, Ciugudean demonstrated that the small ridge-top settlement was fortified with an earthen ditch (Ciugudean 1996). There is currently no evidence of human-made fortification of sites associated with the Wietenberg Culture, though this is undoubtedly a product of limited research, particularly a lack of geophysical research. By 1994, over 500 Wietenberg sites had been recorded in Transylvania (see Boroffka 1994a) though the number has likely spiked in the last two decades with the increase of survey associated with highway and pipeline projects. Wietenberg sites are normally not associated with stratified deposits, with archaeologists suggesting that communities expanded or rebuilt their settlements horizontally rather than vertically as is the case in tell settlements of the Carpathian Basin (see Bălan 2014a). Some important stratified exceptions are the sites of Derșida (which provided the most important stratified ceramic sequence on which the relative ceramic chronology is constructed) (Chidioșan 1980) and Alba Iulia-*Recea/Monolit*, which is the largest stratified Bronze Age site, including Early, Middle, and Late Bronze Age occupation along with pre- and post-Bronze Age deposits, in Alba County (Ciugudean 2009, 2010, 2012b; Ciugudean and Quinn 2015; Lascu 2010, 2012; Popa and Totoianu 2010). The limited quantity of stratified sites and large number of sites have led some archaeologists to conclude that Wietenberg communities were highly mobile pastoralists (see Boroffka 1994a, Horedt 1960).

Early, Middle, and Late Bronze Age communities in Transylvania buried their dead in different ways. Ciugudean (1995, 1996, 1997a, 1997b, 2011) has presented the most comprehensive syntheses of Early Bronze Age mortuary practices in Transylvania. During the Early Bronze Age, communities in the Apuseni Mountains constructed tomb cemeteries along ridges. After death, individuals were laid on the ground and covered with limestone cairns, then earthen caps. The main body treatment was primary inhumation, though secondary inhumations of disarticulated remains are also common. At Ampoița-*Peret*, Ciugudean (1996) documented a stone alter that was covered with an earthen cap like other stone-capped tombs. It is possible that stone alters were used for excarnation, which may help explain the co-occurrence of primary and secondary burials in EBA tomb cemeteries. In the lowlands, tombs were generally larger and not covered with limestone cairns, only with earth (Ciugudean 1996). Across the Carpathian

Macroregion, Early Bronze Age tomb construction is associated with the spread of Yamnaya cultural traditions from the Eurasian Steppe (see Heyd 2011). Ciugudean has argued that other evidence of continuity between Copper Age Coțofeni and Early Bronze Age communities in southwest Transylvania (including site locations and ceramic traditions) suggests that tombs in the Apuseni Mountains were local adaptations of a broader mortuary template rather than evidence of Yamnaya migration. The transition to the Middle Bronze Age Wietenberg Culture saw cremation replace inhumation as the dominant mortuary practice (Boroffka 1994a; Motzoi-Chicideanu 2011; Palincaș 2014). While cremation and burial in urns in flat cemeteries was the dominant mortuary treatment (e.g., Andrițoiu 1978, 1987; Fântâneau et al. 2013; Marinescu 2006; Paul 1995), there is also evidence of depositing cremated remains in the mantles of Early Bronze Age tombs (Ciugudean 1996) as well as inhumation within flat cemeteries (e.g., Paul 1995) and settlements (Bălan 2014a, 2014b; Bălan and Quinn 2014). Grave goods beyond the ceramic vessels that make up the urns and lids that contain cremated remains are sparse in Wietenberg cemeteries (Boroffka 1994a; Fântâneau et al. 2013). The Late Bronze Age Noua Culture is associated with a return to primary inhumation as the dominant mortuary treatment. Instead of highly visible tombs, Noua communities buried their dead in large flat cemeteries, and burial goods often included typical double-handled Noua vessels (*kantharos*).

Bronze Age Archaeology in the Geoagiu Valley

Within southwest Transylvania, the Geoagiu Valley cross-cuts the Trascău Mountains from upland ore-sources and pastureland, through arable land, and connects to the Mureș River near the confluence of the Târnava and Mureș Rivers and the nearby salt spring of Panade. Archaeologists have previously recorded evidence of Bronze Age activity in the Geoagiu Valley through two small excavations and a series of chance finds with no exact provenance. In 1972, Ciugudean excavated an Early Bronze Age tomb at Geoagiu de Sus-*Cuciu* (Ciugudean 1977:43-49, 1986:69, 1991:81-89, 1995:25, 1996:45-46; Vlassa et al. 1986:60, 64). The tomb, which contained 7 burials, was part of a cemetery of 4 visible stone-covered tombs situated on top of a Coțofeni settlement. The whereabouts of the human remains from this tomb are currently unknown. In 1994, Ciugudean conducted salvage excavations on a ritual pit belonging to the Wietenberg Culture at the entrance to the town of Geoagiu de Sus that was discovered during the expansion of a house's cellar (Ciugudean 1999). The extent of the site was unknown until the survey presented in this study. Other unprovenienced material attributed to the Bronze Age from the valley has also been published (Boroffka 1994a; Moga and Ciugudean 1995; Popa and Totoianu 2010). Near the large limestone hilltop (and modern limestone quarry) called Măgura in Geomal, evidence of destroyed tombs has previously been recorded (Ciugudean 1997a:54, 1986:69; 1996:46-47; Vlassa et al. 1986:60). In the area near the confluence of the Geoagiu Valley and the Mureș Valley, a couple sites have been previously excavated. At the large, fortified hilltop Coțofeni site of Capud-*Măgura Capudului*, a small amount of Wietenberg ceramics were discovered during excavations (Boroffka 1994a:28; Roska 1942:125). In the town of Teiuș, two Late Bronze Age cemeteries associated with the Noua culture have been excavated, though the location of the collections is currently unknown.

The paucity of archaeological evidence of Bronze Age occupation in the Geoagiu Valley prior to this project stood in contrast to more extensive work that had been done by Boroffka, Vlassa, and others in the Aiud Valley (Boroffka 1994a, 1994b) and by Ciugudean and others in the Ampoi Valley (Ciugudean 1996, 1995, 1997a). As a major route of access to the Metal Mountains from the Mureș Valley, the paucity of sites stood out as an artifact of archeological sampling rather than a result of limited settlement and other activities in the Geoagiu Valley during the Bronze Age.

Existing Views of Community Organization and Social Change in Bronze Age Transylvania

Mining and Metallurgy

In Romania, the first copper objects have been dated to the Early Neolithic (Starcevo-Criș IIIB-IVA, IV B) (Beșliu and Lazarovici 1995:111; Beșliu et al. 1992:98; Tincu 2011). Copper metallurgy expanded throughout the Neolithic and Eneolithic in Transylvania and the Banat with the Petrești and Tiszapolgar Cultures (Diaconescu 2009; Tincu 2011). Copper metallurgy was important in Copper Age Coțofeni communities

(Ciugudean 2002). There is no concrete direct evidence of copper mining prior to the Iron Age (Boroffka 2006). Boroffka (2006), however, has identified several potential sites of prehistoric mining, including at Cornea, Răchita, and Uioara de Jos that have yet to be subject to systematic archaeological investigation and dating. A new collaboration between Muzeul Național al Unirii in Alba Iulia and the German Mining Museum in Bochum, Germany is currently investigating potential prehistoric gold mining in Bucium and hopefully will produce direct evidence of pre-Iron Age mining.

Romanian gold production pre-dates the Bronze Age (see Ciugudean 2012a). At Cheile Turzii-*Peștera Ungurului*, Lazarovici et al. (2012) link the presence of more than 70 gold items, including small beads and sheets, to a gold production workshop at a Copper Age Coțofeni site. Whether prehistoric gold was mined or recovered from placer deposits (through panning in rivers, streams, and nearby deposits), remains up for considerable debate (see Ciugudean 2012a). Popescu (1956) and Rusu (1972) pre-supposed an alluvial origin for Bronze Age and Early Iron Age gold objects in Transylvania, and Makkay (1996:39-40) has pre-supposed the same for Copper Age gold objects in the Carpathian Basin (Ciugudean 2012a:220). Harding (2000:199-200) suggested a possible mining origin for gold deposits in southwest Transylvania during the Bronze Age. Ciugudean argued that there was likely hard rock mining in the Cetate massif in Roșia Montană, with some of the best evidence being evidence of fire-setting on the surface of an opencast mine at the Găuri site within Roșia Montană (Ciugudean 2012a). The intensity of Dacian, Roman, Medieval, historic, and modern mining in the region would have destroyed most evidence of prehistoric mining – if prehistoric communities were mining at Roșia Montană.

With the lack of direct evidence for Bronze Age mining in southwest Transylvania, there has been very little consideration of how it might be organized. Instead of looking at metal procurement directly, its organization has been explored by considering how southwest Transylvania articulates with surrounding regions, particularly the better-studied eastern Carpathian Basin to the west of the Apuseni Mountains. Gerling et al. (2012) have argued that individuals (primarily adult males) with non-local isotopic signatures found in the Sárrétudvari-Örhalom Early Bronze Age kurgan (burial mound) in the eastern Carpathians came from southwestern Transylvania.

Gerling et al. (2012:1107-1108) suggest individuals from southwest Transylvania were moving down to the Carpathian Basin as part of seasonal transhumance for pasturing livestock. This hypothesis overlooks the significant distance and topography between the Carpathian Basin kurgan and southwest Transylvania – approximately 200km, crossing the Apuseni Mountains – which would make seasonal transhumance less likely. Gerling et al. (2012:1107) dismiss another hypothesis that the individuals were participants in established long-distance exchange relationships, perhaps centered on the trade of metal from the metal-rich southern Transylvania to the metal-poor Carpathian Basin, on the basis that it would be unlikely that trade would be that regular, and that one grave (a child's grave) with a local isotopic signature would not be explained. However, it is not clear that these are sufficient to eliminate the possibility of established long-distance exchange interactions during the Early Bronze Age. Two of the four non-local graves were buried with metal objects – including gold rings and a bronze axe – with parallels in Transylvania (Dani 2011:32). The presence of metal in these graves might indicate that these individuals might have participated in long-distance movement of gold and copper from Transylvania to the Carpathian Basin. O'Shea (2011) has argued that the Mureș River was a key corridor for interregional exchange for the movement of Bronze Age goods, including Transylvanian gold and copper, throughout the Carpathian Basin. The rise of the regional center at Pecica-*Șanțul Mare* during the Middle Bronze Age can in part be attributed to the site's position at a key bend in the Mureș River, which would have allowed the community to monitor and restrict the movement of resources along the Mureș. O'Shea (2011) argues that the expansion of overland trade in the Late Bronze Age, undermined and superseded Middle Bronze Age riverine exchange systems, transforming the paths through which Transylvanian metal and ore would flow. For O'Shea (2011) and Nicodemus (2014), the flow of metal was channelized and controlled by the florescence of Pecica around 1875 BC. For control to be exerted at this point in the system – no matter how extraction was organized in southwest Transylvania – access and interregional trade must be regular, ongoing, and institutionalized.

Social Complexity

Perhaps due to Romanian archaeology's roots in German archaeological approaches focused on material economies, chronology, cultural identity, and interaction, the emergence of social complexity has only recently become a central question in the study of the Romanian Bronze Age. There is little debate that social hierarchies were present in the second half of the Late Bronze Age (Gava Culture, Hallstatt B, 1000-800 BC) (Ciugudean 2010; Gogâltan 2009; Kacsó 1990, 1994, 2008). The Late Bronze Age site of Teleac, positioned to monitor the confluence of the Ampoi and Mureș Rivers, is 30 hectares enclosed by a series of large earthen fortifications (Ciugudean 2009, 2011; Berecki et al. 2013). This site is over three times larger than any Early or Middle Bronze Age settlement in the region. Excavations have uncovered rich material culture as well as evidence for large-scale centralized ceramic and metallurgical production (Vasiliev et al. 1991; Berecki et al. 2013). In addition to the large center of Teleac, other Band-Cugir and Gava settlements across the region suggest that there was a centralized chiefly polity in southwest Transylvania from at least 1250 BC on (Ciugudean 2010).

When and how the socioeconomic systems of inequality that defined these Late Bronze Age societies first appeared in Transylvania is still subject to significant debate. During the Copper Age, Coțofeni communities in southwest Transylvania aggregated in large fortified settlements (e.g., Capud-*Măgura Capudului*), but there is no evidence that multiple communities were integrated into hierarchical polities (see Parkinson 2002 for a similar pattern in the Carpathian Basin during the Copper Age) (Ciugudean 2001, 2002; Popa 2013). In the Early Bronze Age, Ciugudean has argued that the mortuary pattern of restrictive burial and metal grave goods is indicative of the emergence of local elite controlling access to the rich metal resources in the southern Apuseni mountains (Ciugudean 2011:29). Dietrich (2010) has also suggested that Early Bronze Age communities in southeastern Transylvania were characterized by interacting elites.

Dietrich (2010, 2012, 2014b) has argued that the Middle Bronze Age Wietenberg Culture was organized hierarchically based on elite control of salt extraction and distribution. Dietrich has reconstructed settlement patterns based on spatial distributions within existing ceramic chronological phases. Using Thiessen polygons, Dietrich has argued that southeastern Transylvanian Wietenberg communities had a hierarchical settlement pattern: a single hillfort surrounded by several open settlements in the lowlands (Dietrich 2010, 2014b:341). These territorial polities are often associated with bronze hoards that include bronze axes and Mycenaean swords (Dietrich 2014b:341). In southeast Transylvania, which lacks the copper and gold deposits of the southern Apuseni Mountains, Dietrich has argued that elites came to power through control of salt extraction and trade (Dietrich 2010). Dietrich argues that the co-occurrence of Mycenaean swords and rich salt deposits, which has been demonstrated to have been extracted in the Middle Bronze Age (Harding 2013, Harding and Kavruk 2013; Harding and Szeman 2011), indicates that Wietenberg elite were connected to Mediterranean exchange systems focused on the interregional movement of salt (Dietrich 2014b:341-342). Dietrich's assessment of regional settlement patterns relies on the continued accuracy of the existing ceramic chronology as well as equating hilltop sites (which normally lack visible defensive features) and elite-controlled regional centers.

Molnár and Nagy (2013) have approached Wietenberg and Otomani settlement systems by questioning the link between central, defensible, or fortified sites and a regional center at in a regional social hierarchy. Using GIS approaches, they model Middle Bronze Age settlement systems and conclude that Middle Bronze Age communities were organized into hierarchical chiefly societies (Molnár and Nagy 2013:47). Molnár and Nagy problematize the premise, however, found in Dietrich and other publications (e.g., Earle and Kristiansen 2010; Gogâltan 2008:39; Harding 2000:274, 2007:32, 40; Kristiansen and Larsson 2005:225), that fortifications equals the existence of a central authority due to the need to mobilize and coordinate labor (Molnár and Nagy 2013:8). Recent trends within anthropological archaeology have challenged the presumed need for central authority for constructing monuments (see Horsley et al. 2014; Howey 2012; Wright 2014) and the presumed political implications of a perceived settlement hierarchy (see Duffy 2015). Molnár and Nagy (2013:8-9) also question whether the quantity of bronze objects that have been found in northwestern Transylvania can be used as a direct indicator of the existence of a social hierarchy. While referring to the Wietenberg polities as "integrated chiefdoms", they argue that they are closer to tribal and segmentary societies than strongly hierarchical chiefdoms as argued by Kristiansen and Earle (Earle 2002; Earle and Kristiansen 2010; Kristiansen and Larsson 2005).

Molnár and Nagy (2013:47) argue that Wietenberg communities were integrated into settlement clusters with each cluster consisting of one or two smaller fortified centers and four to five open sites of various sizes. Like Dietrich, the spatial analyses by Molnár and Nagy are also built on the integrity of the relative ceramic chronology. For the Wietenberg A (what I refer to as the Formative Wietenberg, see Chapter 7, and the only period for which the existing ceramic chronology is fairly reliable), the settlements are spread across the landscapes and no evidence of site size hierarchies can be identified. The authors emphasize the link between the Wietenberg settlement systems and riverine corridors in northwest Transylvania; one that might be linked to salt extraction and distribution (Molnár and Nagy 2013:55-56).

Together, the majority of researchers in Transylvania argue that complex regional polities emerged in the Early Bronze Age and were thriving by the Middle Bronze Age Wietenberg Culture (with Molnár and Nagy being the most conservative in their assessment of social hierarchy in the Wietenberg Culture). As I explore through the data presented in this dissertation, many of the existing analyses of complexity in the Transylvanian Bronze Age rely upon a relative ceramic chronology that is not supported with absolute dates, a presumed link between metal and elites, and a coarse-grained settlement patterns that may obscure dynamic social processes.

Chapter Summary

In this chapter, I presented the archaeological context for this study emphasizing how previous researchers have theorized the link between metal and social complexity. Bronze Age archaeologists have increasingly recognized that metal is only one dimension of the economy, and that more holistic studies of community organization are needed to demonstrate, instead of assume, the roles metal may have played in creating, marking, and maintaining inequality in Bronze Age societies. In resource procurement zones like southwest Transylvania, it is important to not assume a direct link between metals and social organization. In Chapter 5, I present holistic models for how Bronze Age communities organized themselves and changed over time.

PART III: MODELS

Chapter 5 - Models for the Organization and Evolution of Bronze Age Communities in Southwest Transylvania

Chapter Introduction

This dissertation monitors how community organization changed over the course of the Bronze Age in the resource procurement zone of southwest Transylvania. In Chapter 2, I highlighted the theoretical challenges for studying transformations in middle-range societies. Specifically, models for social organization and evolution are needed that can remedy the tensions between dimensional approaches to social complexity as a continuous spectrum and typological approaches that recognize qualitative shifts in how societies are organized through time. Chapter 2 suggested that approaches to the coherence and dissonance of inequality across institutions may provide a way to understand different types of change in the organization and evolution of middle-range societies. This chapter presents testable models for the organization and evolution of middle-range societies in southwest Transylvania. The models presented below account for the specific history of archaeological research, nature of available or acquirable archaeological data, and geo-environmental context of southwest Transylvania as a resource procurement zone. The types of data necessary to evaluate these models informed the development of the Bronze Age Transylvania Survey project (Chapter 6) and will be evaluated with archaeological evidence presented in Chapters 7, 8, 9, and 10.

The process of modeling community organization and evolution in this dissertation involves several steps. I describe Bronze Age community organization as composed of several distinct institutions. These institutions are defined as sets of socially-mediated rules and obligations that governed (but not dictated) behavior in each of three realms: social, economic, and ideological. Each of these institutions is organized along two continuous dimensions: (1) scale of spatial integration (from local to regional), and (2) consistency across social units (from homogeneous to variable). The organization of each individual institution is measured along these dimensions. I examine how these individual institutions articulate with each other, first within realms and next across realms. The nature of inter-realm articulation can be described as coherent or dissonant. I monitor how individual institutions vary across space and how they change in relation to each other through time. In this approach, no single institution (e.g., how metal procurement is organized) can define the organization of an entire society. Additionally, no single archaeological measure (e.g., settlement hierarchy) can be used to define social complexity. A more refined model of social organization and evolution in the Bronze Age is possible by monitoring the trajectories of inter-institutional tension over time.

In this chapter, I identify the key realms, institutions, and coherent social forms and discuss how they may have changed over the course of the Bronze Age in Transylvania. I present archaeological measures and expectations that can be evaluated using data presented in this study. The alternative trajectories developed here are testable hypotheses for Bronze Age community organization. The archaeological expectations presented in this chapter allow for the evaluation of these alternative models with the archaeological record of southwest Transylvania. The overall goal is to develop a system to monitor community organization and organizational change in middle-range societies.

Key Realms, Institutions, and Social Forms in the Transylvanian Bronze Age

As discussed in Chapter 2, institutions are the socially-mediated rules and obligations that emerge out of human actions and interactions, and recursively affect human choice. Institutions comprise the traditions and ways of behaving that shape many aspects of human cultural behavior. While all institutions, as part of a cohesive social system, are mutually constitutive, separating and characterizing individual institutions can be a useful first-step in documenting community organization.

In this study, I focus on seven institutions, grouped together in terms of three *realms*: social, economic, and ideological (Figure 5.1; Table 5.1). Collectively, the institutions discussed in this study affect lifeways across Bronze Age communities. However, they are not exhaustive of all institutions, and future work that addresses other institutions is needed.

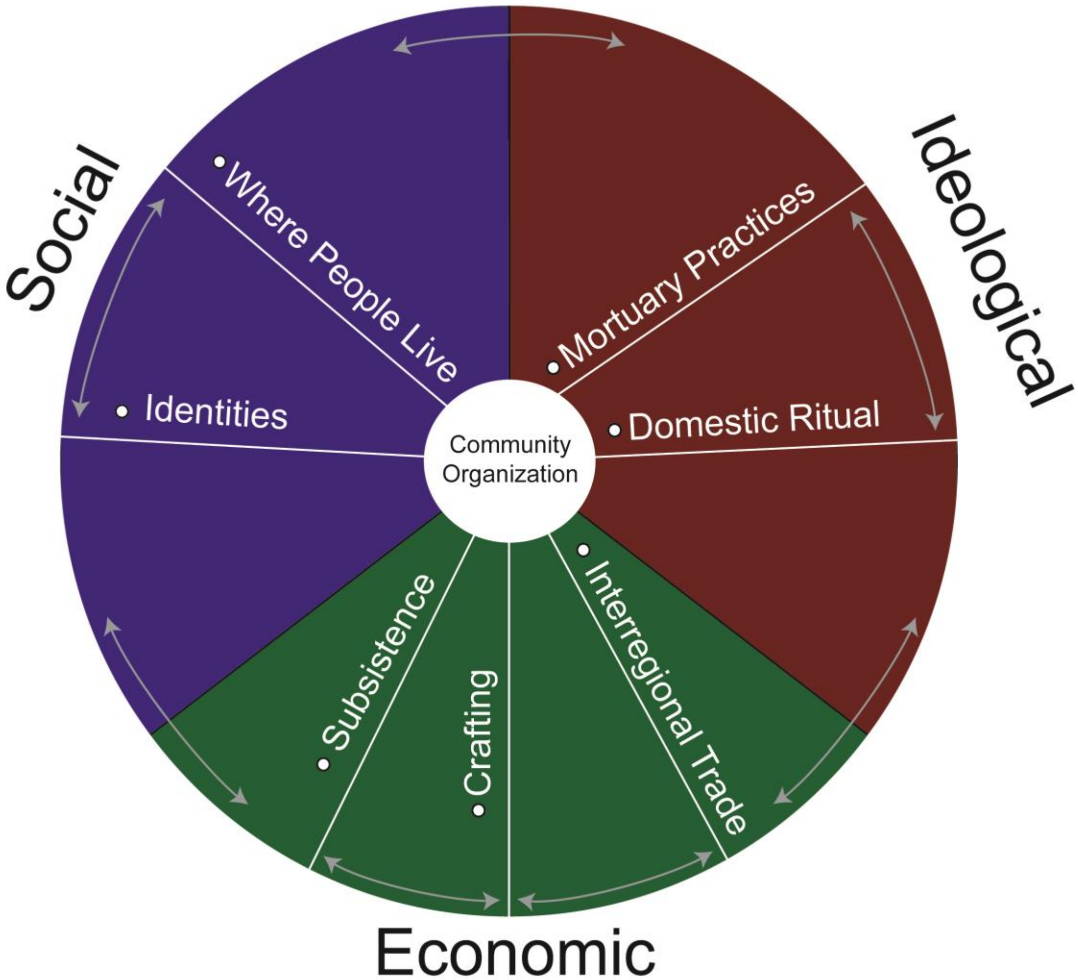

Figure 5.1 – Schematic of feedback among realms and institutions.

Table 5.1 – Realms and some of their constituent institutions focused on in this study.

Realm	**Institution**
Social	How people situate themselves across the landscape.
	What identities are present and marked.
Economic	How crafting was organized.
	How subsistence was organized.
	How trade and exchange was organized.
Ideological	How in/equality was legitimized in mortuary rituals.
	How in/equality was legitimized in domestic/residential space.

Institutions in the social realm affect how social units are defined. In Bronze Age Transylvania, the key social institutions that will be investigated are (1) how people distribute themselves across the landscape, and (2) what identities are present and marked. Institutions in the economic realm affect how goods and resources are procured, produced, distributed, and consumed. In Bronze Age Transylvania, the key economic institutions that will be investigated are (1) how crafting was organized, (2) how subsistence was organized, and (3) how trade and exchange was organized. Institutions in the ideological realm affect how relationships of interpersonal equality and inequality are legitimized, sanctioned, or projected. In Bronze Age Transylvania, the key ideological institutions that will be investigated are (1) how in/equality was legitimized in mortuary rituals, and (2) how in/equality was legitimized in domestic/residential space. Cross-cutting these institutions is political action, undertaken by social units that have decision-making capability for a particular task; also referred to as the *effective agents* for a particular task. The study of the transformation of middle-range societies towards hierarchical centralized polities is the study of the creation of a new scale of *effective agents*, the regional elite, which exert disproportionate influence over institutions and communities, replacing household and local village leaders as the *effective agents* for a range of activities.

Institutions are organized with respect to political decision-making based on two key dimensions: (1) scale of spatial integration and (2) in/equality among social units. Along a continuum, institutions and the activities they influence can be organized towards the local scale (e.g., within villages) or towards the regional scale (e.g., within regional centers). Similarly, institutions and the activities they influence can be organized evenly (decentralized), with social groups engaging in the same suite of activities, or unevenly, with social groups specializing in different activities resulting in significant centralization of activity and the potential for control by a small fraction of effective agents. By measuring the spatial scale at which institutions are organized, and the degree of centralization across effective agents at that scale, we can estimate institutional organization.

How Institutions Articulate in Bronze Age Societies

Assessments of coherence and dissonance in community organization are conducted at the scale of realms (social, economic, ideological and political) rather than at the institutional scale. This is important because even in highly centralized societies, we should not expect all institutions to reflect centralized control. For example, societies can have the same level of centralized organization whether metal production or subsistence production is coordinated by regional elites. These different pathways to complexity have been referenced in many chiefdom models (e.g., staple finance vs. wealth finance; apical vs. constituent hierarchies) (see Earle 1997, 2002; Beck 2003). At the same time, it is important to consider the different implications if one or several economic institutions are centralized.

Community organization is characterized as coherent if regional consolidation and inequality (or lack thereof) is replicated across all realms. For example, if all institutions and realms support local village autonomy with minimal regional integration, the system can be characterized as coherent. Community organization is characterized as dissonant if there are multiple scales of regional consolidation and inequality across different realms. For example, if metal production was coordinated and controlled by regional elites, but there is little evidence of ideological legitimization of regional inequality, community organization can be characterized as dissonant. It is important to state again that dissonant systems are fully functioning societies, and the dissonance is not some sort of ‘error’, but rather a critical aspect of community organization emerging from, and affecting, individuals and relationships.

Monitoring *how* societies are coherent or dissonant is much more important than simply characterizing institutional articulations as one or the other. These institutional configurations would have provided both opportunities and challenges for agents to create social change. By combining institutions organized along spectra (continuous variables) in this way, we can more readily identify qualitative differences in community organization.

Primary Coherent Social Forms in Middle Range Societies

While institutions and realms are organized along a continuum, there are several modes along that continuum. Three modes at the low, middle, and high ends of the continuum are common templates within middle-range societies ethnographically and archaeologically and are explored in this study. Coherent systems will have all realms organized in close proximity to the same mode, while realms in dissonant systems will be organized relative to multiple (2 or 3) modes:

Mode 1: Communities integrated with regional symmetrical relationships, lacking ranking among comparable social units, with activity coordinated by autonomous households or villages.

Mode 2: Communities integrated with regional asymmetrical relationships, with some inequality among social units but minimal ranking, with most activity coordinated by autonomous households or villages, though some temporary activities can be coordinated by local elites.

Mode 3: Communities integrated with regional hierarchical relationships, ranking of comparable social units, with some activity coordinated by autonomous households or villages, though several key activities are coordinated by permanent elites in a regional center.

Models for monitoring change through time are necessary to fully understand social organization. Societies may appear similar on the surface (e.g., similar settlement patterns) at any moment in time but are drawn to different modes. Alternatively, societies may appear superficially different but are drawn to the same mode. We can only understand community organization if we complement synchronic assessments of institutional and inter-institutional organization by monitoring the trajectories of community organization over time (see Anderson 1994; Barrier and Horsley 2014; Blitz 1999; Fowles 2002; Marcus 1998).

Distinguishing Types of Change in the Transylvanian Bronze Age

I argue that archaeologists must be able to identify, describe, and distinguish microevolutionary, macroevolutionary, and social transformational changes. It is important to acknowledge that over time, inequality in societies vary in both degree and kind (Drennan et al. 2010). Microevolutionary changes are constantly happening. Through microevolutionary change, the degree of inequality within any institution can remain constant, or gradually grow or diminish. Gradual and incremental changes within and across institutions will not fundamentally change the nature of how humans interact or communities organize themselves. If community organization is characterized by either coherent egalitarianism or hierarchy, microevolutionary change will have not shift the organizational structure towards dissonance. If systems are dissonant, it will not change the kind of dissonant institutional articulation, nor change the system towards coherence. As described in Chapter 2, these different forms of change vary in terms of their tempo, scale, and breadth across institutions.

Both macroevolutionary change and social transformations within middle-range societies involve the disruption and recombination of inter-institutional articulations. Disruptions, also described by Sewell (2005) as "structural disjunctions" and by Beck et al. (2007) as "ruptures", are episodes where institutional articulations are temporarily disjoined (Beck and Brown 2012:73). Social systems cannot tolerate such disruptions for long, so institutions will quickly rearticulate. When institutions rearticulate, it can be in the same way as prior to the disjunction (which would constitute microevolutionary change), or differently (which would constitute macroevolutionary change). Macroevolutionary changes are commonly identified as cycling or oscillations in social complexity, such as is the case in shifts between gumlao and gumsa organizational forms in Kachin society (see Friedman 1979; Leach 1947, 1954), or as alternative resource management strategies (see Chatters and Prentiss 2005).

Transformations in middle-range societies are a special case set apart from other macroevolutionary changes. In transformative events, institutions rearticulate in *novel coherence*, rearticulating in a fundamentally different way that cannot easily change back. Within middle-range societies, this is seen with the rise of complex regional polities, where economic, social, ideological, and political realms come together to support and legitimize permanent social relationships. Once this threshold is crossed, even if regional polities collapse, they do not easily cycle back to autonomous villages. As such, this qualitative change creates a new level of equilibrium within the spectrum of social complexity. For social transformations, disruptive events that rupture existing social institutions must also be supported with human action and choice to push a novel way of organizing the system, as well as have a broader institutional context that allows for different institutions to be put together in this new way. To this final point, the long-term changes in institutions may position them to a place where it does not take significant convincing by human agents to rearticulate in the new way. For example, if there are already significant economic inequalities in the procurement, production, distribution, and consumption of a range of subsistence and craft products, then a change in ideology through the introduction of new ritual practices may be sufficient to institutionalize those inequalities. If different economic institutions are not amenable to centralization and hierarchy, then similar changes in ritual practice will not be sufficient to successfully institutionalize inequalities. As a result, archaeologists must be able to characterize the broader institutional conditions, identify episodic ruptures in inter-institutional articulations.

Taking a deep historical perspective on the trajectory of a single region allows archaeologists to consider change at multiple scales (see Shryock and Smail 2011). While social transformations are the subject of significant study, smaller-scale changes play an important and often overlooked role in their emergence. Tracing all institutional changes, large and small, over nearly 1500 years makes it possible to understand how, when, and why social transformations occurred in the past.

Monitoring Community Organization and Change in the Archaeological Record

This section presents the ways of monitoring variation in community organization and change through the archaeological record. I present the archaeological measures that will be monitored in this study as well as the material expectations for the institutions and realms. These archaeological expectations

Archaeological Measures

Realms, and the institutions within them, are abstract categories and not directly measurable. Rather, they can be understood through the material traces of activities and behaviors. *Archaeological measures* are the analytical tools which transform the static material record into quantitative assessments of institutions and realms. I will first briefly introduce the different lines of archaeological evidence that are included in this study, and then discuss the specific archaeological measures that will be used to evaluate the organization of individual institutions. There are three primary lines of archaeological evidence that are used in this study to evaluate institutional organization: settlement patterns, mortuary record, and artifacts.

Settlement Patterns

The most significant line of evidence in this study is settlement patterns in Bronze Age Transylvania. *Settlement patterns* are the material remains of how people situated themselves across the landscape. There are three key aspects of settlement patterns that are important for this study: variability in settlement size, nature of inter-settlement networking, and the locations where settlements are placed. First, whether people chose to live in similarly sized, or differently sized, settlements would have impacted the organization of many different social, political, and economic institutions. The presence of settlement site-size hierarchies, where there are few large settlements and many smaller settlements, is traditionally one of the key archaeological measures for the presence of complex regional polities (see Anderson 1994; Duffy 2015). However, demographic centralization does not always correspond with the presence of regional political control (see Quinn and Barrier 2014; Barrier and Horsley 2014). Nevertheless, living in similarly sized communities, or a combination of large and small settlements, would have presented different social contexts that would have affected the capacity for regional control, the need to mobilize subsistence resources, and strategies for resolving inter-personal conflict. The presence of settlement size hierarchies is best measured through estimates of site sizes. In this study, site sizes are directly measured as horizontal extent and vertical depth through pedestrian survey and test excavation, and indirectly estimated through a computer-based model of network connectivity.

Second, how settlements within southwest Transylvania interacted will affect the scale of regional integration of several institutions. Settlements are never completely isolated from each other – there is always some form of inter-settlement interaction, whether positive (e.g., economic cooperation) or negative (e.g., raiding). Within middle-range societies, the nature of inter-settlement interaction is a critical line of evidence for distinguishing different organizational trajectories. The nature of inter-settlement networking is a product of the intensity, types, directions, and frequency of interaction between different communities. One way to characterize inter-settlement interaction is through social network analysis. Network analysis provides a means of predicting which sites will interact with each other, how often they will interact, and to what extent the success of a community is predicated on intense interaction. For example, the presence of substantial settlements in areas with low agricultural productivity would suggest that there would have to be some sort of mechanism to institutionalize inter-settlement mobilization of agricultural resources, otherwise those settlements would not be able to sustain themselves for long. The scales of economic self-sufficiency can be monitored across many different economic and social institutions (including how metal, salt, subsistence, and exotics would have been mobilized). In this study, the nature of inter-settlement interaction is primarily monitored through network analysis of inter-community distance.

Third, where communities place themselves in the landscape is informed, in part, by the organization of economic institutions. Basic economic resources must be mobilized to settlements, and in a heterogeneous landscape like southwest Transylvania, being close to some resources means that the community is farther from others. After settlements are established, their placement will affect the development of economic institutions, resulting in a feedback relationship between economic institutions and settlement patterns. Thus, the settlement system reflects a culturally specific solution to balancing many aspects of the economy. These choices are a product of, and strongly influence, how people are integrated and interact.

The orientation of communities towards spatially discrete economic resources encodes how people valued and mobilized different resources. The economic orientation of settlements is measured in this study through a catchment analysis, in which the entire landscape is given values based on abundance or proximity of resources: (1) agricultural or pastoral land, (2) metal, (3) access to interregional trade routes along the Mureș and Târnava Rivers. The economic orientation can be characterized for each settlement, but also for entire networks (e.g., in which catchments are the largest, most important, settlements located).

Mortuary Record

The mortuary record provides an important complementary line of evidence to regional settlement patterns. The mortuary record is unique among archaeological contexts for several reasons. First, in many cases, the mortuary record is formed through a sequence of processes that can be unpacked. Many residential contexts, such as occupational deposits at Bronze Age Transylvanian settlements, are accumulative deposits of many individual events that cannot be separated out. In cemeteries, discrete depositional events can provide the opportunity to monitor individual agency in the archaeological record. Second, the mortuary record is most often formed through intentioned actions. The treatment of the body, construction of funerary architecture, selection and deposition of grave goods may all reflect intentioned actions on the part of the living. As such, cemeteries are places where we can see what kinds of identities, relationships, objects, and actions Bronze Age peoples wanted to highlight. These may or may not reflect the nature of identities, relationships, or the material world of the living. Because of the intentionality encoded in most mortuary treatments, we can identify key political actors and document political action in ways not normally available in most archaeological contexts. Third, mortuary practices are one of the few contexts where ideological institutions become materialized. In focusing on the practice of ideological institutions, I do not explore the religious content of specific belief systems of Bronze Age societies. Instead, I focus on the roles ritual practices play in mediating social identities, relationships, and inequalities; aspects of ideological institutions that are accessible to prehistoric archaeologists. Fourth, mortuary activity has explicit economic dimensions. Tombs require labor to construct, body treatments like cremation require substantial fuel resources, labor, and skill, and the deposition of grave goods can affect the circulation and value of objects and resources among the living. As a result, the mortuary record in Bronze Age Transylvania contributes important data across several realms and institutions.

In this study, the mortuary record provides information on the scales of social units (based on demographic models of cemeteries), the presence or absence of internal segmentation within a population (based on distinct spatial clustering of contemporaneous burial activity), contesting territorial access to key resources and trade routes (through spatial distribution and visibility of cemeteries in the landscape), and the presence or absence of ideological legitimization of inequality (in differential access to burial and variable energy expenditure in body treatment, funerary architecture, and grave goods).

The spatial dimensions of mortuary analysis have been important since the development of mortuary archaeology in the early 1970s. In his landmark dissertation, Arthur Saxe (1970) proposed several hypotheses that set the agenda for mortuary archaeology in the following decades. One of the more lasting hypotheses was Hypothesis 8, in which Saxe proposed that "to the degree that corporate group rights to use and/or control crucial but restricted resource are attained and/or legitimized by means of lineal descent from the dead (i.e. lineal ties to ancestors), such groups will maintain formal disposal areas for exclusive disposal of their dead, and conversely" (Saxe 1970:119). In this hypothesis, Saxe suggested that where the dead were placed in the landscape was informed by social organization.

Goldstein (1976; 1981:59-61) reviewed ethnographic data employed by Saxe (1970) to support Saxe's Hypothesis 8. In her review, Goldstein determined that Hypothesis 8 did not work in both directions: not all corporate groups that controlled critical and restricted resources through lineal descent maintained formal cemeteries (Goldstein 1981:60-61). Based on her work, Goldstein reformulated Hypothesis 8 to include three separate sub-hypotheses:

> "A. To the degree that corporate group rights to use and/or control crucial but restricted resources are attained and/or legitimized by lineal descent from the dead (i.e. lineal ties to ancestors), such groups will, by the popular religion and its ritualization, regularly reaffirm the lineal corporate group and its rights. *One* means of ritualization is the maintenance of a permanent, specialized, bounded area for the exclusive disposal of their dead.
> B. If a permanent, specialized bounded area for the exclusive disposal of the group's dead exists, then it is likely that this represents a corporate group that has rights over the use and/or control of crucial but restricted resources. This corporate control is most likely to be attained and/or legitimized by means of lineal descent from the dead, either in terms of an actual lineage or in the form of a strong, established tradition of the critical resource passing from parent to offspring.

> C. The more structured and formal the disposal area, the fewer alternative explanations of social organization apply, and conversely." (Goldstein 1981:61).

With this revision of Hypothesis 8, Goldstein made it possible to link the spatial dimensions of mortuary practices to both (1) social organization (i.e. social structure) and (2) economic organization (i.e. the nature of resource utilization) of the society in the past (Goldstein 1981:61). If there are cemeteries, the culture is probably characterized by corporate group structure with lineal descent, and the critical resources within the society may be linked to where cemeteries are placed in the landscape.

Artifact Evidence

The final lines of evidence come from analysis of artifacts recovered through test excavations. The excavations in this project were primarily developed to assess site stratigraphy, collect and date organic material, and generate small comparative samples of artifacts. The artifactual evidence complements larger-scale perspectives from archaeological survey with more fine-grained evidence on the organization of individual institutions. The primary artifact classes discussed in this dissertation, which contribute data across institutions, are (1) objects related to metal production (ores, slags, stone casting molds, and finished metal objects), (2) ceramics, (3) subsistence evidence (faunal remains), (4) stone tools (groundstone axes, chipped stone), (5) non-local resources and objects (obsidian, amber, faience, imported ceramics); and (6) human remains (inhumed skeletal material, cremated bone).

Archaeological Expectations for Inter-Institutional Coherence and Dissonance

As described above, community organization is defined by how institutions articulate. Individual institutions are dimensional, and thus vary quantitatively. Examining how institutions articulate to form inter-institutional constellations that can be coherent or dissonant in multiple ways provides a way to combine qualitative and quantitative approaches within the same model. In cases where social organization is coherent, it is expected that at least one institution in each realm will be organized at the same maximum scale. Using the modes presented above, this would mean that communities could be coherently organized as (1) autonomous villages at the local scale, (2) asymmetric semi-autonomous regional networks, or (3) complex hierarchical regional polities (Figure 5.2). For community organization to be considered coherent, at least one institution within each of the three realms must be organized at the most encompassing mode represented in the institutions.

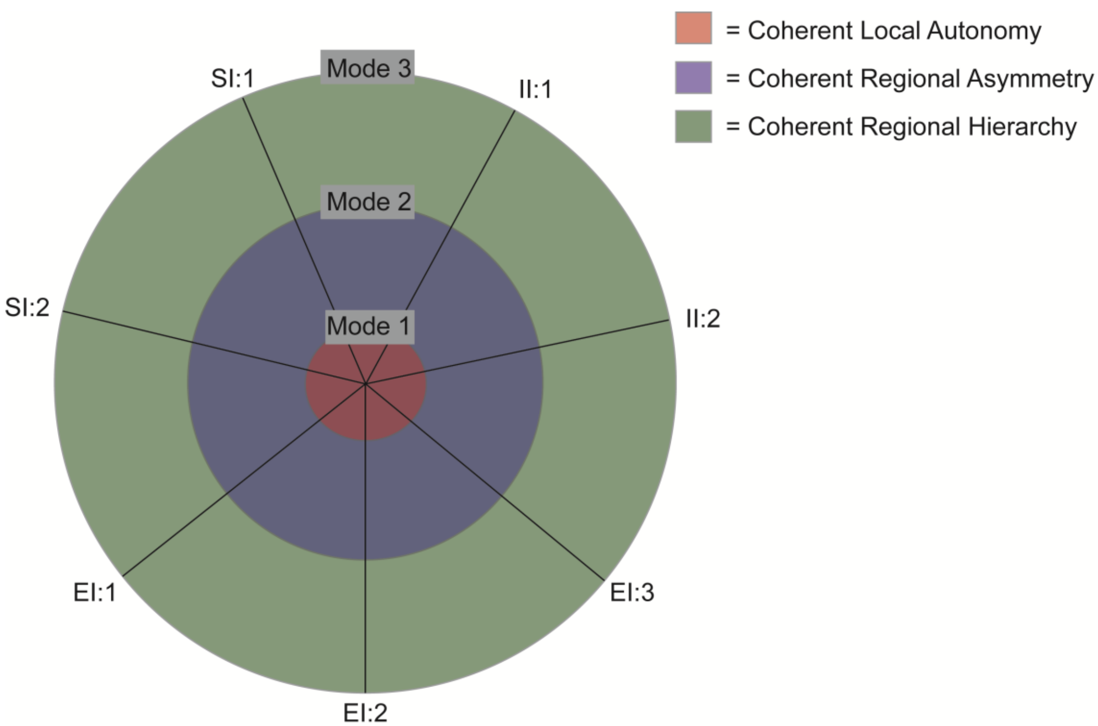

Figure 5.2 – Models of coherent inter-institutional articulations at the three modes (autonomous villages; regional asymmetries; regional hierarchies) for the seven institutions in this study.

In cases where social organization is dissonant, it is expected that institutions within the three realms will be organized at different encompassing modes. There are many more possible constellations of variables than the three coherent forms presented above. Figure 5.3 presents four samples of dissonant community organization. Example (a) portrays a society in which social, ideological, and two economic institutions minimize inequality and promote local autonomy, but in which crafting it is in part influenced by regional elite. Example (b) portrays a society in which settlement systems, identities, crafting economies, and exchange economies indicate the presence of regional elite with hierarchical control, but where subsistence economies are coordinated at a smaller scale and mortuary and domestic ritual do not justify ideologies of regional hierarchy. In example (c), mortuary practices exaggerate inequalities that are not present in social and economic realms. In example (d), mortuary practices and domestic rituals promote more egalitarian world-views to mask inequalities that exist in residential and crafting economic contexts.

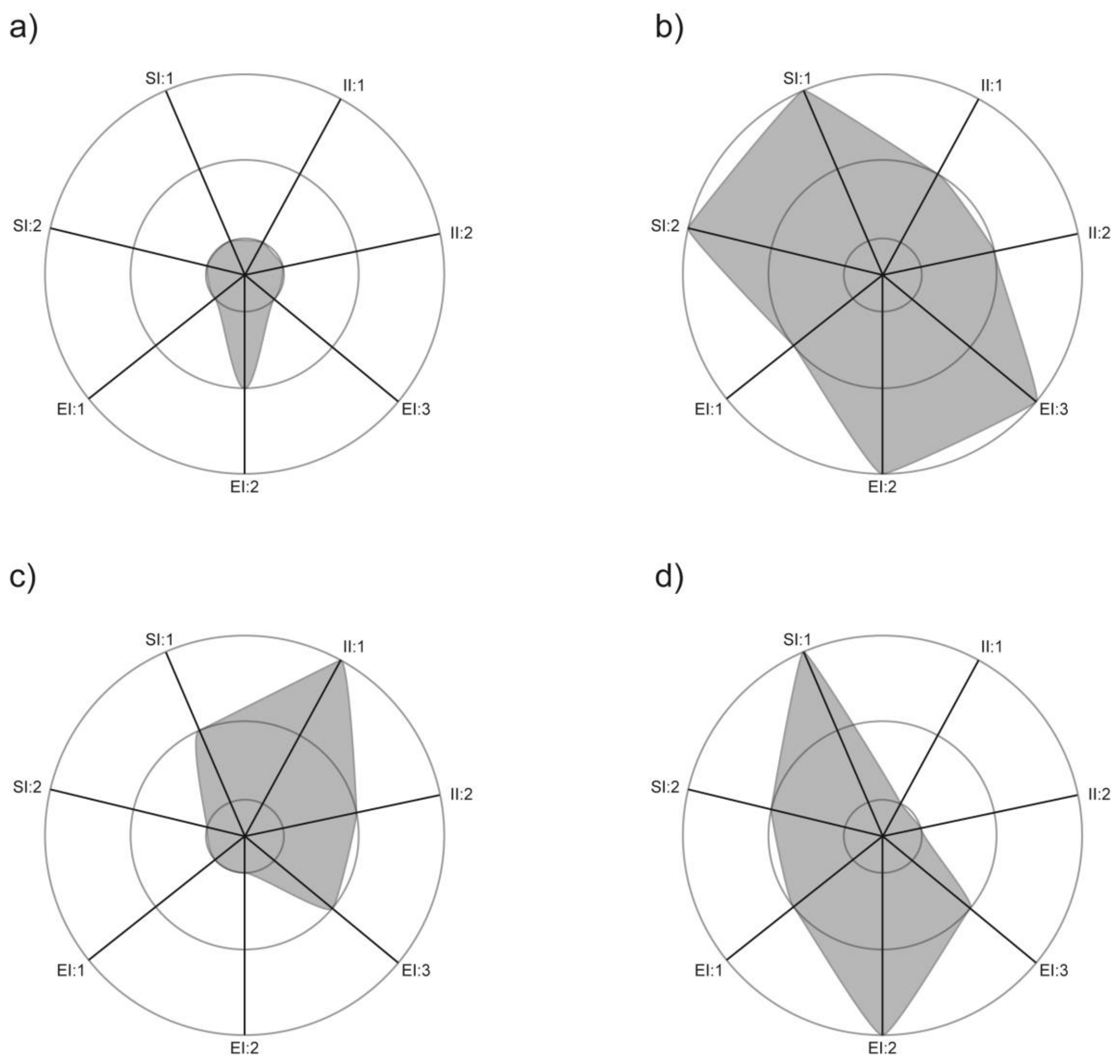

Figure 5.3 – Sample of models of dissonant inter-institutional articulations for the seven institutions in this study.

By examining the relationships among the dimensional institutions, it is possible to characterize community organization in a more nuanced way than traditional typological or dimensional approaches.

Diachronic Archaeological Expectations

The three different types of change, microevolutionary change, macroevolutionary change, and social transformation, vary in their (1) scale, (2) breadth across social realms, and (3) tempo (rate/pace, frequency, amplitude) (Table 5.2). The different configuration of these variables of change facilitate a particular change's capacity to affect broader social organization, in particular the nature of how political action is enacted across social realms which is at the core of anthropological archaeological investigations of social evolution (e.g. Beck 2003).

Table 5.2 – Modeled types of change and their scale, breadth, and tempo.

	Scales of Change	**Breadth of Change Across Social Realms**	**Tempo of Change**
Microevolutionary Change	Confined to a single, smaller scale	Limited change within one institution or realm	Mostly gradual, though may be punctuated; continuous and constant
Macroevolutionary Change	Confined to a single, larger scale	Fundamental change in a small number of institutions or realms, Limited change in across a realm	Either gradual or punctuated, though more punctuated than not; episodic and infrequent
Social Transformation	Felt at multiple scales	Fundamental change across multiple institutions and realms	Mostly punctuated, though may be gradual; exceedingly rare

How institutions and realms articulate also affect, and are affected by, change through time. Exploring the social dynamics that lead towards coherent or dissonant social organization (through inter-institutional *convergence* or *divergence*) can be done by tracing the organization of different institutions through time (Table 5.3). Examining change at this scale can also allow archaeologists to better identify and understand when and why social transformations occur.

Table 5.3 – Modeled changes in inter-institutional articulations.

	Change in Inter-Institutional Articulation
Microevolutionary Change	Continued coherence or dissonance with little change.
Macroevolutionary Change	Shift from coherence to dissonance, or vice versa; or Shift from one dissonant constellation to another dissonant constellation
Social Transformation	Shift from dissonance to novel coherence; or Shift from one form of coherence to another form of coherence

Archaeologically, microevolutionary change can be seen in changing material culture with minimal impact (as seen in changing scale of integration or consistency across social units) on the organization of any institution or realm. Macroevolutionary change can be seen when single institutions, or a small number of institutions within a single realm, shift from centralized to decentralized, or vice versa. Transformation can be seen when many institutions, across several realms shift from centralized to decentralized, or vice versa (Figure 5.4).

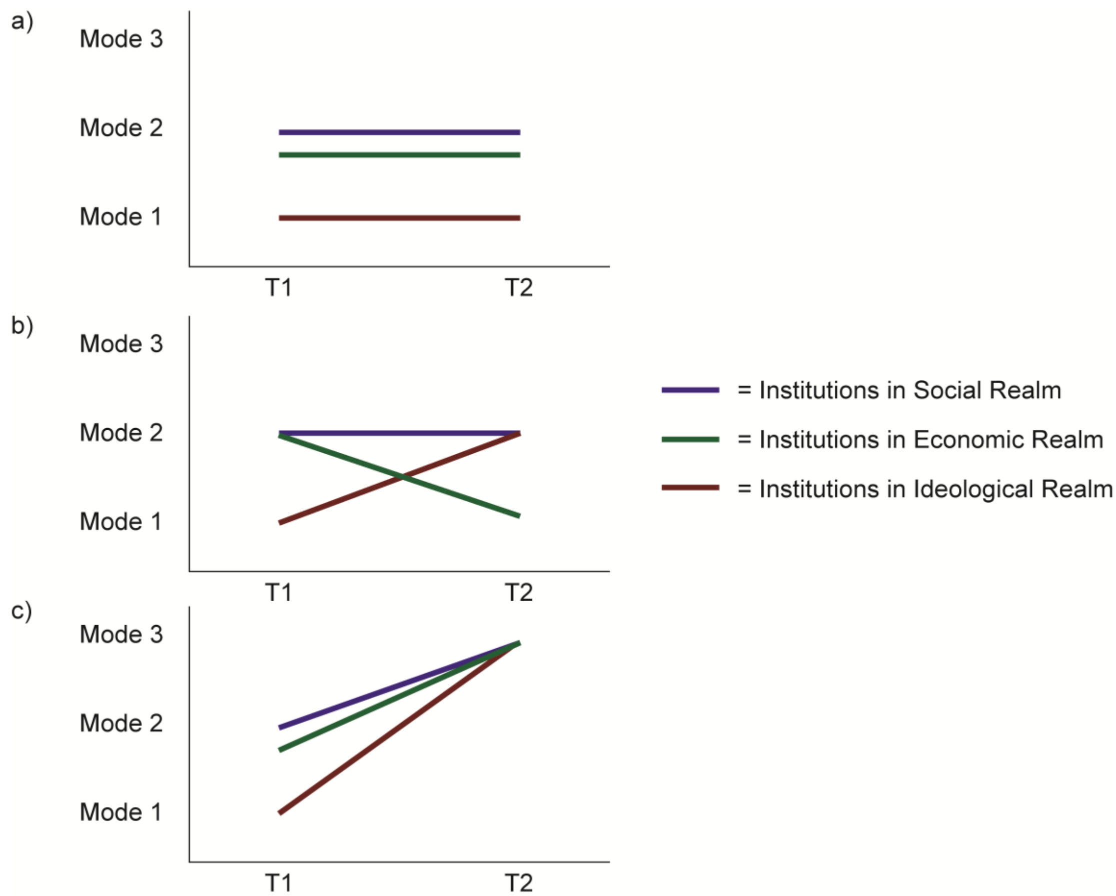

Figure 5.4 – Models of institutional change for (a) microevolutionary change, (b) macroevolutionary change, and (c) social transformations.

An example of microevolutionary changes include changing material representation of the same identities and relationships (e.g., gradual changing through time in Early Bronze Age ceramic decoration techniques). Landvatter (2013) has referred to this type of change as "representational change" in which there is no change to the overall structure of society or its constituent institutions. An example of macroevolutionary changes include shifts in food production strategies (e.g., transition between foraging and collecting subsistence strategies) (Prentiss 2009). Prentiss and Chatters (2003; Chatters and Prentiss 2005) characterize these shifts as changes in Resource Management Strategies (see Kuijt and Prentiss 2009; Rosenberg 2009;). Landvatter (2013) has referred to this type of change as "structural change" in which there is a change to the overall structure of society or its constituent institutions. Finally, an example of transformation is the emergence of state-level societies (Spencer 2009). While elsewhere state formation has been lumped with changing Resource Management Strategies (see Prentiss et al. 2009), the impacts of these sociopolitical changes are much larger in scope and occur much less often in human history. The rarity and impactfulness of these changes require that they be treated separately. Though distinct, transformative changes are still macroevolutionary processes, just at a larger scale.

Archaeological Expectations for the Organization of Institutions

In this section, I present the archaeological expectations for several alternative ways in which each individual institution in Bronze Age Transylvania may have been organized. It should be stated again, each institution is organized as a continuum along two dimensions: (1) scale of integration and (2) evenness across institutions. Rather than present all possible values and archaeological correlates for each institution, I will focus instead on defining the low and high endpoints along the continuum of complexity: as decentralized or centralized. The actual organization of any institution may fall close to, or somewhere between, these endpoints. In Chapter 11, I will present the archaeological evidence for each institution collected by the BATS Project and evaluate whether, and in what ways, it matches the archaeological expectations for centralized and institutionalized inequality. Once the archaeological expectations for the continuum endpoints are described here, I will turn to models for how these different institutions articulate.

Social Realm Archaeological Expectations

Social Institution 1: How People Situated Themselves Across the Landscape

If settlement patterns supported, and were influenced by the presence of, regional elites (centralized), the region should be integrated into a centralized multi-village polity (Carneiro 1981:45, 1998; Earle 1997; Peebles and Kus, 1977; Redmond 1998, Spencer 1987, Spencer and Redmond 2014). In this case, we would expect a regional hierarchy to be detected through site sizes distributed in multiple (two or three) modes representing two or three tiers of settlement (Flannery 1998; Spencer and Redmond 2004, 2014:38; Wright and Johnson 1975). The top tier of the settlement hierarchy should be occupied by a single regional center (within each polity) (Spencer 1998; Spencer and Redmond 2014:38). As part of a regional polity, settlements across multiple tiers must be integrated into an interaction network. In societies lacking state-level bureaucratic institutions for effective delegation and monitoring of partial authority, the territory integrated by polities is limited (Spencer 1987, 1990; Wright 1977). In middle-range societies, the spatial extent of regional polities would roughly have been one half-day's walk from the regional center (Livingood 2012; Spencer and Redmond 2014:38). Within that distance, there will be settlements of all sizes within the settlement hierarchy. Additionally, smaller settlements will cluster in close proximity to regional centers, as populations are pulled to the advantages of living near the economic, social, ideological, or political center, or pushed into that zone to fill economic niches, or contribute goods and labor to elites in the center. As a result, the overall population will be clustered, rather than evenly distributed across the landscape. The presence of settlement hierarchies and network clustering can be monitored through quantitative analyses of site sizes (see Drennan and Peterson 2004) and network statistics. In particular, a rank-size graph of settlements should have a primate distribution (Drennan and Peterson 2004).

In decentralized systems where settlement is coordinated at the local level by autonomous communities, the region will lack a settlement hierarchy and single regional center. While not all sites will be the same size (though the differences will mostly be minimal), settlement systems lacking regional centers can be identified by a rank-size graph that has a convex distribution (Drennan and Peterson 2004). Additionally, autonomous communities will have lower clustering, will be more evenly distributed across the landscape.

Social Institution 2: What Identities were Present and Marked

Human social systems are characterized by what Crumley (1995) has called the "scalar hierarchy", comprising of individual, household, community, regional, and macroregional levels (see Flannery 1976; Spencer 1997; Spencer and Redmond 2014:37). In centralized and hierarchical middle-range societies, we would expect identity marking at multiple scales, including individual, household, lineage, village, polity, and regional. We would expect that identity at the polity level in emergent hierarchical middle-range societies would be strongly marked through material signals. It would have been less important to mark individual household, village, and regional identities in these contexts, except for the emergent elite, who would be invested in signaling across all scales. Polity identity could be marked through ceramic decoration (shared decoration technique or motifs), regional cemeteries (e.g., Tara, Ireland – Quinn 2015), or textiles (which do not preserve).

At each social scale within polities, we would expect to find evidence of pervasive differentiation in social status among comparable social units. Specifically, we would expect that there will be differential rank among different individuals, households, and settlements, though polities within a region or macroregion will not be ranked relative to each other. Social status differentiation among individuals might be expressed through patterns of diet and health (in mortuary populations) and differential burial treatment, grave goods, and funerary architecture (Peebles and Kus 1977; Spencer and Redmond 2014:39). Social status differentiation among households might be expressed through size and elaborateness of household construction, differential material evidence of food production (high ranked animals and elements; high yield plants with minimal processing evidence), crafting (metal, fineware-ceramics, attached specialists), and access to long-distance trade routes (imported resources and ceramics), or differentiation among related individuals buried in spatial clusters in terms of burial treatment, grave goods, and funerary architecture (Peebles and Kus 1977; Spencer and Redmond 2014:39). Social differentiation among villages might be expressed through differential food production, crafting, and access to long-distance trade routes, and community cemeteries.

In decentralized middle-range societies with village autonomy would also expect identity marking at multiple scales. With local autonomy, we would expect that identity at the household, lineage, and village levels would be the most critical scales of identities marked through material signals. These identities could be marked through ceramic decoration, local cemeteries and spatial clusters within cemeteries, or textiles. In ceramics, we would expect significant diversity in ceramic decoration, with more spatial clustering of decoration patterns, within each settlement or sector of a settlement. At all social scales, we would expect to find evidence of minimal differentiation in social status among comparable social units.

Economic Realm Archaeological Expectations

Economic Institution 1: How Crafting Was Organized

If crafting was organized and controlled by regional elites (centralized), we would expect to see the emergence of a settlement hierarchy with all steps of the craft production process present within the regional center, while smaller settlements should lack most, if not all, stages of production. In the case of metal procurement, we would expect regional centers positioned to restrict access to upland sources and permanent mining communities near upland sources that would have had to have been supported (through the mobilization of food by elites) by settlements in more productive agricultural landscapes. If elites controlled metal production, we would expect one of two spatial patterns. In the first scenario, all the steps of the metal production process (ore processing, smelting, casting, and use) should be present within the regional center, and smaller settlements should lack most, if not all, stages of production. In the second scenario, the regional center could be centrally located to coordinate the different steps of the metal production system if different settlements specialized in different steps of the process (e.g., regional elites situated between procurement locations and smelting/casting locations). For ceramics, centralized production could be monitored through stylistic analysis and clay sourcing that show that ceramics were produced only at a few key settlements and distributed throughout a regional network. Additionally, fineware ceramics (with minimal or no visible temper, surface treatment and/or decoration), which may have required a high technical skill should be disproportionately be found in regional centers or other elite-contexts. The production of special items, such as ox-cart models, antler scepters, and groundstone axes, would be found in regional centers if controlled by regional elites. Secondary products (wool, milk, textiles), are difficult to monitor directly in the archaeological record. Archaeologists can monitor the production of secondary products through indirect material evidence, including awls and spindle whorls for textiles and distinct age/sex profiles in faunal assemblages when raising animals for secondary products (see Nicodemus 2014).

If crafting was coordinated at the household or village level in autonomous communities (decentralized), we would expect to see all stages of the metal production process spread evenly across all settlements in the region, which should be of similar size. If households and villages had to secure their own direct access to metal sources, we may see evidence of competition for access through warfare (e.g., fortifications) or territorial markers.

Economic Institution 2: How Subsistence Production Was Organized

If subsistence production was organized and controlled by regional elites (centralized), we would expect to see the emergence of a settlement hierarchy where the regional center was situated with access to highly productive subsistence land; either in rich agricultural land, or along ecotones where agricultural and pastoral activities could be directed. There are situations where concern over defense may lead communities to not place themselves near highly productive land. This is more common, however, in state-level societies (e.g. Monte Alban) where bureaucratic institutions exist to mobilize subsistence products to an elite core. In the organization of middle-range societies, much of the base subsistence production would still have been organized at the household level. Elsewhere in the Carpathian Basin (e.g. Pecica-*Şanţul Mare*; Százhalombatta-*Földvár*), concern over defense lead communities to construct significant earthen fortifications rather than move their sites to more defensible positions in the landscape (see Parkinson and Duffy 2007). Control over the mobilization of subsistence products normally associated with hierarchical societies could be demonstrated in Transylvania through the presence of permanent large mining settlements that were too large, and in too poor agricultural land, to be self-sufficient. Paleobotanical and faunal assemblages should highlight that regional centers would have had access to a diversity of species, particularly an abundance in high ranked plants and animals. Elite control of food production would also manifest itself in differential diet and health among the population, as seen in skeletal evidence. Isotopic evidence of diet and osteological indicators of health and pathology (e.g., dental hypoplasias, cribra orbitalia), should show a stratification within the regional population and a link between good health, high quality diet, and high energy expenditure mortuary treatments. It is important to note that elite control in centralized hierarchical middle-range societies would not have removed the need for local villages to be self-sufficient in their day-to-day subsistence needs (see Earle 1987; Peebles and Kus 1977; Wright 1977; Spencer and Redmond 2014:39). Instead, control was more likely focused on intensifying agricultural production to produce a surplus above what would be required for each community's local subsistence needs. These surpluses could then be mobilized, either through supporting specialized communities (e.g., mining communities), or more likely through feasting and other conspicuous consumption events (Brown and Kelly 2015; Hayden 2001).

If subsistence production was coordinated at the household or village level in autonomous communities (decentralized), we would expect to see no significant differences between communities in their ability to provision for themselves. Settlements would be positioned in the landscape to be self-sufficient, meaning any minimal differences in site sizes would have to be linked to the availability of local resources (e.g., larger sites only in highly productive lowlands, smaller sites in less productive uplands). Given the topographic variability in southwest Transylvania, we would not expect autonomous communities to necessarily be eating the same foods. This means that there could have been inter-settlement variability in paleobotanical and faunal assemblages, though those differences would be qualitative rather than quantitative. There would also be minimal differences in diet and health across mortuary populations.

Economic Institution 3: How Trade and Exchange Was Organized

If trade and exchange was organized and controlled by regional elites (centralized), we would expect to see the emergence of a settlement hierarchy where the regional center was situated to directly restrict travel along inter-regional trade routes. In southwest Transylvania, the primary inter-regional trade route is along the main rivers (in particular the Mureș River). There are only a few resources that show up in Bronze Age sites in the Carpathian Macroregion that are not locally available in southwest Transylvania. Specifically, Baltic amber, faience, and obsidian would have had to have been imported, though no obsidian has been found at a Wietenberg site in Transylvania (see Boroffka 1994a). Non-local ceramics could also serve as an index of inter-regional interaction, particularly with the emergence of regionally diagnostic ceramic traditions during the Middle Bronze Age. If coordinated by elites, we should expect to see exotics disproportionately associated with elites, such as concentrated in regional centers or in elite mortuary contexts.

If trade and exchange were coordinated at the household or village level in autonomous communities (decentralized), we would expect exotics to be either spread out evenly across all sites or following a distance-decay model (with fewer exotics found as you moved away from the Mureș River corridor). Without elite control, there may have been temporary, seasonal, trade fairs where communities came together to trade (see Tache 2011). If households and villages had to secure their own direct access to trade routes, we may see evidence of competition for access through warfare (e.g., fortifications) or territorial markers.

Ideological Realm Archaeological Expectations

Ideological Institution 1: How In/Equality was Legitimized in Mortuary Contexts

Ideology is an important way in which equal, or unequal access to power and resources is legitimized (Earle 1997:205; Spencer and Redmond 2014:32). Ideological institutions are not just passive reflections of social organization, they are a potential avenue for making, modifying, or masking inequality differences and regional integration. Mortuary rituals are important episodic events in which ideologies are negotiated and transformed. In cases where regional integration and inequality is legitimized through ideologies, we would expect to see differential access to burial (based on demographic models of the living population) and participation in mortuary events (based on spatial restrictiveness of access to cemeteries, body preparation facilities) where only a small portion of society is eligible (Quinn 2015). We would also expect differential energy expenditure patterned across the mortuary population (measured through differential presence and abundance of grave goods, body treatments, and funerary architecture).

If ideological institutions promoted and legitimized egalitarian identities and relationships, we would expect burial eligibility to be extended to most, if not all, community members (more of the population buried). We would also expect minimal differences in energy expenditure across mortuary populations, up to and including bans on grave goods or funerary architecture. All members of the social group would be able to participate in mortuary events, suggesting they would be positioned in accessible locations.

Ideological Institution 2: How In/Equality was Legitimized in Daily Contexts

Ideologies of equality and inequality are also legitimized in daily contexts. In cases where regional integration and inequality is legitimized through ideologies, we would expect restricted access to domestic and intra-community ritual and the material signals of inequality. Daily signals of inequality could have been maintained through everyday objects and practice, including in food preparation and consumption. As such, we might expect societies with highly centralized ideological institutions to have certain fineware ceramics restricted to particular households or ritual spaces such as public monumental architecture. Public ritual in spaces controlled, or constructed by, elites would result in potential close spatial association of elite residences with public spaces (such as mounds, plazas).

In contexts where egalitarian identities and relationships were legitimized through ideologies, we would expect minimal differences across the community in house size and construction, fineware ceramic distribution, and evidence of domestic ritual and communal (rather than restrictive) public spaces.

Modeling the Organization and Evolution of Communities in Resource Procurement Zones

The models for the organization and evolution of communities in southwest Transylvania presented in the previous sections are general models that can be applied to understand the evolution and organization of any middle-range societies. While the specific institutions and archaeological measures will differ, the same general framework can be used to understand quantitative and qualitative change in many different case studies across different temporal and geographic contexts. However, the geo-environmental and temporal context of communities in southwest Transylvania, as a metal and salt resource procurement zone at the start of the Bronze Age, necessitates and additional layer of modeling to examine in what ways the local trajectory is affected by these conditions.

Southwest Transylvania is resource procurement zone in the larger Carpathian Macroregion, a region where metal and salt resources are unevenly distributed. As part of this larger macroregion, community dynamics in southwest Transylvania would have affected, and been affected by, how different regions interacted (or didn't). It is necessary to examine the nature, direction, and intensity of inter-regional interaction and compare trajectories of community organization from different regions to better understand the evolution of community organization within southwest Transylvania. By examining how communities in southwest Transylvania interacted with communities in surrounding regions, we can gain a better understanding of how resource procurement zones articulated with non-resource procurement zones in Bronze Age Europe specifically, and middle-range societies in general.

Why an Accurate, Fine-Grained Chronology is Necessary for Modeling Community Organization and Social Change in the Bronze Age

There are many anthropological and culture historical reasons why an accurate chronology of the Transylvanian Bronze Age is necessary for modeling community organization and change. The archaeological record is often viewed as a palimpsest of past activity, in which sequential events leave material traces that have been compressed to appear contemporaneous. The accumulative nature of the archaeological record is critical for investigations at larger time-scales inaccessible to ethnography (Bailey 2007:203). While a few researchers (e.g., Bailey 1981:110, 2007:203; Binford 1981:197; Foley 1981:14) have rightly extolled the advantages of archaeological palimpsests (providing long-term perspectives), there are some situations in which this aspect of the archaeological record can provide significant handicaps. In particular, the loss of chronological resolution can be an impediment to asking certain anthropological questions in which contemporaneity is assumed.

Anthropological models of social, economic, political, and ideological organization assume that the archaeological materials and anthropological social units being compared co-occur in time. For example, anthropological models of chiefly society assume there are elites that are interacting with non-elites to mobilize resources and labor and create inequality. When examined archaeologically, researchers look for variability in the material record that would indicate there were elites and non-elites that were interacting – which may include variability in house sizes and complexity, burial elaboration, and differential distributions of certain craft and trade goods that might have been concentrated in the hands of elites. When such variability is detected archaeologically, researchers use it as evidence for the presence of social inequalities. However, if the chronological resolution of the archaeological record is significantly coarse, archaeologists may inaccurately interpret diachronic shifts (e.g., shift from the while community living in small houses to large houses) as contemporaneous variability (e.g., big houses and small houses). Archaeologists must try to determine whether the patterns in the material record are due to synchronic variability or reflect change through time.

An accurate chronology is also critical for our culture historical understanding of Bronze Age Transylvania. Other surrounding regions, particularly the Carpathian Basin, have developed radiocarbon-based chronologies over the past two and a half decades (Bolohan et al. 2015; Duffy 2010; Forenbaher 1993; Jaeger and Kulcsar 2013; O'Shea 1991; Uhnér 2010). The lack of an absolute chronology in Transylvania has meant that many of the dates for the start or end of different periods (e.g., EBA and MBA) have simply been adopted from neighboring regions. As I will show below, it will be important to identify when the Transylvanian sequence syncs with, or diverges from, what is going on across the Carpathian Macroregion. In addition to connecting the Transylvanian chronology to the surrounding regions, an accurate chronology is necessary for the reconstruction of local social, economic, political, and ideological organization (particularly settlement patterns, resource procurement, craft production, interregional exchange, and mortuary practices). These reconstructions are based on our understanding of archaeological variability, and what variability is due to change through time and what is due to social variation across contemporary communities in Transylvania at various points in time during the Bronze Age.

Contemporaneity

At this point it is necessary to clarify what is meant by "contemporaneity" in this discussion. Bailey (2007:206) has explored the topic of contemporaneity within his discussion of time perspectivism and palimpsests. Objects, sites, or events are said to be contemporaneous if they occurred at *the same time*. However, there is a significant amount of variability built into the concept of *the same time*. True contemporaneity is extremely rare, and is only really materialized when multiple objects are formed from the same event (e.g., conjoining flakes, anatomically adjacent bones from the same skeleton) (Bailey 2007:206). When archaeologists consider contemporaneity, however, they are often conceptualizing contemporaneity at a coarser scale.

> "In archaeological interpretation, the reality is that in order to combine sufficient data together to make a large enough sample for analysis, we inevitably end up aggregating data from temporally distinct episodes of activity. Thus, in comparing different episodes of activity, we have to make certain assumptions about the time depth within which we are willing to accept as 'contemporaneous' the various events or materials to be compared and this is as true of intra-site spatial analysis (Galanidou, 1997) as it is of inter-site analysis (Bailey et al., 1997; Papaconstantinou and Vassilopoulou, 1997; see also Papagianni, 2000). *'Contemporaneity' is thus an arbitrary concept with no absolute measure*" (Bailey 2007:206 – emphasis added).

If contemporaneity is an arbitrary concept, then it is up to archaeologists to define it. The temporal resolution at which materials and events may be aggregated is thus a function of the chronological resolution of the dating methods available and the research questions that are being investigated (Papaconstantinou 1986; Bailey 2007:206-207).

For the regional approach employed in this study, the archaeological record can be considered a *spatial palimpsest*, a large-scale palimpsest in which different activities are materialized across a landscape, often at the expense of temporal resolution (Bailey 2007:205-207). In Bronze Age in Transylvania, AMS radiocarbon dating and Bayesian modelling can help improve the chronological resolution of spatial palimpsests.

In Chapter 7, I present a new chronology for the Bronze Age in Transylvania. In particular, Chapter 7 presents the phases in which events are considered contemporaneous. However, in the cemeteries that have been well dated (Sebeș-*Între Răstoace*, Țelna-*Rupturii*, Meteș-*La Meteșel*) and within the Geoagiu Valley where most settlement occupations have been dated, the growing corpus of dates allows us to consider contemporaneity through direct dating rather than association with broad subphases. These dates provide the basis for directly monitoring the tempo of change, but also for indirectly monitoring any contemporaneous changes in institutions and realms (limited by available chronological models to the generational time scale).

Models for How Procurement Zones Articulate with Non-Procurement Zones

There are three models for how procurement zones articulate with non-procurement zones considered in this study: (1) core-periphery world systems model, (2) peer-polity interaction sphere model, and (3) no interaction.

A model of core-periphery relationships comes from world systems theory (Wallerstein 1974; Sherratt 1993). Originally developed to explain colonial relationships within state societies, this model expects that economically and politically advanced cores exploited peripheries for labor and raw materials. If the Bronze Age Carpathian Macroregion contained a core-periphery interregional relationship, we would expect that procurement zones like southwest Transylvania were exploited by more politically, socially, and economically complex polities in surrounding regions. The archaeological expectations of this model is that southwest Transylvania would lack centralized regional elites while surrounding regions would have much larger regional polities with the economic, military, and political might to exploit mining communities. Exploitation may also manifest itself in lower quality of diet (as seen in faunal and paleobotanical assemblages, isotopic evidence from human remains), higher rates of pathologies (as seen in human osteological evidence), and restrictions on access to valuable items, such as finished metal objects and exotics (e.g., Baltic amber).

A model of peer-polity interaction has more commonly been applied to middle-range societies (see Tache 2011; Renfrew and Cherry 1986). Peer-polity interaction models focus on the nature of interaction between polities (defined as the largest autonomous socio-political unit in a region – Renfrew 1986b:2). Unlike world systems models that suggest a hierarchical relationship among regions and polities, peer-polity models suggest that interacting populations will have similar scales of autonomous socio-political units. When there is a change in the scale of autonomous socio-political units in one area, it will be followed with a similar transformation at about the same time in other connected regions (Renfrew 1986b:7). If the Bronze Age Carpathian Macroregion contained peer-polity interactions between communities in resource procurement zones and non-resource procurement zones, we would expect the scale of regional integration and degree of inequality to be similar in both types of landscapes. Evidence of interaction (e.g., trade in resources, finished goods like ceramics and metal object) should be present. Changes in the scales of the autonomous socio-political units should be relatively contemporaneous across the Carpathian Macroregion.

In certain cases, peer-polity interactions can produce an “interaction sphere” (see Caldwell 1964; Hayden and Schulting 1997; Quinn 2006b) where communities of interacting elites share a common set of supralocal values, rituals, behavior, styles, and raw materials, while different groups or cultures may retain distinctiveness at the level of subsistence technology and local craft goods. In a Bronze Age Interaction sphere, we would expect the emergence of a shared set of material culture (e.g., ceramics, metal, adornment objects) among interacting communities; and that non-interacting communities would not share supra-local values, rituals, behaviors, styles, and raw materials.

The third and final model that is considered is a null hypothesis of interregional interaction. In this model, there is minimal direct interaction between communities in resource procurement zones and those in non-resource procurement zones. The only way in which communities in non-resource procurement zones could collect economically necessary raw materials (e.g., copper, gold, salt) without interacting with communities in resource procurement zones would have been by organizing direct procurement forays that bypassed and avoided local communities. Evidence of such forays could be seen in the presence of metal resources in non-procurement zones but no other material culture items from the resource procurement zones in non-procurement zones (e.g., ceramics). We can reject this null hypothesis if evidence for broad inter-regional interaction is found. While it would technically be evidence of interregional interaction (competition), evidence of communities in resource procurement contesting access to metal sources may also support a model of direct forays. The presence of defensive fortifications, outposts, and territorial markers (e.g., mound cemeteries) near metal sources may suggest the presence of interregional forays that were contested. By comparing the trajectory of community organization in southwest Transylvania with surrounding non-resource procurement zones, in the Carpathian Basin and central Transylvania, we can evaluate these models.

Mechanisms of Change in Procurement Zones

There are several mechanisms of change that may lead to sociopolitical transformations in middle-range societies in resource procurement zones. Studies that try to identify single prime movers for social change in middle-range societies have routinely been proven inadequate to explain change in all cases (see Earle 1997). In this study, I do not propose that any of the following are the only mechanisms at play in the evolution of middle-range societies in procurement zones. Indeed, these mechanisms are not exclusive of each other (Renfrewb 1986). Social change is the result of a combination of these internal and external processes and events. Considering the range of factors that lead to social change in southwest Transylvania can provide insight into the long-term development of social complexity in the Bronze Age.

We can divide the range of causal mechanisms for social change in middle-range societies into two general categories: (1) internal factors, and (2) external factors. Internal changes emerge from within a social system. Population growth is one of the more commonly cited factors that spurred evolutionary change in community organization (see Johnson 1978). As regional population grows, stresses are placed on decision-making frameworks and existing social institutions. Political economic strategies employed by elites to control the flow of goods, resources, information, and labor through a social system can also be considered an internal factor. Aggrandizing individuals could affect the flow of resources through bottlenecks, turning differential access into social debt through conspicuous consumption, feasting, and gifting (Hayden 2001). Intensification of food production to create surplus to be mobilized through debt relationships is another way archaeologists have hypothesized internal change could produce transformative change without external factors (see Barrier 2011; Renfrew 1986b; Stanish 2004). Internal changes in social organization can also emerge from changing practice by individual agents, as conscious or unconscious actions that do not mesh with existing institutions can, if broadly adopted, change the organization of institutions (Giddens 1984). Finally, technological innovations, such as those that can lead to intensified production (e.g., plows for agricultural production, kilns for metal smelting, boats for interregional transportation) can help produce social change from within a society.

There are several external factors that can affect community organization of a society. In particular, external factors can produce *ruptures* – events that disarticulate existing relationships between material resources and their associated institutions (Beck et al. 2007; Sewell 2005). Events can introduce a shock to a social system that may result in a change across multiple, interconnected structural domains (what I refer to in this study as institutions and realms) when ruptures allow for novel ways of re-articulating the material world with their associated institutions (Beck et al 2007). One of the more commonly cited external factors that can produce a shock to a system and produce ruptures is environmental change (see Fisher et al. 2009). Additionally, the immigration of different populations into a region can also significantly affect local community organization. This is perhaps most dramatically seen in cases of European contact in the New World, including the "shatter zones" of the American Southeast (see Beck 2013; Ethridge and Schuck-Hall 2009). Finally, community organization in one region may change as the result of changes in the nature of inter-regional interaction (e.g., disruption of existing inter-regional exchange routes) (see Renfrew 1986b). This is particularly relevant to resource procurement zones, as changing systems of value, commodification, or discovery of new sources, can substantially reorganize inter-regional interaction and provide the opportunity for social change.

Any social transformation in resource procurement zones will likely involve several internal and external factors. Technological changes in mining and metal production technology can affect the ability of local elites to exert control over raw materials or finished objects (either positively or negatively). Local elites may have been able to turn differential access to metal, subsistence resources, or trade routes into regional political authority through conspicuous consumption, debt relationships, and warfare. Additionally, the abundant metal sources may have attracted populations from outside the local region to move in to secure access to these necessary economic resources. The introduction of culturally and potentially ethnically different populations may have created opportunities for novel inter-institutional articulation. As interregional interaction became more formalized within political structures (as metal became increasingly commodified throughout the Bronze Age), community organization would have been significantly affected by any changes to inter-regional interaction (e.g., changing transportation technologies, routes, cultural affiliation of trade partners).

To understand the range of mechanisms that produced microevolutionary, macroevolutionary, and transformative change, I will draw primarily on comparing the trajectory of change (scale, breadth, and tempo) within southwest Transylvania with those in surrounding areas. We can attribute synchrony between the Transylvania and Carpathian Basin trajectories to primarily external factors, while differences between trajectories will likely be significantly affected by internal factors. I will also consider the sequencing of change within southwest Transylvania with the expectation that any causal mechanisms (e.g., population growth, ideological change, technological innovations) should predate broad social transformations (though the chronological and institutional data required to evaluate many of these factors are beyond the scope of this dissertation).

Scenarios for Community Organization and Social Change in Transylvania

The models presented above can be linked together to create a couple scenarios for the development of complex regional polities with institutionalized inequality in southwest Transylvania:

Scenario 1: Hierarchical polities do not emerge in the time period in question, but there are substantial reorganizations that make its later adoption possible,

Scenario 2: Hierarchical polities emerge during the Bronze Age due to elite control of metal,

Scenario 3: Hierarchical polities emerge during the Bronze Age due to another factor (such as agricultural/subsistence production; ideologies).

These broad scenarios can be evaluated using the archaeological evidence developed through the BATS Project, presented in Part IV. Examination of the fine-grained trajectory of changes in community organization can also reveal more specific aspects of change, including historically particular events such as large-scale migrations. The multiscalar models presented in this chapter can help archaeologists identify changes in community organization in southwest Transylvania in particular and explore how qualitative transformations emerge out of quantitative changes in middle-range societies more generally.

Chapter Summary

The models developed in this chapter are critical for our understanding of the development of complex regional polities in Bronze Age Transylvania. They provide a means for identifying if and when large-scale social transformations occurred, documenting the social context prior to and after the transformation that allowed for transformation to occur, and evaluating some of the potential proximate mechanisms that contributed to the transformative change. The deep-historical approach, tracing community organization for nearly 1400 years, also provides opportunities to examine what microevolutionary and macroevolutionary changes laid the groundwork for successful social transformations, whether there were other, failed, attempts at transformation, and what may have inhibited social transformation from occurring earlier or through different mechanisms. Together, the results of these analyses will contribute to our understanding of social change in Bronze Age Europe, as well as broader anthropological models of social change in middle-range societies.

PART IV: BRONZE AGE TRANSYLVANIA SURVEY PROJECT

Chapter 6 - Field Methods and Project Design

Chapter Introduction

In order to test the different models of community organization and social change in southwest Transylvania, it was necessary to generate new datasets that could build on the limited amount of previous research. Previous projects, along with a long history of chance finds and unsystematically recovered sites, provide an important starting point from which testable hypotheses can be generated. However, new field, laboratory, and analytical methods were required to more fully understand the structure and dynamics of these Bronze Age communities.

In this chapter I describe the multiscalar research design of the Bronze Age Transylvania Survey (BATS) Project. In Chapter 5, I described how the archaeological measures in this study provide lines of evidence to test hypotheses on the organization and evolution of Bronze Age societies. This chapter provides a more detailed description of the methods employed in the BATS Project. The project was designed to take advantage of previous data, generate new datasets based on field and laboratory work, balance financial and temporal demands, and work within the permitting structure set forth by the Romanian National Commission. This project combined reconnaissance survey, pedestrian survey, test excavation, and extensive radiocarbon dating. Several of these traditional archaeological techniques had not previously been extensively applied to the study of Bronze Age Transylvania. Many of the components, as well as the full synthesis of approaches, of the research design can be applied to other archaeological questions, landscapes, and assemblages across the globe. Together, the methods and approaches set the analytical foundation for this and future studies into emergent inequality in southwest Transylvania.

The Bronze Age Transylvania Survey Project

The BATS Project was designed to investigate the organization, lifeways, and landscape use of Early and Middle Bronze Age communities in the Mureș Valley and Trascău Mountains. The BATS Project began in 2011 as a collaboration between the University of Michigan Museum of Anthropological Archaeology (UMMAA) and Muzeul Național al Unirii Alba Iulia (MNUAI). The primarily collaborators in the project are myself (Colin Quinn – UMMAA) and Dr. Horia Ciugudean (MNUAI) with important logistical and advisory support provided by Dr. John O'Shea (Associate Director of the UMMAA) and Dr. Gabriel Rustoiu (Director of MNUAI). While broadly interested in transformations across Transylvania during the Bronze Age, the BATS Project has focused on the landscape within the current administrative boundaries of Alba County, Romania.

The BATS Project Analytical Scales

The BATS Project is designed to monitor changes in the organization of larger social scales, including the development of complex regional polities, the generation of regional identities, and the dynamics of macroregional interaction. As such, the BATS Project employs several analytical scales, with the explicit knowledge that these analytical scales that allow for the study of multiple social scales. The different spatial analytical scales, from smallest to largest, include: (1) artifact and specific sample analyses; (2) occupation levels and assemblages (defined through stratigraphic observation); (3) individual sites (defined through site extent and boundaries); (4) the micro-region (defined by the Geoagiu Valley and the modern administrative communes of Rameț, Stremț, and Teiuș); (5) the region (defined through modern political boundaries of County Alba, Transylvania); and (6) the macroregion (defined as inclusive of the Carpathian Mountains, Transylvania, and Carpathian Basin) (Figure 6.1). The different temporal scales, in increasing duration, of primary importance to the BATS Project include: (1) events (in particular burial, burning, and other depositional events); (2) occupation durations (as defined through stratigraphic observation); (3) sub-phases of the Early, Middle, and Late Bronze Ages (as defined through absolute and relative dating); (4) phases of the Bronze Age – particularly the Early and Middle (as defined through absolute and relative dating); (5) the Bronze Age (as defined through absolute and relative dating) (see Figure 6.1).

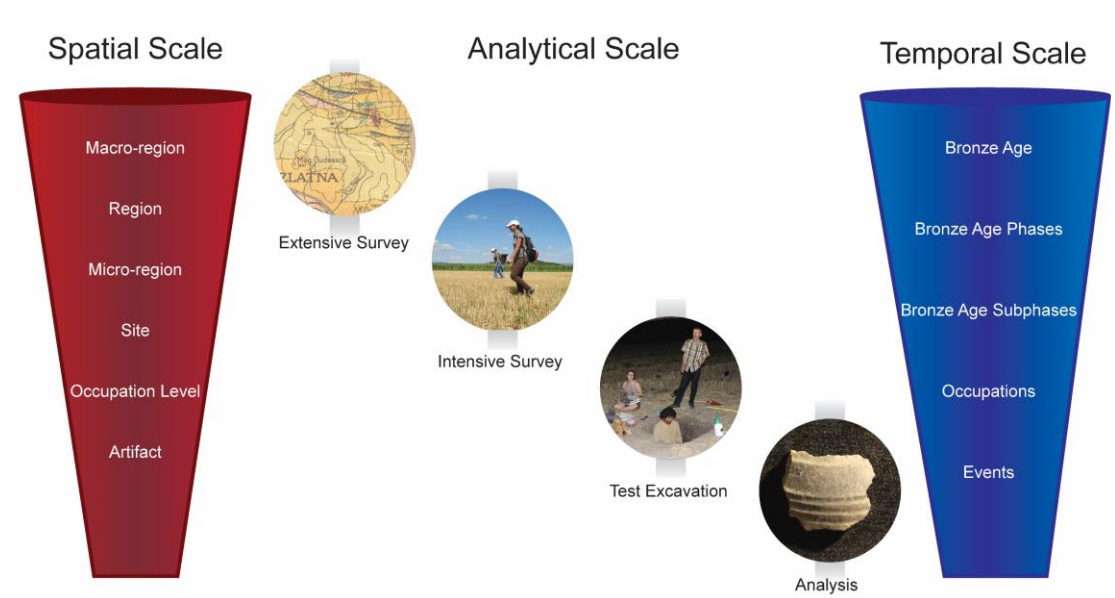

Figure 6.1 – Analytical scales and research methods of the BATS Project to examine community organization and social change ate multiple spatial and temporal scales.

These different analytical scales must be investigated using multiscalar field and laboratory methods (as described below). Linking these analytical scales to social scales must be done with caution. There is no 1:1 relationship between analytical and social scales. For example, archaeologists who excavate houses are careful to distinguish between archaeological units (houses) and social units (households) (e.g. Robin 2003). Despite being regional phenomena, the emergence of complex regional polities must be studied at both larger (macroregional) and smaller (site) scales. Similarly, processes that occur across one time scale may be significantly different than those that occur at other time scales.

The BATS Project is designed to focus more on the dynamics of regional community organization. As a result, the approaches employed focus on characterizing settlements and variability across landscapes rather than houses and variability across settlements. Future research, specifically large-scale horizontal excavation targeted at understanding the internal organization of settlements and houses, is needed to complement and further nuance the patterns observed in this study.

The anthropological goals of this research project require multiscalar archaeological techniques. In the next three sections, I describe the methods employed that cross-cut the spatial and temporal analytical scales identified here.

Archaeological Survey

Survey is one of the most common and important archaeological approaches. Survey is a collection of methods designed to understand human activity within landscapes with minimal impact on the archaeological record. Survey techniques are designed to be conducted at large spatial scales; maximizing spatial coverage and minimizing costs relative to excavation. It is often conducted as a first phase within a research design and can inform decisions about where and why to excavate. Survey techniques include remote sensing (e.g., satellite imagery, aerial photography), field walking and collection, site mapping, and geophysical prospection (e.g., ground-penetrating radar, magnetometry). Because of the cost, time, and types of data produced with the different forms of survey, each is best applied to a particular spatial scale and set of research questions. The BATS Project employed two general resolutions of survey: (1) extensive survey and (2) intensive survey.

Extensive Survey

Extensive survey was conducted at the scale of Alba County. Research was focused on the central and eastern portions of the county, encompassing the Mureș River Valley and the Trascău Mountains. This region encompasses all of the natural resources that were important to Bronze Age communities. This includes metal (copper and gold) sources in the Trascău and Metal Mountains, salt springs near the Mureș River at Panade and Ocna Mureș, and the Mureș River as a corridor for interregional movement and trade (Figure 6.2).

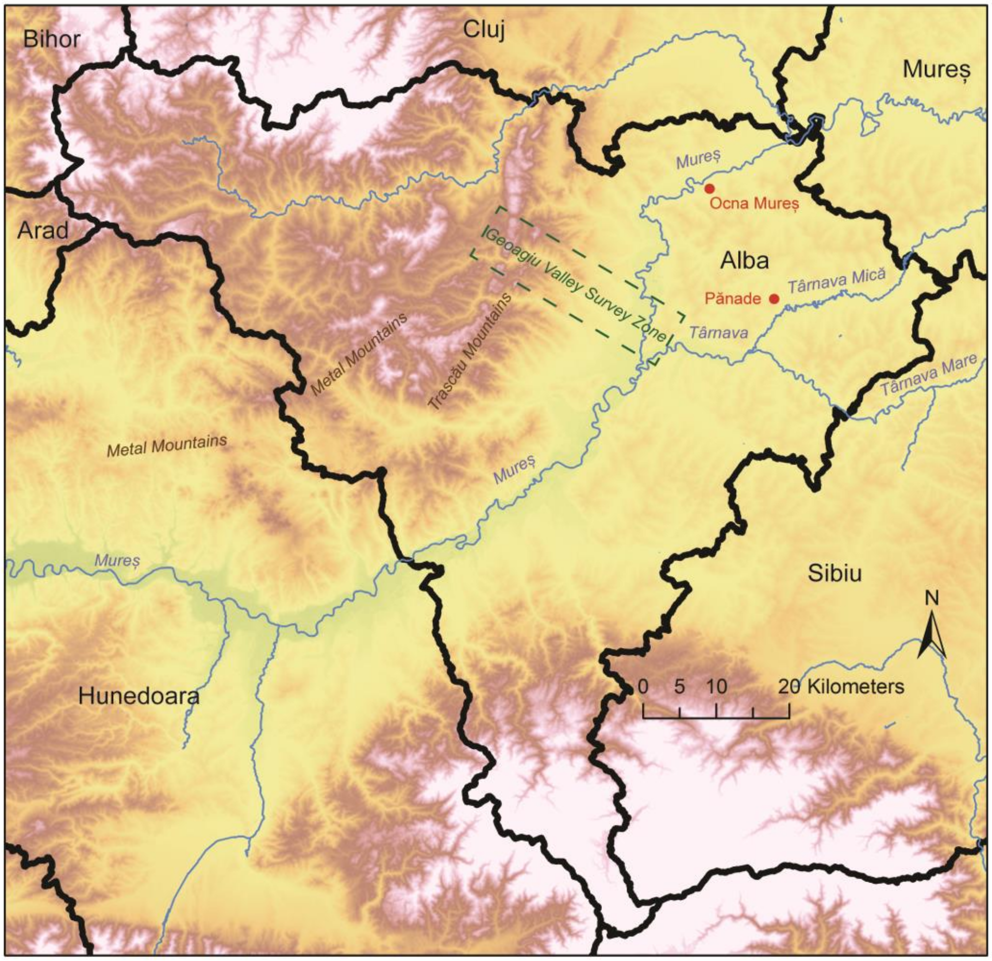

Figure 6.2 – Map of Alba and surrounding counties in southwest Transylvania with Geoagiu Valley intensive survey zone marked.

The rugged landscape in the northwest corner of Alba County was not included in the extensive survey for two main reasons. First, there has been limited archaeological research conducted in the region. As a result, there is currently no archaeological evidence of Bronze Age settlement in the area (including from chance finds). Second, this portion of the county is associated with the headwaters of the Criș River, and as such may be more closely associated with communities to the west (in Arad County and eastern Hungary), rather than the communities to the east. The far southern tip of Alba County was also omitted, as its location in the southern Carpathian Mountains is closely linked with the surrounding counties, also has been understudied, and is not in close proximity to the Mureș Valley. As a result, the extent of the extensive survey is an area approximately 75 km x 60 km.

The extensive survey included three main components. The first component of the extensive survey was remote survey using satellite imagery. Two sources of satellite images were used: CORONA satellite imagery and Google Earth. CORONA imagery is now de-classified satellite photographs taken during the 1960s and 1970s (Figure 6.3). Archaeologists have been taking advantage of the highly detailed satellite imagery to identify archaeological sites (e.g., Beck et al. 2007; Oltean and Abel 2012; Philip et al. 2002; Ur 2003). The imagery can be particularly important to see landscapes prior to increased development in recent years. CORONA imagery can help with the identification of Bronze Age sites, as seen in the CORONA image of the site of Munar in Arad County, Romania in which the fortified Middle and Late Bronze Age site is clearly visible (Gogâltan and Sava 2010:Figure 60). The freely available satellite imagery from Google Earth provides another set of images, taken forty to fifty years after the Corona Images, and in color (see Figure 6.3).

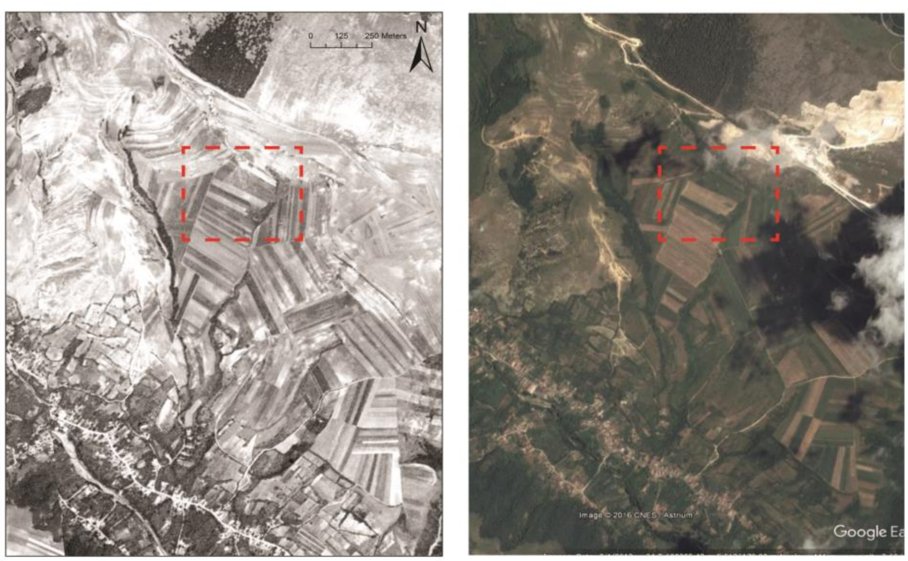

Figure 6.3 – CORONA imagery (left) and Google Earth (right) imagery of Geoagiu de Sus. The red squares frame Geoagiu de Sus-Fântâna Mare, which cannot be identified through this imagery alone.

While remote survey using satellite imagery has allowed for the identification and characterization of Bronze Age sites in the Carpathian Basin, it proved significantly less successful in southwest Transylvania. No fortifications are at Early and Middle Bronze Age sites are visible in the satellite imagery. The 1-2 m pixel size is too coarse to clearly identify any of the Early Bronze Age burial mounds that are present in the landscape. However, the imagery does clearly identify the fortifications at the Late Bronze Age site of Teleac (Figure 6.4).

Figure 6.4 – CORONA imagery of the Late Bronze Age hillfort at Teleac with visible fortifications.

The second component of the remote survey was examining historical maps from the Austro-Hungarian Empire. The Austro-Hungarian Empire, of which Transylvania was part until the end of World War I, conducted three different surveys mapping their territory. The first military mapping survey took place in 1784-1806, the second took place in 1806-1869, and the third took place in 1868-1880. These maps were the primary military base maps for the Empire (Figure 6.5). The maps have been digitized and georeferenced and are available for purchase.

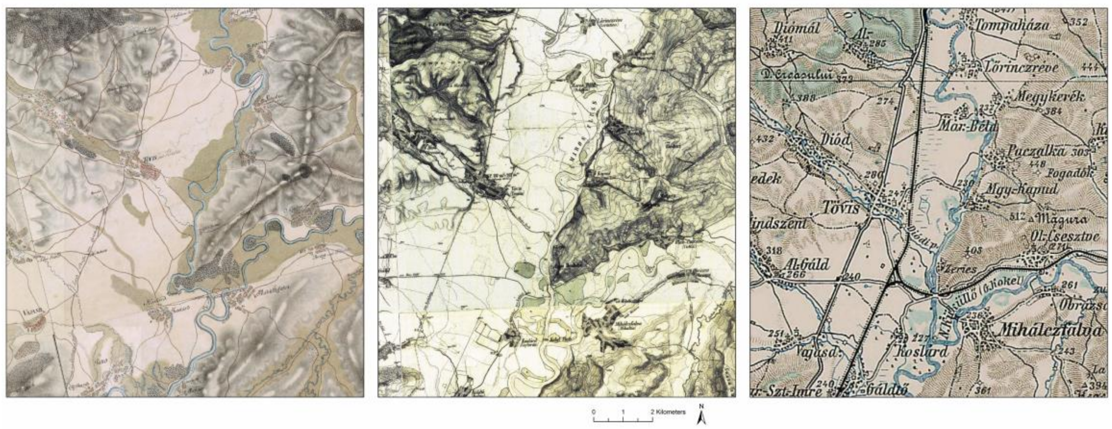

Figure 6.5 – The First (left), Second (middle), and Third (right) Austro-Hungarian Survey maps for the lower Geoagiu Valley and its confluence with the Mureș River.

As military maps, the surveyors placed a lot of emphasis on features that can correspond with archaeologically significant features: topography and high ground, hills and mounds, fords, and ditches. In the flat Carpathian Basin, the maps identified many of the archaeological features, including kurgans, tells, and fortifications. In the mountains of southwest Transylvania, however, cultural features that produce significant and distinct changes in elevation on the landscape are indistinguishable from the natural topography. These maps did provide important information about the location of river fords and changes in the course of the Mureș prior to channelization. The maps were more useful after identifying sites through intensive survey to look at changing landscape use and historical agricultural practices that may have impacted the integrity of subsurface deposits.

The lack of easily identifiable sites on the satellite imagery and historical maps does not reflect a lack of sites. Instead, it is a result of a mountainous and undulating landscape in which human-made features do not often stick out (at least at the scale required to be identified in these images and maps). The places where CORONA imagery and the Austro-Hungarian maps have been most helpful are extremely flat (e.g., the Carpathian Basin - Gogâltan and Sava 2010) or not affected by invasive agriculture and vegetation (e.g., the Near East – Beck et al. 2007; Philip et al. 2002; Ur 2003). Given the topography of southwest Transylvania, more intensive survey methods were required.

The third and final component of the extensive survey involved the digitization of known sites. A long history of agriculture and small-scale archaeological projects in the region had produced a large catalog of sites, including many Bronze Age sites (Moga and Ciugudean 1995). The archaeological sites of southwest Transylvania are most completely presented in Moga and Ciugudean's (1995) *Repertoriul Arheologic al Județului Alba* (The Archaeological Repertoire of Alba County). Many additional sites, and more details on Bronze Age sites can be found in Boroffka's (1994a) and Ciugudean's (1996) dissertations. More sites have also been published in Romanian journals and edited volumes (e.g., Muntean 2008; Berecki and Balázs Áldor 2007). Additionally, consultation with Ciugudean allowed me to identify and record several sites that have not previously been published.

The strategy of digitizing the previously known sites was straightforward. First, I generated a map of sites by dropping pins in Google Earth at known site locations. Site locations were derived from published site maps, published site descriptions that contain information on the site's location, and Ciugudean's descriptions. Additionally, the Romanian convention of naming archaeological sites based on the names of the landscape features where they are located (local toponyms) proved quite useful. For example, "*dealul"* is Romanian for "the hill." A site with "*dealul*" in the name is likely located on the top of a hill. This was particularly helpful when accurate coordinates were not published and I had to use general descriptions to identify the most likely positions of the site.

Once a preliminary map was created, I visited as many sites as possible and re-record their site location using a handheld GPS (Garmin 62s). This step was critical for several reasons. First, it allowed me to confirm that there was actually a site in the place it was reported. In some cases I had to reposition the site several hundred meters from its preliminary placement. Second, it allowed me to characterize the nature of the site. This included recording site size, the state of preservation of the site, the presence and abundance of cultural material on the surface, and the temporal and cultural affiliation of that material. Many of the previously published sites were recorded in the late 19th and early 20th centuries, often based on information from local farmers who brought cultural material they found in the field to archaeologists based in local and county museums. As such, many of the sites could be considered little more than "find spots" – places where Bronze Age ceramics were found. In some cases it became clear that the find spots were actually settlement sites, but in others they appear to have been more random chance finds not associated with a permanent settlement. In cases where there was a site, it was important to record its precise location within the landscape as well as determine the site's size in order to run the GIS and network analyses described below. Third, while traveling to many of the sites I identified new, previously unrecorded, sites. This "encounter" survey method allowed me to get a much wider view of the diverse landscapes and settlements associated with Bronze Age communities than was afforded with the much more spatially restrictive intensive survey. As a result of this process I recorded 110 previously known settlement sites and found 6 previously unrecorded sites within the region. Of these settlements, only 66 have a relative chronological and cultural affiliation to sub-phases of the Bronze Age (see Appendix A). Extensive survey also helped record 60 discrete Early Bronze Age cemetery sites, with a total of 205 individual mounded tombs, as well as 9 Middle Bronze Age burial sites (including burials in settlements).

Intensive Survey

Intensive survey was conducted at the scale of an individual valley. The Geoagiu Valley is located in the Trascău Mountains and the survey area included its confluence with the Mureș River (Figure 6.6). The valley is bracketed by the Gârbova Valley to the north and the Cetea Valley to the south. The Geoagiu River is a small stream that is too shallow to be traveled by boat. The river extends approximately 25km from the its origin in the Metal Mountains to its confluence with the Mureș River. This project focused on the last 20km of the valley; the region to the east of the limestone ridges near Rameț. The survey covered the territory of the modern villages of Rameț, Geoagiu de Sus, Stremț, and the town of Teiuș on the west side of the Mureș, and the villages of Capud and Pețelca on the eastern side of the Mureș. In total, the intensive survey unit covered parts of an area approximately 20km x 4km.

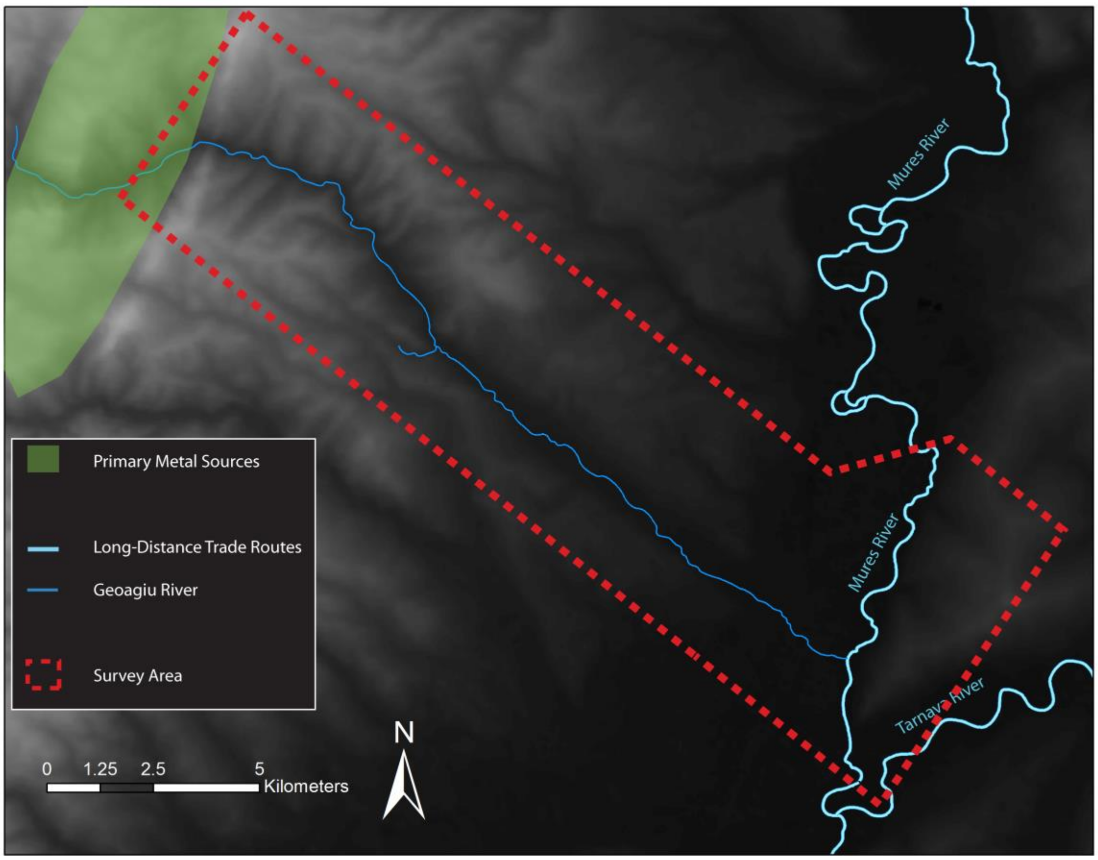

Figure 6.6 – Extent of intensive survey in the Geoagiu Valley and its confluence with the Mureș River.

The Geoagiu Valley was chosen for intensive survey for three reasons. First, it is located in a key geographic zone. This valley would have been an important route along which people and resources could have moved between the Metal Mountains and ore-rich pockets of the Trascău Mountains down to the interregional trade routes of the Mureș River. Additionally, its confluence with the Mureș River is in close proximity to the confluence of the Mureș and the Târnava Rivers – the largest (Mureș) and second largest (Târnava) rivers in Transylvania. Second, there had been very little previous archaeological work conducted in and around the valley. The extensive survey documented only three known find spots with material dating to the Bronze Age. Previous work in Alba County had focused on the Ampoi Valley (e.g., Ciugudean 1996) and the Aiud Valley (e.g., Boroffka 1994b). The Geoagiu Valley is equidistant from both of these valleys. It was unclear if the paucity sites in the Geoagiu Valley was an artifact of Bronze Age settlement patterns or unsystematic sampling that produced the extensive survey dataset. Third, the Geoagiu Valley and its confluence with the Mureș is significantly less developed than the areas associated with the Aiud and Ampoi valleys. The modern town of Teiuș, located at the confluence of the Geoagiu Valley and the Mureș River, is much smaller than Alba Iulia and Aiud (located at the confluences of the Mureș with the Ampoi and Aiud valleys respectively). Together, these factors made the Geoagiu Valley an ideal location for conducting intensive survey.

Along the Geoagiu Valley there are several different topographic and environmental zones, which offered differential access to resources such as metal, salt, pasture, and agricultural fields. This variability allows us to examine how Bronze Age communities utilized the landscape and placed themselves in relation to these resources, and how these social choices and economic consequences changed throughout the Bronze Age. However, this variability has impacted modern landscape uses as well; the lowlands have been intensively plowed while the uplands are either forested or untilled pasture. As such, the preservation and archaeological visibility of sites in the landscape varies significantly along the valley. Survey techniques must similarly be flexible to deal with the different landscapes.

Intensive coverage of the landscape in the Geoagiu Valley was conducted by pedestrian survey. Pedestrian survey was designed to identify areas where Bronze Age material culture were present, define site boundaries, and identify areas for subsurface testing.

The main unit of survey was the *field system*. A field system was defined as an agricultural plot that had one type of crop coverage. Field systems boundaries often were based on modern ownership boundaries, although some field systems did cross multiple ownership parcels. Given the variability in survey conditions, all transect data and field-grabbed material culture items were pooled together by field system. In cases where field systems contained Bronze Age sites, we returned and employed a secondary site-based collection strategy.

In each field system that could be surveyed, transects were spaced 20m apart. Survey team members walked each transect and documented all prehistoric (hand-made) sherds as well as all other diagnostic artifacts. The lateral visibility depended on the field system, but ranged from 1 meter (in mature cornfields) to 5 meters (in plowed fields). At the end of each transect, the artifacts were photographed and only a sample (if any) were collected. All diagnostic Bronze Age sherds were collected, while the majority of post-Roman material was not collected. The field system attributes, including size, survey transect width, ground cover, and presence of artifacts, were recorded at the completion of each field system. Each field system was photographed to document the surface visibility, crop coverage, and general placement in the landscape. The boundaries of the field system were recorded, either through GPS points at the corners using a Garmin GPSMAP 62s or through drawing the boundaries using the fourth-generation iPad on satellite imagery available through the app GPSPro.

The crop coverage during the survey seasons (primarily June-August) was not ideal for pedestrian survey. In southwest Transylvania, wheat is normally planted in the late autumn and harvested in mid-July. There is almost no visibility of the ground surface between the spring and when the harvested fields are plowed to plant again (around October). Corn is normally planted in the early spring, hand-picked in August and September, and the dried stalks harvested in October-December for animal fodder. Survey in maturing corn is slow, but possible. Visibility was limited by the 3-4m tall corn; which led us to pool all find information to the field system. After the dried stalks are harvested, however, ground visibility drops until the fields are plowed again (in the early spring). Alfalfa was continuously grown and harvested, and fields covered in alfalfa are often unplowed for years. There are many fields that were left fallow or for pasture that have very poor ground visibility. A mixture of other crops, such as mustard and sunflowers, had different seasonality, and field systems where they were growing were generally unable to be surveyed during the summer months. Fortunately, crops are often rotated every year or two years. Working across multiple field seasons allowed us to survey some fields that were initially unable to be surveyed.

When we identified a Bronze Age site through pedestrian survey, we would return and conduct site specific surface collections to determine the horizontal extent of sherd scatters, identify all periods of occupation represented in the plowzone, and generate collections that could be compared across and between sites. The first step was to conduct survey in 5m transects to identify the horizontal extent of the site. Only diagnostic objects were picked up during these transects. At some sites, we collected all material culture items in a 10 x 10 m square (usually two collection units per site). This technique was employed specifically at sites where subsurface testing revealed that the entire site (or many of the occupation components) had been destroyed through erosion and/or plowing. These 10 x 10 m collection units were the only way to systematically understand internal site variability and generate material culture that could help characterize economic, political, and temporal organization of the site.

At each settlement, we recorded: (1) site location and elevation using a Garmin 62s with a point taken in the middle of the site; (2) landscape setting; (3) landcover and surface visibility based on vegetation; (4) horizontal extent (in hectares) after establishing a site perimeter and recording it using a Garmin 62s GPS or iPad; (5) cultural and chronological affiliations through ceramics; (6) the sampling strategies employed for survey and collection strategies; (7) date of fieldwork; and (8) village and site names (if known). At each tomb, we recorded: (1) site location and elevation using a Garmin 62s with a point taken in the middle of the site; (2) landscape setting; (3) diameter of the tomb; (4) shape of the tomb; (5) date of fieldwork; and (6) village and site names (if known).

A total of 12 definitive Early and Middle Bronze Age settlements and 20 Early Bronze Age cemeteries were recorded in the Geoagiu Valley. through intensive survey. Additionally, several new Neolithic, Eneolithic, Late Bronze Age, Roman, and Medieval settlements were discovered. Prior to this survey, only 2 find-spots (Rameț-*Curmatura* and Geoagiu de Sus-*Viile Satului*) had been identified as likely locations of Bronze Age settlement. One EBA tomb cemetery (Geoagiu de Sus-*Cuciu*) had been previously excavated by Horia Ciugudean (although the location of the excavated materials is currently unknown).

Test Excavations

Test excavations were a critical component of the BATS Project research design. Because the landscape is highly variable – from the rocky Trascău Mountains to the large Mureș flood plain – surface survey alone is insufficient for understanding settlement history in the Geoagiu Valley. In some locations, colluvial deposits capped intact Bronze Age deposits and materials on the surface provided no hint at what lay beneath. In others, particularly in the low terraces above the Mureș and near modern towns (e.g., Teiuș), intensive plowing destroyed all intact deposits. Even when sites were identified on the surface, there were often occupational components that were not identifiable based on surface assemblages because they were buried by meters of other cultural deposits. Test excavation to characterize the presence and nature of intact cultural deposits at archaeological sites was the only way to fully understand the settlement history and site formation processes that created the archaeological landscape. Fortunately, the Romanian permitting system is supportive of small-scale subsurface testing as a form of archaeological survey.

The BATS Project test excavations were designed to: (1) characterize the subsurface deposits at each site; (2) collect organic material for radiocarbon dating to reconstruct the site occupation histories; (3) generate collections (particularly ceramics) that could be correlated with radiocarbon dates to test and refine existing chronological models; and (4) generate collections that could allow for comparing economic variation within and between sites. Given the small windows provided by the test excavations, they were not designed to fully reconstruct intra-site organization or economic systems. However, several test units were placed in fortuitous locations that helped identify metalworking features, activity areas, house floors, storage pits, and kilns which together provide important and novel data on social and economic organization of Bronze Age communities.

Test excavations were a multi-step process. First, sites that had been identified during remote and pedestrian survey were selected. Second, a series of shovel test probes

(STPs) (n=2 to 8) were conducted across the site in order to identify the best locations to target with expanded test excavations. The STPs were taken down to either sterile, 1m deep, or until we were confident that we had a handle on the nature of deposits at the site. The size (depth and width) of each STP was recorded, the deposits were described in notebooks, and photographs were taken. The location of each STP was recorded using a handheld GPS. In most cases, all material culture recovered in the STP was collected together, though in some cases collection bags were assigned based on natural or arbitrary stratigraphic breaks (particularly in the deep STPs with intact cultural deposits from multiple periods).

Third, several (n=1 to 3) 1m x 1m excavation units were placed across individual sites in locations that the STPs indicated would have the best chance of producing intact cultural deposits. Each test unit was excavated to sterile. Materials were collected in 10 cm arbitrary levels within natural stratigraphy. This means that 10cm levels were excavated unless there was evidence that the stratigraphic layer ended, in which case levels could be as shallow as 1cm. In each level, a standard 5 liter soil sample was taken for flotation. All material culture (e.g., animal bone, ceramics, daub) was collected together within each excavation level. Radiocarbon samples, particularly charcoal, were collected and their three-point provenience was recorded. We attempted to recover several samples per excavated level, although this was not always possible. When completed, profiles were drawn and photographed and soil samples were taken in 10cm increments from the top of the unit to the base (these soil samples remain in the curated collection).

Finally, material collections were washed, sorted, and preliminarily analyzed in the lab. Finds were first sorted into general categories (e.g., ceramics, fauna, metal, ore, daub, groundstone, lithics). Next, counts and weights of finds within each category was made, with ceramics being subdivided into diagnostic (rims, bases, handles, and decorated) and non-diagnostic categories prior to being counted and weighed. Flotation samples were processed in the lab. The samples from 2012 and 2013 were floted using a large flotation tank and the samples from 2014 were processed using bucket flotation (see Logan [2012] for protocol for bucket flotation). Samples of charcoal, metallurgical debris, faunal remains, botanical remains, and heavy fraction from flotation were shipped to the University of Michigan Museum of Anthropological Archaeology (UMMAA), and in some cases other labs across the United States, for analysis. All other cultural material (e.g., ceramics, metal, daub, stone, lithics, and soil samples) is curated at the MNUAI.

Dating Methods

The cornerstone of this dissertation is a new absolute chronology for the Transylvanian Bronze Age. The first step in this process was collecting samples of datable organic material. Historically, Romanian archaeologists have not collected or curated organics – including charcoal and animal bone, though this has been changing over the past decade. New samples for AMS dating needed to be generated through fieldwork with an emphasis on context and spatial control.

The samples for radiocarbon dating in the BATS project were chosen through a series of criteria. From settlements, samples were chosen from each stratigraphically distinct occupation level. In most cases, we chose samples that had direct association with diagnostic ceramics that were the foundation of the pre-existing relative chronology. Due to lower costs, we preferentially selected wood charcoal samples from occupation levels. However, in some cases, particularly when there was no preserved charcoal or if the charcoal did not produce accurate dates, we processed samples of animal bone.

From cemeteries, samples were chosen to date the full formation of cemeteries when possible. We ran samples on inhumed human bone, which involves extracting and dating the collagen present in the bone, and cremated human bone, which involves dating bone carbonate from calcined bone (collagen does not preserve in cremated bone). Multiple dates from individual tombs and burial clusters were selected. Within cemeteries, we selected samples from across burials that had different mortuary treatments. Selecting samples across different burial treatments allowed us to identify what variability in mortuary treatment was due to change through time and what variability could be attributed to social segmentation, agency, and different identities. As with samples from settlements, we chose to select samples from the same deposit as diagnostic ceramics to help test existing ceramic chronologies.

In total, 49 new radiocarbon dates have been analyzed. Of these, 11 date Early Bronze Age activity (2 from settlements, 9 from cemeteries), 29 date Middle Bronze Age activity (17 from settlements, 12 from cemeteries), and 2 date Late Bronze Age activity (1 from settlements, 1 from cemeteries). 5 dates come from intrusive material (dates from different occupational layers at the site that were out of place – most likely due to bioturbation). 2 samples provided spurious dates that are not included in the rest of the analyses. The majority of samples (25) were charcoal, though 14 bone (2 animal and 12 human) and 10 cremated bone samples were also run. The samples were split among several laboratories. The majority (37) were processed at the National Oceanographic Institute AMS lab (NOSAMS) in Woods Hole, Massachusetts. 10 samples were processed at the University of Arizona AMS lab (AA) with the help of Dr. Greg Hodgins. 2 samples were processed at the University of Georgia AMS lab. The labs were selected for their accuracy, discounts for NSF-funded research, and turnaround times. By emphasizing the diversity of samples across multiple types of material (charcoal, bone collagen, bone carbonate) and multiple different laboratories, institutional or processing biases were mitigated. These methods allowed for the creation of a new radiocarbon based chronology for southwest Transylvanian Bronze Age (Chapter 7).

Chapter Summary

In this chapter, I have described the fieldwork strategies employed to generate data to test the archaeological expectations of anthropological models of the organization and evolution of Bronze Age societies described in Chapter 7. Structural limitations on fieldwork (permits, cost, and time) were mitigated through the development of a multiscalar data collection strategy. The next section presents the results of the field project with a specific focus on a new regional chronology, the organization and evolution of settlement systems, and evidence for the long-term development of economic, demographic, and ideological centralization in southwest Transylvania.

Chapter 7 - A New Chronology for the Bronze Age of Southwest Transylvania

"There is no history without dates." - Claude Lévi-Strauss (1966:258)

Chapter Introduction

An accurate chronology is fundamental to understanding the organization (synchronic comparisons) and evolution (diachronic change) of any society. Unfortunately, the Bronze Age in Transylvania has lacked an absolute chronology. Instead, archaeologists have had to rely upon ceramic seriation, broad metallurgical horizons, and other relative dating techniques to construct the existing regional chronology.

Fortunately, radiocarbon dating of organic material associated with in situ ceramic assemblages offers an unambiguous solution to this issue. In addition to dating deposition events and occupation levels in which the supposed temporally diagnostic ceramics occur, Bayesian modeling provides a means of constructing and further refining a regional chronology that is independent of the ceramic decoration techniques and motifs. Bayesian modeling for radiocarbon dates has become common within archaeology; moving beyond calibration to complex models based on stratigraphy, phasing, and other relationships among samples (see Barrier 2017; Bayliss and O'Sullivan 2013; Bourgeois and Fontijn 2015; Bronk Ramsey 2009; Cobb et al. 2015; Krus and Peteranna 2016; Krus et al. 2015; Pluckhahn et al. 2015). Additional information about Bayesian modeling of absolute radiocarbon dates, including an overview of the methods underlying Bayesian analysis as well as a larger discussion of their history and purpose, can be found in work by Bronk Ramsey (2009) and Bayliss (Bayliss 2009; Bayliss and O'Sullivan 2013). By decoupling decoration and dates, ceramics are free to be explored for other important social, economic, and political information that was previously sidelined at the expense of trying to document change over time.

In this chapter, I present a new radiocarbon chronology for the Bronze Age in Transylvania. I present 42 new Bronze Age dates that were collected, run, and analyzed as part of the BATS Project (out of 49 total samples) and combine them with the existing radiocarbon dates to create new phasing for the Transylvanian Bronze Age that is independent of any particular ceramic technique. This new chronology has significant implications for understanding community organization in southwest Transylvania, as it structures the analysis of the organization and evolution of social, political, economic, and ideological institutions throughout the Bronze Age.

Dating the Transylvanian Bronze Age

Prior to the start of the BATS Project, only 6 radiocarbon dates from the first 1500 years of the Bronze Age (2700-1200 cal. BC) had been published[1]. While the lack of Bronze Age radiocarbon dates is due in part to scarce economic resources and few systematic excavations, it in part has reflected a belief that sequences of metalwork and ceramics obviate the need for independent dating techniques in late prehistoric Europe (O'Shea 1991:98).

Metalwork and ceramics are the two most important artifact classes for relative dating sequences. The ceramic-based relative chronology is discussed below. The most important metalwork chronology for later European prehistory is the Reinecke system (Reinecke 1965). Developed for Central Europe, the sequence has been used to synchronize regional chronologies from Western, Central, and Eastern Europe (see Ciugudean and Gogâltan 1998; Diaconu 2014; Roberts et al. 2013). The expansion of radiocarbon dates across Europe has resulted in the current conceptualization of the metalwork chronology. The Bronze Age sequence of the Reinecke system begins at approximately 2150 BC, as he considered earlier metalwork as part of the Late Neolithic (see Roberts et al. 2013). There are six periods of Early/Middle Bronze Age and four Late Bronze Age periods prior to the start of the Iron Age (Ha C) (Table 7.1).

[1] In the past 3 years, 16 new radiocarbon dates have been published.

Table 7.1 - The Reinecke System for Bronze Age Chronology Based on Metalwork. Note that the dates are estimates and not anchored with absolute dating techniques.

Period	Dates
Bz A1	2150-2000 BC
Bz A2	2000-1575 BC
Bz B	1575-1475 BC
Bz C1	1475-1425 BC
Bz C2	1425-1325 BC
Bz D	1325-1200 BC
Ha A1	1200-1125 BC
Ha A2	1125-1025 BC
Ha B1	1025-925 BC
Ha B2/3	925-800 BC
Ha C	Post 800 BC

This metalworking sequence has served as the primary way of synchronizing internal Transylvanian Bronze Age chronological phases – generated through seriation of ceramic assemblages – with the cultural and chronological developments occurring in the Carpathian Basin (see Ciugudean and Gogâltan 1998).

The existing ceramic and metalwork chronologies are insufficient for the research goals of this dissertation. Ceramic styles are usually localized, while European metalwork styles are homogeneous over much larger spatial distributions. As such, ceramics and metalwork provide different chronologies at different spatial scales. Ceramics are used to generate regional sequences, and metalwork is used to synchronize these regional sequences across Europe. Consequently, ceramic chronologies and metal chronologies cannot be used to independently cross-check the accuracy of each other (see Bóna 1975). Only absolute dates from archaeological deposits with these materials can anchor both local and macroregional sequences.

The belief in the material-based chronological sequences and the frequent dismissal of independent dating techniques has recently waned. Hungarian archaeological communities in the Carpathian Basin have invested heavily in radiocarbon sequences (e.g., Raczky et al. 1994). The Romanian archaeological community has been slower to invest in independent dating techniques, although we are currently in a period of transformation in the Romanian Bronze Age literature in which radiocarbon dates are given higher priority in research agendas (see Bălan and Quinn 2014; Berecki 2016;

Ciugudean and Quinn 2015; Dietrich 2014a; Frînculeasa et al. 2011; Gogâltan 2015; Harding and Kavruk 2013; Kaiser and Sava 2009; László 2002; Németh 2015; Popescu and Băjenaru 2008; Whitlow et al. 2013).

In this study, I present 42 new radiocarbon dates, bringing the total number of pre-Gava Bronze Age dates from Transylvania to 64. It is now possible to begin to create a new absolute chronology – one that is separate from the ceramic chronology. We can then compare the ceramic chronology to the absolute chronology rather than having the ceramics speak only to temporality. By disarticulating ceramic decoration and dates, we not only get a better understanding of the tempo of social change in Bronze Age Transylvania by breaking down spatial palimpsests, we also free up ceramics to contribute to our understanding of economic organization and social signaling of identity.

Ceramic Variability and Chronology

Ceramics have carried a lot of responsibility in Bronze Age Europe. Patterned variability in the distribution of the form, fabric, and decoration have been critical for identifying cultural groups and situating them in time and space. There is no better example than Gimbutas's (1965) *Bronze Age Cultures in Central and Eastern Europe* for understanding the central role that ceramics have played in understanding the organization and evolution of European Bronze Age societies. For the Middle Bronze Age in the Carpathian Basin, ceramic variation has been the key component for creating systematic approaches to regional culture history, particularly the work by Bóna (1975). Ceramics have been used to define spatially and temporally distinct cultural groups (Bóna 1975; Duffy 2010; Nicodemus and O'Shea 2015; O'Shea 1991).

However, not all ceramic variation (and in some cases, mortuary – see O'Shea 1991:99; Sandor-Chicideanu and Chicideanu 1989:15) can be attributed to change over time (Nicodemus and O'Shea 2015; O'Shea 1991). One of the earliest and best examples of radiocarbon dating challenging existing metalwork and ceramic seriations comes from the Maros Group in southwestern Hungary, near the confluence of the Tisza and Mureș Rivers. An extensive radiocarbon sequence developed by O'Shea (1991) challenged and refined the existing chronology. Many of the cultural groups in the eastern Carpathian Basin that were previously seen as sequential were now demonstrated to be contemporaneous (O'Shea 1991:101). As a result of this reorganization and synchronization of cultural groups (e.g., the Nagyrév and Maros Groups), new social interpretations of the archaeological record are necessary. Instead of comparing change over time, archaeologists are now comparing two distinct social groups that decorated their ceramics and buried their dead in strikingly different ways (see O'Shea 1996).

Returning to Transylvania, we see a chronological sequence in the same position as the Carpathian Basin prior to the 1990s. Ceramic variability has been primarily interpreted as indicating change over time. When distinct traditions of technological style (ways of making decoration) were identified, they were placed in sequential order (see Boroffka 1994a; Chidioșan 1980). By generating a new radiocarbon-based absolute chronology for Transylvania, we must confront the contradictions with the existing ceramic chronology and seize the opportunities for new insights into the organization and evolution of Bronze Age communities. In particular, by disarticulating decoration from dates we can test to see if variability in ceramic decoration really matches time, or if decoration may be freed up to help us explore other forms of variability, including forms of social identity (ethnicity, sodality, status) and organization of craft production.

Traditional Chronology for Bronze Age Transylvania

The Early Bronze Age in Transylvania

The Early Bronze Age in Romania began with the end of traditional Copper Age (also called Eneolithic) Baden (in the Carpathian Basin) and Coțofeni (in Transylvania) Cultures. The impetus for the transformation from Copper Age cultures to Early Bronze Age cultures has been variably attributed to a migration of new people into the Carpathian macroregion from the Eurasian Steppe (the so called "Yamnaya" people), or to in situ local adaptations to changing technologies (Ciugudean 1996). Whether a new people, a continued cultural development, or a cultural synthesis with a local adoption of non-local attributes, the Early Bronze Age marked distinct transformations in social, economic, ideological, and political systems on the path from more autonomously organized Neolithic and Copper Age societies (see Parkinson 2002) towards more centralized and politically hierarchical societies at the end of the Bronze Age (see Kristiansen and Larsson 2005).

According to relative dating, synchrony with surrounding regions, and a handful of radiocarbon dates, the transition to the Early Bronze Age in Transylvania occurred around 2700 BC. Many tombs with EBA ceramics have been found placed on top of Coțofeni settlements, and Coțofeni material culture is often incorporated into the earthen mantel on top of the stone cairns of the tombs (Ciugudean 2011:24). Radiocarbon samples from the site of Livezile (jud. Alba), from both a tomb (Poz-42712; 4015 ±35 BP) and the associated settlement (Bln-4624; 4109 ±44 BP), suggest that the transition to the EBA in southwest Transylvania had occurred by 2700 BP (Ciugudean 1996; Gerling and Ciugudean 2013:4). This corresponds with the limited absolute dating of the end of the Coțofeni Culture (Ciugudean 2000:57-59, Pl. 154; Gerling and Ciugudean 2013:4). The development of the Early Bronze Age in surrounding regions, where there is a longer history of absolute dating, has also placed the Bronze Age between 2700 and 2000 cal. BC (O'Shea 1991). While some researchers have incorporated the final phase of the Coțofeni Culture into the EBA (see Mauel 2014), this is not the dominant view. There is a strong consensus that the end of the EBA in Transylvania coincides with the emergence of the Wietenberg Culture at approximately 2000 BC, described in more detail below.

The internal chronology of the EBA, however, has been subject to some debate. Ciugudean (1996) identified three, allegedly temporally distinct, ceramic traditions in the Transylvanian Bronze Age (Table 7.2).

Table 7.2 - The internal relative chronology for EBA in southwest Transylvania based on ceramic decoration (after Ciugudean 1996).

Period	Date Range	Diagnostic Ceramic Attributes
EBA I – Livezile	2700-2500 BC	Hatched horizontal bands and rhombs and incisions on rims and shoulders, plastic applications, some superficial channeling.
EBA II - Șoimuș	2500-2250 BC	Applique and, folded rims
EBA III – Iernut	2250-2000 BC	Rusticated and textile impressed ceramics

Ciugudean links the Livezile group (EBA I) to allegedly contemporaneous cultural groups such as Foltești, Schneckenberg, Govora-type discoveries of the Glina Culture, late Vucedol and Mako Cultures; the Șoimuș group (EBA II) to Copăceni, Schneckenberg, Jigodin, as well as Somogyvar-Vinkovci; and the Iernut group (EBA III) to the Gornea Orlești horizon and classical Nagyrev and Hatvan Cultures in other parts of Romania and the Carpathian Basin (Ciugudean 1996:153; Gerling and Ciugudean 2013).

Rusticated and textile impressed ceramics emerged across the Carpathian Basin by the start of the Early Bronze Age (e.g., Mako Culture, 2800 BC) and continue until the start of the Middle Bronze Age (2000 BC). In Transylvania, however, they only appear in the EBA III (Iernut) period, in the last 3 centuries of the Early Bronze Age. It is important to note that in southwest Transylvania, the Iernut ceramics have only been found long the major rivers and not in the Apuseni Mountains. A radiocarbon date from a burial at Meteș, a site in the mountains that is not affiliated with Iernut ceramics, has placed it into the time period associated with the Iernut ceramics (Poz-42714; 3660 ±50 BP) (Gerling and Ciugudean 2013). Additionally, in southeast Transylvania, the EBA III period, as defined by the presence of rusticated ceramics, appears to be represented by only a single site, assigned to the Zoltan group (Cavruc and Dumitroaia 2001:120-121).

While Ciugudean's (1996) initial conceptualization of the Early Bronze Age internal chronology remains the standard (see Gogâltan and Apai 2005), several researchers have suggested subtle modifications. Again based on ceramic seriation, Popa and Totoianu (2010) argue that there is an intermediate phase (EBA IIb) between the Șoimuș/Copăceni (EBA II) and later phases of the EBA III, which they divide into two subphases (EBA IIIa; EBA IIIb) (Popa and Totoianu 2010:376-377). They separate out rusticated wares, including Gligorești-Valea Janului, Năeni-Schneckenberg, and early Ciomortan type finds (EBA IIb), as temporally distinct from textile-impressed wares, including Gornea-Foieni I and Ciomortan finds (EBA IIIa) and Gornea-Foeni II and Ciormortan finds (EBA IIIb), though both have their origin in the Carpathian Basin.

Popa and Totoianu (2010:377), following Gogâltan and Apai (2005) also argue that the textile-impressed surface treatment is not present at the third phase type site of Iernut identified by Ciugudean (1996), so they refer to the third and final phase of the Early Bronze Age as the Gornea-Foeni period instead. However, given that there is minimal difference in the ceramic attribute definition and the presumed time span of the final phase, I will continue to refer to the third type ceramics as "Iernut."

In one of the more substantial proposed changes to the internal EBA chronology, Gogâltan and Apai (2005) argue that the Șoimuș group overlapped with the Coțofeni Culture. This argument was based on an analysis of old collections from in the 1960s housed in the Arad Museum and Institute of Archaeology and Art History at Cluj. Provenience information is significantly lacking, and it is unlikely that the finds that the Șoimuș and Coțofeni ceramics were made and deposited contemporaneously (mixed deposits through EBA reuse of Coțofeni settlements is common). Due to these issues, little weight can be given to this assertion.

To summarize the existing relative chronology, most archaeologists agree that the Early Bronze Age in Transylvania extended from 2700-2000 BC. There is also a general agreement based on ceramic seriation that there are three primary phases of internal development of the Early Bronze Age in southwestern Transylvania. These phases have divided the 700 year EBA span into EBA I (Livezile group – 2700-2500 BC), EBA II (Șoimuș group – 2500-2250 BC) and EBA III (Iernut group – 2250-2000 BC). While these are commonly accepted, there are already cracks forming in this chronology based on the few radiocarbon dates that have been published. In particular, there is a question about whether the mountains and most of eastern Transylvania were uninhabited during the EBA III period, as would be suggested based on the spatial distribution of sites with Iernut ceramics, or if there may be a continued use of the EBA II ceramics in some parts of southwest Transylvania after the introduction of EBA III ceramics.

The Wietenberg Culture

The Wietenberg Culture was first identified and defined by Schroller (1933:12-20) based on previous research focused on a Dacian settlement by C. Seraphin at Sighișoara-*Dealul Turcului/Wietenberg*. Nestor (1933:92-94) and Popescu (1944:100-106) furthered the link between the Wietenberg Culture and the Bronze Age. The Wietenberg type site produced significant finds, including an important spiral-decorated plastered hearth/altar and numerous decorated ceramics and metal objects (Boroffka 1994a; Horedt 1960). However, the nature of the deposits and excavation precluded any establishment of the temporal span or an internal chronology for with Wietenberg

Culture. In this section I will describe the historical development of these two key concepts.

The Temporal Span of the Wietenberg Culture

Situating the temporal span of the Wietenberg Culture within the Bronze Age is important for establishing connections to social transformations across Europe. It wasn't until the work by Horedt (1960:107-137) that a chronology that established the temporal span of the Wietenberg within the longer Bronze Age was proposed. On the basis of metal finds, Horedt proposed that the Wietenberg Culture existed between the Bz A2-D periods (2000-1200 BC) in Reinecke's Central European chronology. For several decades, this view persisted in the work of Soroceanu (Soroceanu and Istrate 1975:25), Chidioșan (1980), Andrițoiu (1992), and Boroffka (1994a).

More recently, some Romanian scholars have argued that the Wietenberg extended from the Bz A2 period to only the end of the Bz C period (2000-1325 BC) in Reinecke's chronology. This view was first proposed by Gogâltan (Gogâltan et al. 1992:12-13), and expanded by Ciugudean (1997b:81; 1999). For others, including Popa (Popa and Totoianu 2010:248, Table 1), the Wietenberg Culture, as the lone culture in Transylvania, ended at the end the Bz C period, but continued as part of a larger cultural synthesis – combined with Noua elements – until the end of the Bz D period (approximately 1200 BC).

The development of radiocarbon-based chronologies of Middle Bronze Age cultural groups (e.g., O'Shea 1991), has had an impact on how Romanian scholars view the temporal span of the Wietenberg Culture. Across the Carpathians, the Middle Bronze Age has been dated to between 2000/1900-1500/1400 cal. BC (Boroffka 2013:884-888; Fischl et al. 2013; Jaeger 2010; Jaeger and Kulcsar 2013). As a Middle Bronze Age group, some scholars have taken to adopting the Carpathian Basin absolute-dating temporal span to the Wietenberg Culture. Consequently, this has some researchers have begun situating the Wietenberg between 2000/1900-1500/1400 BC (e.g., Boroffka 2013).

Together, we can identify three distinct hypotheses of the end of the Wietenberg (Table 7.3).

Table 7.3 – Three existing chronological models for the end of the Wietenberg Culture.

Model	Analytical Basis	Citation
Model 1: End at 1200 BC	Metal. Synchrony with end of Reineke's Bz D period. Can include some overlap with Noua Culture.	Popa and Totoianu 2010; Boroffka 1994a; Chidioșan 1980
Model 2: End at 1500 BC	Radiocarbon Dates in Surrounding Regions. As a Middle Bronze Age culture, Wietenberg ended when other MBA cultures (in the Carpathian Basin) ended; Limited overlap with Noua	Boroffka 2013
Model 3: End at 1325 BC	Metal. Synchrony with the end of Reinecke's Bz C period. Some overlap with Noua Culture is possible.	Ciugudean 1997b

The end of the Wietenberg Culture is a source of significant recent debate in the Romanian literature (see Bălan 2014a; Bălan and Quinn 2014; Bejinariu 2001:24; Boroffka 1994a:251; Ciugudean 1997b:66-67, 2010:158, 163; Ciugudean and Quinn 2015; Dietrich 2014a; Gogâltan 2001:196-197; Gogâltan et al. 2004:73-74; Gogâltan 2009:119; Kaiser and Sava 2009; Popa and Raza 2009:37; Popa and Totoianu 2010:221; Rotea 1994; Rustoiu 2000:165-166; Vasiliev 2005:8). At its core, the debate centers on the relationship between the Wietenberg Culture and the Noua Culture. The Noua Culture, typified by inhumation burials and vessels with a new fabric, simple decoration, distinctive "kantharos-type" handles, originated in the western Eurasian Steppe (modern day Ukraine) (Dietrich 2014a, 2014b; Georgescu and Gonciar 2006; Kaiser and Sava 2009; Sava 2002). Based on existing radiocarbon dates, it appears that the Noua Culture can be placed between 1500-1200 cal. BC, although the cultural group likely originated earlier outside of Transylvania, as early as the 16th century BC (Bălan and Quinn 2014; Dietrich 2014a:62; Kaiser and Sava 2009; Motzoi-Chicideanu 2011:565).

Romanian scholars have debated the nature of the Wietenberg-Noua relationship for decades. While the majority of researchers have promoted the co-existence of these two cultural groups (see Andrițoiu 1992:67-68; Andrițoiu and Vasiliev 1993:128, 134; Boroffka 1994a:275, 283-284, 288, and map 58; Ciugudean 1997b:79-80; 2010; Florescu 1964:196-198; Gogâltan et al. 1992:pl. 13; Horedt 1967:139-141; Rusu 1964:247-248; Soroceanu 1973:498-500; Soroceanu and Retegan 1981:206), there has been some limited opposition (see Vulpe 1996:40, note 20).

The most accepted model for the development of the Late Bronze Age is that the Noua Culture infiltrated Transylvania from the southeast (near Brașov), and slowly and steadily pushed the Wietenberg Culture communities out of their land as they expanded to the west and north (Boroffka 1994a). The primary evidence for this so called "Noua expansion" is the lack of ceramics bearing the last "phase" of Wietenberg decoration in central and southeastern Transylvania (Figure 7.1). Additionally, in Alba County, most sites with late "phase" Wietenberg decoration are found on the right side of the Mureș, in and towards the Apuseni Mountains, not towards the Transylvanian Plateau (Ciugudean 2010:159-160, fig. 1; Popa and Totoianu 2010:222). As such, there is temporal overlap between the Wietenberg and Noua in Transylvania, though the two cultural groups are still alleged to have been primarily spatially distinct.

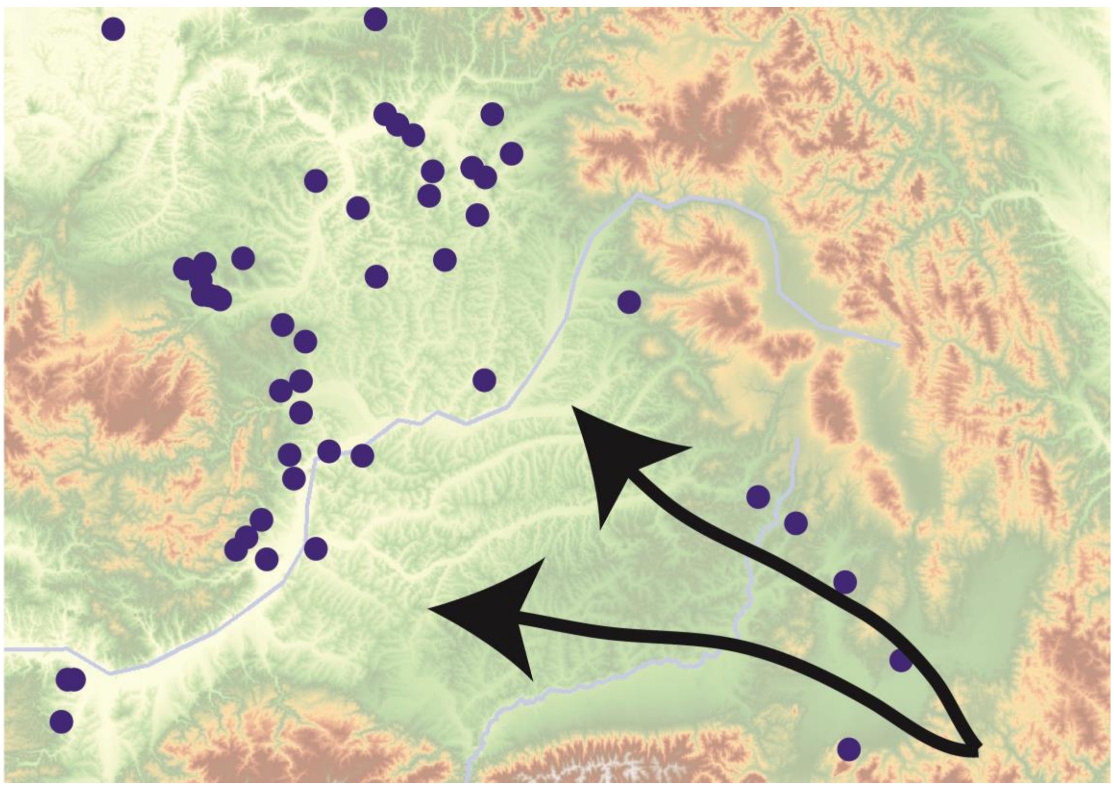

Figure 7.1 – Sites with Wietenberg D decoration and hypothesized Noua expansion routes into Transylvania.

There is some material evidence for the overlap/interaction of Wietenberg and Noua communities. A pit at Sighișoara-*Cartierul Viilor* contained Wietenberg and possibly Noua pottery (Baltag and Boroffka 1996; Motzoi-Chicideanu 2004; Popa and

Boroffka 1996). Gogâltan has gone as far as to suggest that there is a new cultural synthesis between late Wietenberg and Noua elements in central Transylvania, termed "Gligorești-type discoveries" or "Gligorești group" (Gogâltan et al. 2004:73-74; Gogâltan 2009:119). While some have adopted this new classification (see Popa and Raza 2009:37; Popa and Totoianu 2010:221), others have remained skeptical (see Ciugudean 2010:158, 163; Ciugudean and Quinn 2015; Vasiliev 2005:8).

To summarize, based primarily on metal and synchrony with surrounding Middle Bronze Age regions, the current consensus is that the Wietenberg Culture began approximately 2000 BC. Consensus breaks down towards the end of the Wietenberg sequence. There are multiple opinions (three alternative models), which see the Wietenberg ending at some point between 1500 and 1200 BC, and most with some overlap with the Late Bronze Age Noua Culture. Absolute radiocarbon dates may resolve these issues.

The Internal Chronology of the Wietenberg Culture

By the late 1960s, Romanian Bronze Age archaeologists were beginning to identify internal variability within the Wietenberg ceramic and metal assemblages. Most of the variability was attributed to temporal change, as can be seen in the distinction of earlier and later Wietenberg stages by Rusu (1964:246-247) and Berciu (1966:193).

It wasn't until Chidioșan's 1963-65 and 1969 excavations at the stratified tell site of Derșida in far northwest Transylvania that a material-based internal chronology for the Wietenberg Culture was proposed. Chidioșan (1980) linked the three occupational strata within Derșida to three distinct phases of the Wietenberg Culture, which he termed phases "I", "II", and "III". Derșida lacked what was to become a fourth phase "IV", though Chidioșan (1980:81-84) was the first to define it based on previous observations by Soroceanu (Soroceanu 1973; Soroceanu and Istrate 1975:25; Soroceanu and Retegan 1981:206, notes 55-58; Soroceanu et al. 1976:63). Because of the lack of material associated with the fourth phase at Derșida, the first proposed periodization of the Wietenberg Culture had only three phases, each corresponding to the main occupation levels at Derșida (see Horedt 1967:138-141; Chidioșan 1968, 1970). Gradually, the four-phase internal division of the Wietenberg became standard (Andrițoiu 1987; Andrițoiu

1992:53-54; Rotea 1994). The internal chronology developed based on the stratigraphy at Derşida has been augmented through more recent work, although the general structure has remained in place.

The largest treatment to date of the Wietenberg Culture is the work by Boroffka (1994a). Boroffka also maintained a four phase chronology for the Wietenberg, which he termed phases “A”, “B”, “C”, and “D” (Boroffka 1994a:244-257). Boroffka also subdivided the first phase into two categories, “A1” and “A2” which were split on the basis of increased presence of recognizable Wietenberg motifs. Boroffka’s four phases correspond with the four phases defined by earlier scholars, primarily on the stratigraphy of Derşida. Boroffka (1994a) conducted an intensive collections-based study and seriation of materials from across Transylvania. The majority of collections were from unstratified sites, surface survey, and old finds with limited provenience. Consequently, Boroffka’s study did much to explore patterns in ceramic variability across Transylvania, confirming the presence of typological categories of ceramics and patterned associations in decoration technique and motifs, but the nature of the data did not allow him to significantly challenge the existing chronological categories.

The internal chronological development of the Wietenberg Culture in both the Chidioşan (1980) and Boroffka (1994a) schema is based on seriation of ceramic decoration techniques. Decoration is usually only found on the fine-ware ceramics, and as such, much of the coarse-ware ceramics (including most storage and cooking vessels) have no influence on the chronology (Dietrich 2014b:341). The forms and fabrics of ceramics have no explicit role in defining the chronological phases. The decoration techniques associated with each chronological phase are (Figure 7.2):

- Phase A/I: Combing (clustered evenly spaced shallow incisions) and simple geometric designs (e.g., triangles) (though Boroffka’s A2 has some spiral elements as well);
- Phase B/II: Channeling (wide vertical or transverse channels) and simple incisions (lines made through dragging of a pointed tool – often as lines, with spiral elements as well);
- Phase C/III: Stippled decoration (*Zahnstempelung*), (successive indentation of a pointed tool into short parallel chains to infill motifs);
- Phase D/IV: Wide-banded successive impressions and roughened areas for application of lime encrustation to infill motifs.

Figure 7.2 - Examples of different Wietenberg decoration types.

The internal Wietenberg chronology is considered *additive* – new techniques of decoration are added through time, but previous techniques can and do persist. So, the combing found in the first phase can also be found in second and thirds phase assemblages, and the channeling and spiral motifs that are traditionally associated with the second phase can also be found in the third phase. The broad trend is towards increasing complexity in decoration technique (from the first phase to the third phase) with a decrease in complexity (phase IV) corresponding with the end (implicitly, the decline) of the Wietenberg Culture. In this case, complexity is synonymous with the time needed to make the decorations, as stippling – the height of "classical" Wietenberg decoration is likely the most time-intensive to produce. The overlap in ceramic decoration techniques is an empirical observation. The absolute dates presented below will reveal an alternative explanation for what the overlaps mean.

The additive nature of the Wietenberg ceramic chronology has had a significant impact in how assemblages have been attributed to different chronological phases. The general rule is that if an assemblage has any amount of 'later' decoration elements, it must be from this later time period. The problem is exacerbated in old assemblages or surface collections without provenience. In the majority of these cases, if there is stippled decoration, the site is attributed to the third phase; obscuring the potential for any earlier phase occupations to be identified. This is particularly troubling as the stippled decoration of the third phase is the most easily identified, visibly striking, and visibly diagnostic of all the Wietenberg decoration technique, which influences both recovery in the field as well as phase attribution in the lab. This may be a significant source of bias in the Wietenberg settlement structure reconstructed through old (unsystematically surveyed and recorded) sites.

Boroffka did not initially emphasize the additive nature of the Wietenberg ceramic chronology. This is best seen in his discussion of the formation of the Wietenberg cemeteries at Bistrița-*Cetate* and Sibișeni-*Deasupra Satului* (Boroffka 1994a:251-252). Boroffka attributed different individual graves to different chronological periods based on the variation in decoration on ceramics in each grave. For Bistrița, he identified Phase A and B ceramics, and for Sibișeni, he identified Phases A, B, and C. These cemeteries are now more commonly interpreted as single component cemeteries, attributed to the latest period of diagnostic ceramics for each site (see Palincaș 2014).

The internal Wietenberg chronology has continued to have been tinkered with since Boroffka's (1994a) synthesis. Based on new fieldwork from Rotbav in southeast Transylvania, L. Dietrich has recently proposed an alternative basis for an internal split based on ceramic decoration. Rather than focusing on decoration technique, she focuses on variability in motifs (Dietrich 2014b:338-339). Dietrich identifies three distinct stages of ceramic decoration development at Rotbav, from (1) simple geometric ornaments, to (2) ornamentation with 'false spirals' (S-shaped hooks), to (3) rhomb-like angular forms (Z-shaped hooks). These are generally fit to the Wietenberg phases of A/B/C (Boroffka scheme) or I/II/III (Chidioșan scheme), although Dietrich is quick to point out that the chronology is valid primarily for just the Rotbav settlement and should not yet be used for the whole of Transylvania (Dietrich 2014b:339). Similar to other classification schemes (Ciugudean 2010:159-160, and fig. 1; Chidioșan 1980; Boroffka 1994a), this suggests that the late phase of Wietenberg was not present in southeast Transylvania, as the Noua culture had allegedly replaced them after the end of the third Wietenberg phase.

Romanian scholars have lamented that the relative chronology has not been evaluated with radiocarbon dates (see Boroffka 1994a:289-290). Prior to the start of the BATS Project in 2011, there had been only 3 published dates for the Wietenberg Culture. There has been a recent influx of new dates, as 16 new dates have been published outside of the BATS Project since 2013 (Table 7.4).

Table 7.4 - Previously published radiocarbon dates for the Wietenberg Culture unassociated with BATS Project. Dates calibrated with OxCal 4.2.2.

Sample ID	Site	Ceramic Phase	Date (BP)	Calibrated (1-sigma)	Citation
Hd-28203	Rotbav-*La Parut*	Wietenberg B	3547±24	1937-1830 cal BC	Dietrich 2014a
Bln-5626	Oarța de Sus	Wietenberg B	3507±37	1887-1772 cal BC	Kacsó 2004
Ly-9190	Oarța de Sus	Wietenberg B	3265±30	1608-1503 cal BC	Kacsó 2004
Hd-29515	Alba Iulia-*Recea/ Monolit*	Wietenberg C	3448±21	1865-1695 cal BC	Ciugudean and Quinn 2015
UGAMS-12286	Pauleni-*Ciuc*	Wietenberg B	3440±25	1860-1692 cal BC	Whitlow et al. 2013
VOI 2	Voivodeni–*La Scoală*	Wietenberg C	3412±42	1755-1642 cal BC	Németh 2015
VOI 3	Voivodeni–*La Scoală*	Wietenberg C	3407±38	1748-1646 cal BC	Németh 2015
VOI 1	Voivodeni–*La Scoală*	Wietenberg C	3337±38	1684-1548 cal BC	Németh 2015
Bln-4622	Sighișoara-*Cartierul Viilor*	Wietenberg C	3330±30	1682-1533 cal BC	Popa and Boroffka 1996
Hd-27967	Rotbav-*La Parut*	Wietenberg C	3195±19	1497-1442 cal BC	Dietrich 2014a
Hd-27989	Rotbav-*La Parut*	Wietenberg C	3174±16	1493-1427 cal BC	Dietrich 2014a
RoAMS 16-07	Luduș-*Fabrica de Cânepă*	Wietenberg C	3422±36	1765-1665 cal BC	Berecki 2016
RoAMS 16-03	Luduș-*Fabrica de Cânepă*	Wietenberg C	3346±73	1736-1531 cal BC	Berecki 2016
RoAMS 16-06	Luduș-*Fabrica de Cânepă*	Wietenberg	3346±73	1876-1745 cal BC	Berecki 2016
RoAMS 16-08	Luduș-*Fabrica de Cânepă*	Wietenberg C	3345±78	1737-1530 cal BC	Berecki 2016
RoAMS 16-04	Luduș-*Fabrica de Cânepă*	Wietenberg D	3186±73	1599-1323 cal BC	Berecki 2016
RoAMS 16-05	Luduș-*Fabrica de Cânepă*	Wietenberg	3147±66	1872-1700 cal BC	Berecki 2016
DeA-5021	Gligorești-*Holoame*	Wietenberg/ Noua	3298±38	1619-1529 cal BC	Gogâltan 2015
DeA-5096	Vlaha-*Pad*	Wietenberg/ Noua	3249±30	1606-1460 cal BC	Gogâltan 2015
DeA-5152	Vlaha-*Pad*	Wietenberg/ Noua	3236±41	1600-1447 cal BC	Gogâltan 2015

As more and more dates are added, it becomes increasingly difficult to maintain the existing relative dating structure (see Ciugudean and Quinn 2015; Bălan and Quinn 2014; Berecki 2016; Németh 2015). Fortunately, with radiocarbon dates, there is no need for ceramics to have to carry the entire chronological burden for the Wietenberg Culture. Radiocarbon dates are both more accurate and precise than relative dating approaches. As we start to disarticulate ceramic decoration from dates we free up ceramics and ceramic decoration to be explored from a whole new anthropological perspective.

A New Absolute Chronology for the Transylvanian Bronze Age

The 42 new dates used in this analysis can be found in Appendix B. In the appendix, I describe the archaeological context, material, and analytical history of each new radiocarbon sample. I also present Bayesian models that were developed based on known information about spatial relationships at each site in order to more accurately reconstruct settlement and cemetery formation in southwest Transylvania (see Chapters 8 and 9). These alternative models, often termed sensitivity analyses, provide an indication of the reliability of the preferred model for the formation of each site (Bayliss 2009:134). Wood charcoal samples were processed at the National Oceanographic Sciences AMS (NOSAMS) Laboratory. Bone collagen samples were processed at NOSAMS and the University of Georgia AMS (UGAMS) Laboratory. Bone carbonate samples (on cremated human bone) were processed at the University of Arizona AMS (AA) Laboratory. All dates were calibrated to 1-sigma (68%) with OxCal v.4.2 (Bronk Ramsey 2009). The radiocarbon dates come from sites across southwest Transylvania (Figure 7.3), though sites within the Geoagiu Valley tested during the BATS Project have been more intensively sampled than most other sites. In this section, I present synthetic Bayesian models derived from the new and previous radiocarbon dates for a new absolute chronology designed to test the validity of the existing relative chronology for the Bronze Age in southwest Transylvania.

To establish the temporal span of different ceramic phases, I employed a phase model which predicts the start and end boundaries of the distribution of dates. This model generates probability distributions for the start and end of phases based on the available dates. Phases with fewer dates have wider distributions while phases with many dates have narrower boundary distributions. As a result, phases with few dates are likely predicted to be longer than they are in reality, while the predicted boundaries of phases are likely slightly shorter than they are in reality. With only 64 total dates, the date ranges for ceramic phases should be considered approximations. The predicted span dates are based on the highest peak in the sum distribution for the start and end boundaries.

There are two advantages this approach to modeling the chronology of the Transylvanian Bronze Age. First, it can establish whether the temporal extent of the Early, Middle, and Late Bronze Ages, and the dates of transitions between these culturally distinct phases are detectable and synchronous with surrounding regions. Second, it makes it possible to demonstrate whether different ceramic styles are contemporaneous or sequential. This is particularly important for characterizing the relationship between the Livezile-Șoimuș styles in the Early Bronze Age, the four Wietenberg types (A, B, C, D) in the Middle Bronze Age, and the later Wietenberg-Noua cultures. If the phase spans significantly overlap, they are considered to be contemporaneous. If the phase spans do not significantly overlap, they are considered to be sequential. For the existing relative chronology to be supported, different ceramic styles should be distributed sequentially rather than contemporaneously. Because no deposits with Iernut ceramics (EBA III) have been dated, this ceramic style is omitted from this analysis; nonetheless, the distributions of other ceramic styles documented in this analysis will impact how we think about this style.

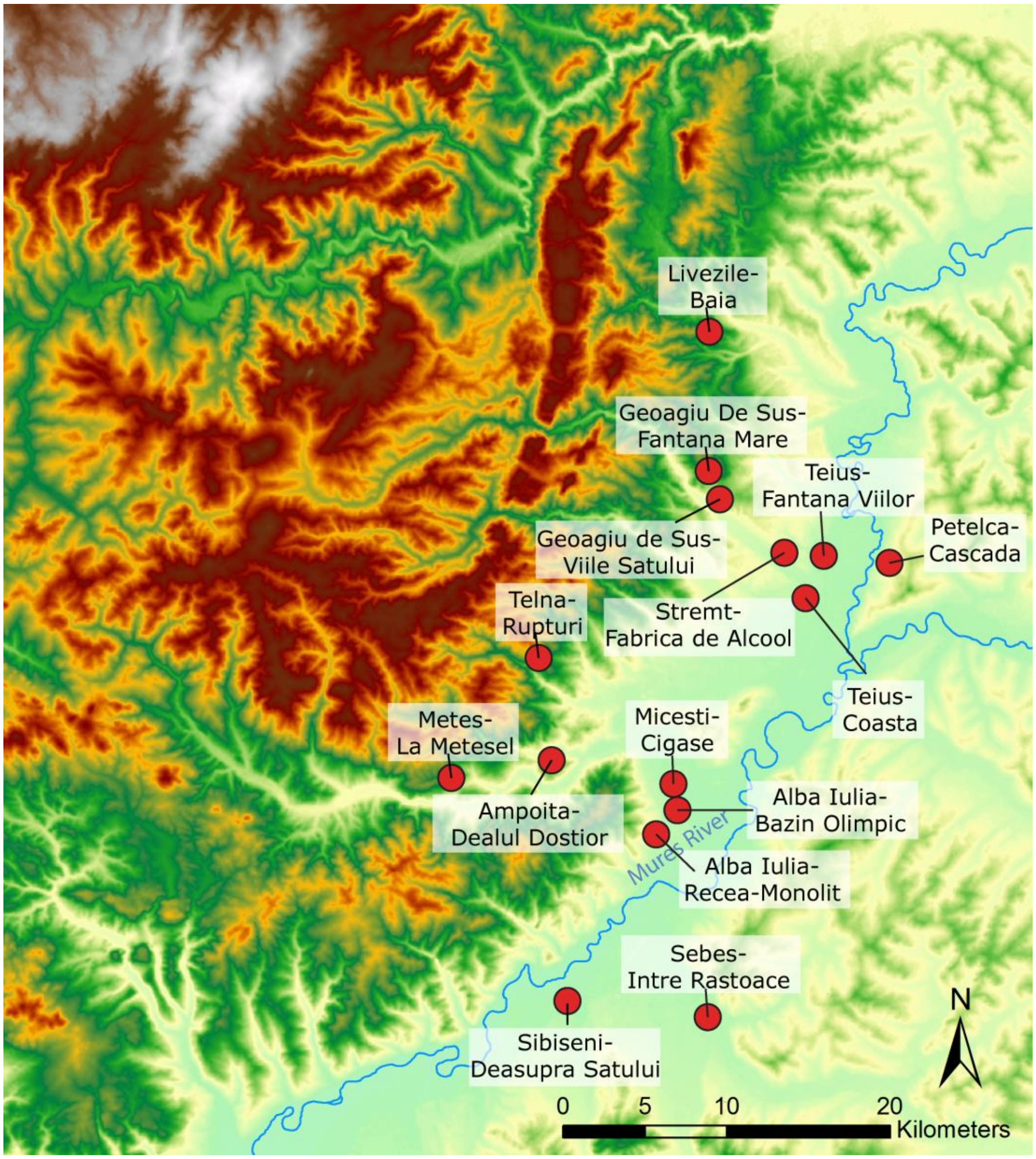

Figure 7.3 - Map of sites in southwest Transylvania with Bronze Age radiocarbon dates.

Absolute Chronology for the Early Bronze Age

In contrast with the relatively large number of new dates for the Wietenberg Culture, there are few radiocarbon dates that can be used to evaluate the existing ceramic chronology for the EBA. This is due to two factors. First, there were few EBA settlements (seven) found within the Geoagiu Valley. We were only able to conduct test excavations at five of these sites and of these, only two provided material that accurately dated the Early Bronze Age component of the settlement. Second, many of the Early Bronze Age samples that we ran came from mortuary contexts that lack diagnostic ceramics. As a result, we can use the mortuary dates to generally date the temporal span of the Early Bronze Age, as well as the tempo of mortuary activity in particular cemeteries, but we cannot fully evaluate the existing ceramic chronology.

There have been a few published radiocarbon dates from southwest Transylvania, that, when combined with the new BATS Project dates, can provide some insight into the span and development of the Early Bronze Age in Transylvania (Table 7.5, Figure 7.4).

Table 7.5 - New and previously published dates from the Early Bronze Age in southwest Transylvania.

Sample ID	Site	Ceramic Phase	Date	Calibrated (1-sigma)	Citation
Bln-4624	Livezile-*Baia* (settlement)	EBA I – Livezile	4109 ±44	2855-2581 cal BC	Ciugudean 1997a
Poz-42712	Livezile-*Baia* (Tomb 2 Burial 2)	EBA I - Livezile	4015 ±35	2573-2487 cal BC	Gerling and Ciugudean 2013
OS-100919	Geoagiu de Sus-*Fântâna Mare*	EBA II - Șoimuș	3970 ±80	2581-2340 cal BC	New
OS-113543	Teiuș-*Coastă*	EBA II - Șoimuș	3690 ±20	2131-2035 cal BC	New
OS-108309	Meteș-*La Meteșel* (Tomb 1 Burial 7 Female)	EBA (probable Coțofeni)	4400 ±30	3087-2930 cal BC	New
OS-108310	Meteș-*La Meteșel* (Tomb 1 Burial 7 Male)	EBA (probable Coțofeni)	4280 ±25	2907-2890 cal BC	New
OS-108308	Țelna-*Rupturii* (Tomb 2 Burial 7)	EBA (possible Coțofeni)	4170 ±30	2876-2696 cal BC	New
OS-108307	Țelna-*Rupturii* (Tomb 2 Burial 4)	EBA (possible Coțofeni)	4130 ±30	2859-2631 cal BC	New
OS-108278	Țelna-*Rupturii* (Tomb 1 Burial 1)	EBA	4080 ±30	2835-2506 cal BC	New
OS-108279	Țelna-*Rupturii* (Tomb 1 Burial 3)	EBA	3990 ±30	2565-2473 cal BC	New
OS-108808	Țelna-*Rupturii* (Tomb 1 Burial 2)	EBA	3960 ±30	2566-2458 cal BC	New
OS-108810	Țelna-*Rupturii* (Tomb 2 Burial 3)	EBA	3960 ±30	2566-2458 cal BC	New
OS-100961	Ampoița-*Dealul Doștiorului* (Tomb 1 Burial 3)	EBA	3850 ±25	2430-2212 cal BC	New
OS-113604	Pețelca-*Cascadă*	EBA	3810 ±20	2286-2206 cal BC	New
Poz-42714	Meteș-*La Meteșel* (Tomb 1 Burial 3)	EBA	3660 ±50	2132-1962 cal BC	Gerling and Ciugudean 2013

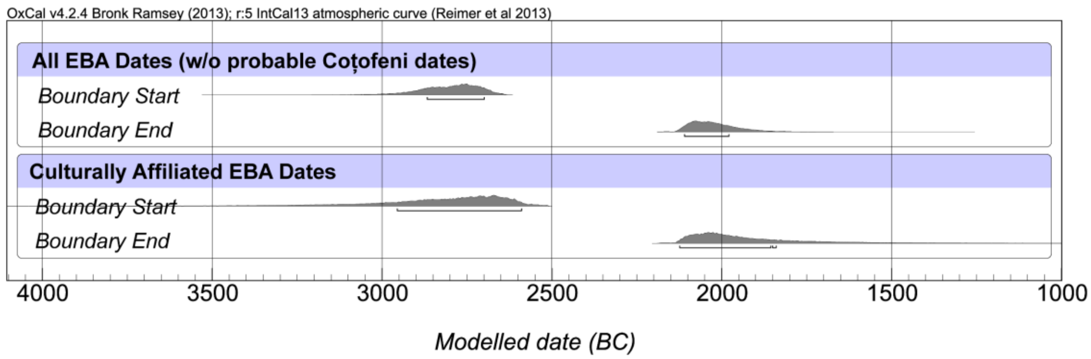

Figure 7.4 – Start and end boundaries for the Early Bronze Age based on all EBA dates (without probable Coțofeni dates) (n=13), and based on the culturally affiliated EBA dates (n=4).

Using all affiliated dates and most dates from culturally unaffiliated tomb cemeteries (omitting probable Coțofeni burials from Tomb 1 Burial 7 at Meteș-*La Meteșel*), places the temporal span between 2750-2075 cal. BC. The culturally unaffiliated dates from tomb cemeteries that may be from the Coțofeni Culture influence the span of these dates to be earlier than expected. This is mitigated by focusing only on the affiliated dates. The apex of the start and end boundaries for the four culturally affiliated dates (n=4) place the temporal span of the Bronze Age approximately 2675-2035 cal. BC. Because of the modeling technique, this range is likely slightly narrower than the actual start and end dates of the Early Bronze Age. Therefore, it is likely that based on affiliated dates, the Bronze Age began around 2700 cal. BC and ended around 2000 cal. BC.

When these dates are broken down further, a clearer picture of the temporal span and internal sequence of Early Bronze Age ceramic styles emerges (Figure 7.5). The simply decorated Livezile ceramics (EBA I) span from 2675-2495 cal. BC. The more elaborately constructed Șoimuș ceramics (EBA II) span from 2575-2025 cal. BC. There is minimal overlap between Livezile and Șoimuș ceramics, which supports the existing relative ceramic chronology. The eleven culturally unaffiliated dates from mounded tomb cemeteries have a wider distribution than the affiliated dates, from approximately 2980-2090 cal. BC. The early dates from these tumuli suggest that the tomb building construction in southwest Transylvania originated with the Coțofeni culture and continued through the Early Bronze Age. The lack of a break between the Coțofeni and EBA dates supports suggestions of continuity rather than population replacement between the Copper Age and Early Bronze Age proposed by Ciugudean (1996). The earliest dates from Burial 7 in Tomb 1 at Meteș-*La Meteșel*, similar in form to the other EBA burial mounds, pre-date the end of the Coțofeni Culture. The stagger in the dates suggests that the earliest burials in the mound (in particular the female in Tomb 1 Burial 7) may have been buried elsewhere prior to their interment in the mound. The continuity between body and practice suggests a link between these early burials and later communities using the cemetery (potentially direct ancestry, though DNA and isotopic work may help reveal the nature of these relationships). It should be noted that some of the Copper Age burials found in tumuli are secondary burials (e.g., at Meteș). These individuals may have died and been buried elsewhere prior to interment in the mounded tomb cemetery; which may not have been constructed until centuries later. The unaffiliated and affiliated dates both suggest the EBA ended by 2000 BC. This sequence for the EBA in Transylvania is very similar to the absolute chronology for the Mureș Culture developed by O'Shea and Nicodemus (Nicodemus 2014; O'Shea 1996; O'Shea and Nicodemus 2017)

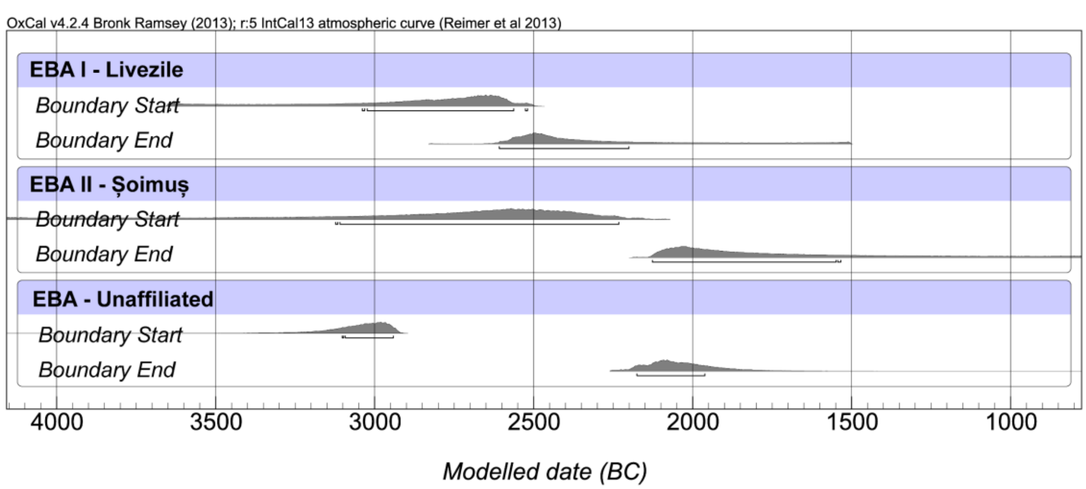

Figure 7.5 – Start and end boundaries for all EBA dates by ceramic phase.

The most surprising revelation from the radiocarbon dating is that the Șoimuș ceramics extend until almost 2000 cal. BC. The sample from a feature at Teiuș-*Coastă* has date to the time period traditionally associated with textile-impressed and rusticated Iernut ceramics. The Early Bronze Age deposits at Teiuș-*Coastă* are shallow, likely representing a single phase of occupation at the site. A single rusticated Iernut-ware ceramic fragment was found on the surface through survey; which is far less than would be expected if there was a Iernut settlement, particularly with the abundant Șoimuș-style ceramics recovered at the site. It is likely that the site was occupied by a community that manufactured and used Șoimuș ceramics, but also potentially interacted with Iernut communities. As a result, the radiocarbon date cannot be eliminated as an outlier – it fits well with the distribution of material culture at the site. Unfortunately, no dates associated with Iernut ceramics have been dated. At this point, it is likely that there is temporal overlap between Șoimuș (EBA II) and Iernut (EBA III) ceramics. While Iernut ceramics are likely dated to the last few centuries in the third millennium BC, the introduction of these ceramics into the region did not result in an abandonment of the Șoimuș ceramic tradition. This means that there were likely communities that were making Șoimuș ceramics that were contemporaneous with communities making Iernut ceramics. The lack of Iernut-linked dates makes this conclusion about the relationship between Șoimuș and Iernut communities tentative.

To summarize, the Early Bronze Age spans from 2700-2000 cal. BC. The Livezile-Șoimuș sequence is supported, though communities making Șoimuș ceramics persist to the end of the EBA rather than are replaced by Iernut ceramics. There is probable temporal overlap between Șoimuș communities and Iernut communities during the last century or two of the third millennium BC. Due to a paucity of dates, I will continue to place the division between the EBA II and EBA III around 2250 cal. BC, though the EBA III, where Șoimuș communities were contemporaneous with Iernut communities, was much likely much shorter, and started later in time. The temporal continuity in mortuary practices between the Coțofeni and Livezile communities suggest that Early Bronze Age cultures are local developments rather than the result of an influx of new people into the region. The temporal span, internal sequencing, and local origin of the Early Bronze Age cultural groups matches much of the existing relative chronology (except for the span of the Șoimuș ceramics and probable temporal overlap with the Iernut ceramics).

Absolute Chronology for the Wietenberg Culture

This chronology combines the previous dates (n=16) with new dates from Wietenberg contexts (n=30) run as part of the BATS project. For a full description of the dates, see Part I of Chapter IX. Here I present the synthesis of the dates in order to test the existing ceramic chronology's models for the temporal duration and internal development of the Wietenberg Culture (Figure 7.6**)**.

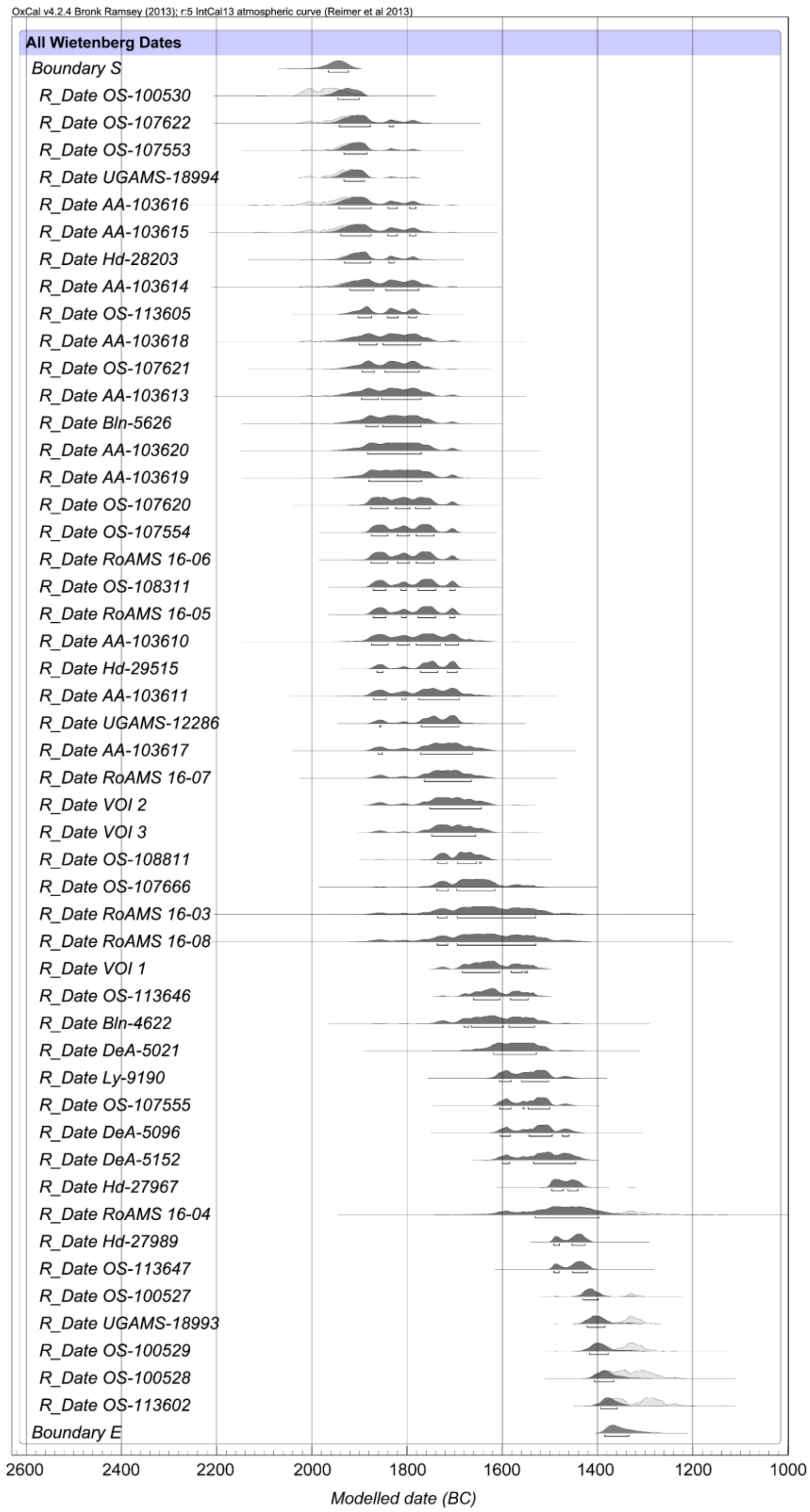

Figure 7.6 – All Wietenberg dates.

For the sake of clarity, I will refer to the different ceramic styles as "Wietenberg A", "Wietenberg B", "Wietenberg C", and "Wietenberg D". These four categories match the recognized decoration techniques that define the four categories in both Chidioșan's (Phase I-II-III-IV) and Boroffka's (Phase A-B-C-D) chronologies. However, in my convention, these archaeological types are *not* treated as sequential phases. They are simply different constellations of ceramic decoration techniques. By examining their chronological spread independent of each other, we can see if they are truly sequential, or if there is significant overlap in their chronological distributions. If the types are chronologically sequential, then the existing relative chronology will be confirmed. If the types overlap, however, then we must consider that these ceramic decoration types as something other than discrete chronological phases. As is clear from the growing corpus of ^{14}C dates, the different Wietenberg decoration techniques do not represent chronological divisions and they must instead be dealt with as stylistic constellations.

The Early-Middle Bronze Age Transition and the Beginning of the Wietenberg Culture

The earliest dates associated with the Wietenberg Culture confirm that the it began at the transition between the Early and Middle Bronze Age in the Carpathians, right around 2000 cal. BC (Table 7.6). The earliest date associated with Wietenberg Culture ceramics run by the BATS project, 3610 ±25 BP, comes from Geoagiu de Sus-*Fântâna Mare* (OS-100530). An additional sample associated with Wietenberg A ceramics came from Stremț-*Fabrica de Alcool* and produced a date of 3560 ±35 BP (OS-107622). Several more samples produced very similar dates:

Table 7.6 – Five earliest dates associated with the Wietenberg Culture.

Sample ID	**Site**	**Decoration Type**	**Context**	**Date**	**Calibrated (1-sigma)**
OS-100530	Geoagiu de Sus-*Fântâna Mare*	Wietenberg A	Unit 3 Level 5	3610 ±25 BP	2020-1935 cal. BC
UGAMS-18994	Pețelca-*Cascadă*	Wietenberg B	Unit 1 Level F	3570 ±25 BP	1946-1889 cal. BC
AA-103616	Sebeș-*Între Răstoace*	Wietenberg B	Burial 34	3562 ±42 BP	2007-1784 cal. BC
OS-107622	Stremț-*Fabrica de Alcool*	Wietenberg A	Unit 3 Level F	3560 ±35 BP	1959-1785 cal. BC
OS-107553	Stremț-*Fabrica de Alcool*	Wietenberg C	Unit 3 Level D	3560 ±25 BP	1941-1885 cal. BC

Of the 36 dates associated with Wietenberg ceramics, none likely pre-date the 2000 cal. BC threshold for the Early and Middle Bronze Age transition. The peak of the modeled start boundary (see Figure 7.6), is 1950 cal. BC. The single-phase modeled dates shorten the span of the likely start and end of the Wietenberg culture. As such, the start date likely pre-dates 1950 cal. BC. The large cluster of dates right after 2000 cal. BC from deposits associated with Wietenberg ceramics suggests that the Wietenberg ceramic tradition emerged and spread rapidly. The limited overlap of Wietenberg dates with Early Bronze Age radiocarbon dates also supports the idea that there was a large-scale transformation in ceramic production traditions right around 2000 cal. BC. In this case, the absolute dates have confirmed the existing relative dating chronology based on metal and ceramics (see Boroffka 2013). The Wietenberg Culture began at the start of the Middle Bronze Age, between approximately 2000-1950 cal. BC. For the purposes of this study, I will use the 2000 cal. BC date for both the start of the Wietenberg Culture and the Middle Bronze Age.

The Late Bronze Age and the End of the Wietenberg Culture

The Wietenberg Culture appears to end by 1300 cal. BC. The five latest dates from Wietenberg deposits come from the upper levels at Geoagiu de Sus-*Fântâna Mare* and Pețelca-*Cascadă* (Table 7.7). The single-phase model of the Wietenberg Culture, which provides an early date for the end of Wietenberg has a peak end boundary at approximately 1360 cal. BC. It is more likely that the end of the Wietenberg is slightly later, between 1350-1315 cal. BC (see discussion of individual Wietenberg ceramic types below). Based on these dates, we can link the end of the Wietenberg Culture in time to the end of Reinecke's Bz C phase (1325 BC). This matches the model proposed by Ciugudean (1997b). These dates contradict the model that linked the end of the Wietenberg to the end of Reinecke's Bz D Phase (1200 BC) (Popa and Totoianu 2010; Boroffka 1994a) as well as the model that placed the end of the Wietenberg synchronically with the end of the Middle Bronze Age cultures of the Carpathian Basin (1500 BC) (Balan and Quinn 2015; Boroffka 2013; Ciugudean and Quinn 2015).

Table 7.7 - Five latest dates associated with the Wietenberg Culture.

Sample ID	Site	Decoration Type	Context	Date	Calibrated (1-sigma)
OS- 113602	Peţelca-*Cascadă*	Wietenberg B	Unit 1 Level E	3050 ±25 BP	1380-1266 cal. BC
OS-100528	Geoagiu de Sus-*Fântâna Mare*	Wietenberg C	Unit 3 Level 3	3070 ±25 BP	1391-1291 cal. BC
OS-100529	Geoagiu de Sus-*Fântâna Mare*	Wietenberg C	Unit 3 Level 4	3100 ±25 BP	1414-1307 cal. BC
UGAMS-18993	Peţelca-*Cascadă*	Wietenberg B	Unit 1 Level E	3110 ±25 BP	1421-1311 cal. BC
OS-100527	Geoagiu de Sus-*Fântâna Mare*	Wietenberg C	Unit 3 Level 2	3130 ±20 BP	1432-1447 cal. BC

There are also several dates from Noua and other Late Bronze Age cultural contexts (Table 7.8**)**.

Table 7.8 - Non-Wietenberg Late Bronze Age dates from Transylvania.

Sample ID	Site	Cultural Affiliation	Date	Calibrated (1-sigma)
Bln-4622	Sighişoara-*Cartierul Viilor*	Noua	3330 ±30 BP	1682-1533 cal. BC
DeA-5021	Gligoreşti-*Holoame*	Noua	3298 ±38 BP	1619-1529 cal. BC
DeA-5096	Vlaha-*Pad*	Noua	3249 ±30 BP	1606-1460 cal. BC
DeA-5152	Vlaha-*Pad*	Noua	3236 ±41 BP	1600-1447 cal. BC
Hd-28276	Rotbav-*La Parut*	Noua	3196 ±30 BP	1497-1441 cal. BC
Hd-27972	Rotbav-*La Parut*	Noua	3085 ±23 BP	1405-1303 cal. BC
OS-113542	Teiuş-*Fântâna Viilor*	Unknown	3080 ±20 BP	1397-1302 cal. BC
Hd-29163	Alba Iulia-*Bazin Olimpic*	Unknown	3062 ±21 BP	1385-1285 cal. BC
OS-108807	Mediaş-*Valea Viilor*	Noua	3060 ±25 BP	1386-1281 cal. BC
Hd-28321	Rotbav-*La Parut*	Noua	2994 ±19 BP	1264-1208 cal. BC

When compared with the Wietenberg dates, there is definitive evidence that Noua and other culturally unaffiliated Late Bronze Age ceramics overlapped in time in Transylvania (Figure 7.7).

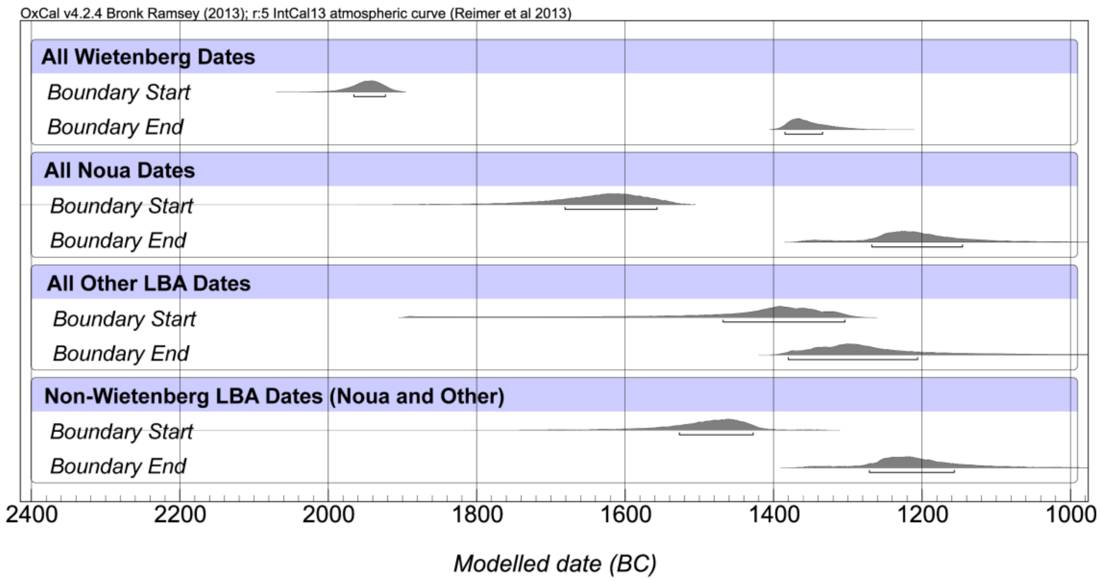

Figure 7.7 – Start and end boundaries for all Wietenberg (n=50), Noua (n=8), other LBA cultures (n=2), and non-Wietenberg LBA (n=10).

Noua elements may have appeared in Transylvania as early as 1640 cal. BC. In Transylvania, the earliest dated Noua elements are found in association with Wietenberg Culture ceramics (at Sighișoara-*Cartierul Viilor*, Gligorești-*Holoame*, and Vlaha-*Pad*). There is synchrony between the potential early introduction of Noua elements and the start of the collapse of Pecica-*Șanțul Mare* and the peak at Klárafalva-*Hajdova* starting around 1680 cal. BC (O'Shea and Nicodemus 2017). While Noua ceramic elements have been dated to the Middle Bronze Age, no fully Noua settlements pre-date the transition to the Late Bronze Age. The earliest dated fully Noua settlements appear in Transylvania starting between 1500-1450 cal. BC (at Rotbav-*La Parut*). Consequently, Noua communities overlapped with Wietenberg communities in Transylvania from approximately 1500 cal. BC to around 1320 cal. BC (Figure 7.8). It should be noted that the earliest dates for Noua are primarily from southeastern Transylvania, the most likely ingress from the Eurasian Steppe into the Transylvanian Plateau. In southwest Transylvania, Noua elements may have appeared as early as 1620 cal. BC (at Gligorești-*Holoame*). However, the most definitive evidence for the timing of the movement of

Noua communities into the region comes from a Noua burial at Mediaș-*Valea Viilor*, and the likely Noua settlement at Teiuș-*Fântâna Viilor*, which both post-date 1400 cal. BC. By 1400 cal. BC, there were communities making and using both Noua and other non-Noua, non-Wietenberg ceramics in southwest Transylvania. The overlap with Wietenberg continued for just under 100 years, as Wietenberg ceramic traditions ended by 1320 cal. BC. After 1320 cal. BC, Noua ceramic traditions continue, and were ultimately replaced with Gava ceramic traditions after 1100 cal. BC, although this is beyond the temporal scope of this dissertation.

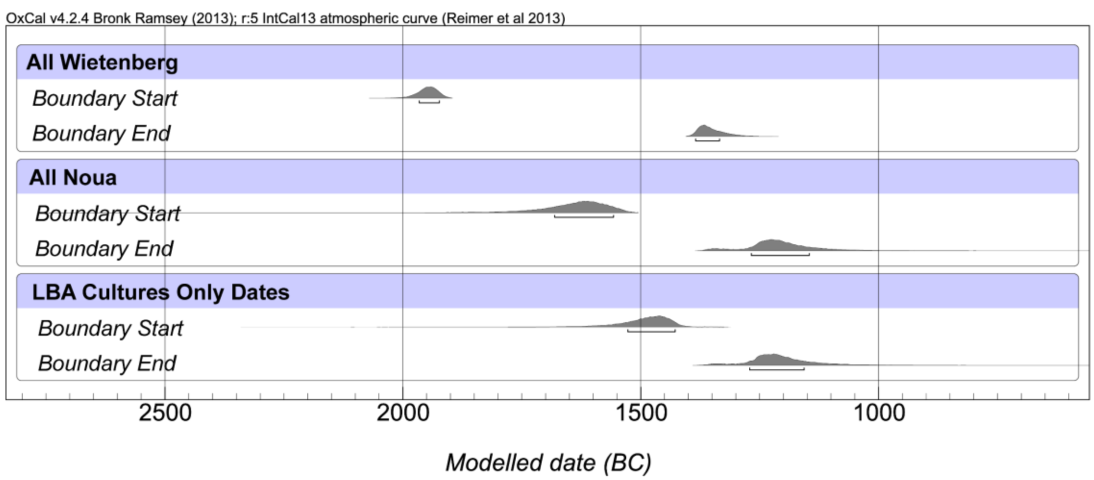

Figure 7.8 – Start and end boundaries for all Wietenberg (n=50), Noua (n=8), and LBA sites (Noua and Other) with dates of Noua elements in Wietenberg sites omitted (n=6).

Breaking Down Wietenberg Phases: Stylistic Diversity and Temporal Overlap

The existing internal chronology of the Wietenberg Culture (from Boroffka 1994a; Chidioșan 1980) is not supported with the new current radiocarbon dates. The start and end boundaries are modeled using single-phase models in OxCal by ceramic type (Figure 7.9). The peak of the boundary distributions for the start and end of each ceramic type puts the temporal span of Type A as 1980-1900 cal. BC, Type B as 1945-1350 cal. BC, Type C as 1900-1375 cal. BC, and Type D as 1780-1500 cal. BC. With this modeling technique, these spans are likely slightly shorter (starting later and ending earlier) than the actual distribution of each type.

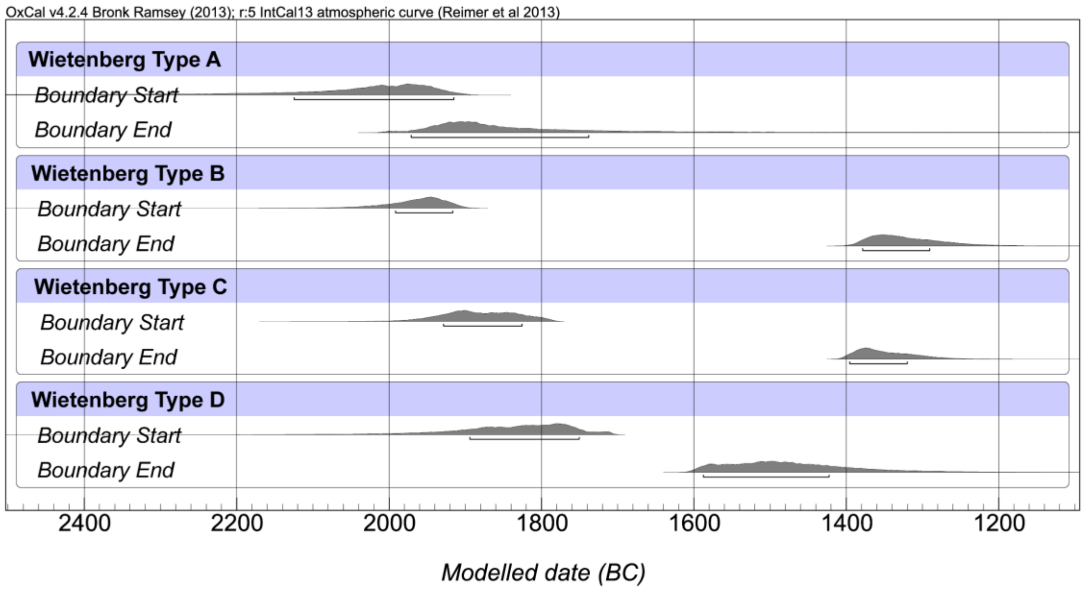

Figure 7.9 – Start and end boundaries for individual Wietenberg ceramic styles: Type A (n=2), Type B (n=17), Type C (n=22), Type D (n=6).

The most striking and important revelation from the radiocarbon sequence is that there is a *significant* amount of overlap in the ceramic types. The general order of appearance of each type in the existing relative ceramic chronology (first A, then B, then, C, then D) derived primarily from the stratigraphy at Derșida (see Boroffka 1994a; Chidioșan 1980) is supported with the radiocarbon dates. However, instead of a sequential replacement, it is clear that assemblages linked to different types overlap significantly. Wietenberg A was the only type from 2000-1945 cal. BC. Wietenberg A and Wietenberg B overlapped from 1945-1900 cal. BC. Wietenberg C was added by approximately 1900 cal. BC, near when Wietenberg A dropped out. By 1875 cal. BC, Wietenberg B and Wietenberg C were the only types until Wietenberg D emerged, approximately by 1780 cal. BC (but perhaps as early as 1880 cal. BC). Wietenberg B, Wietenberg C, and Wietenberg D overlapped until 1500/1450 cal. BC when Wietenberg D dropped out. The timing of the end of Wietenberg D corresponds with the emergence of non-Wietenberg Late Bronze Age sites in Transylvania (primarily Noua Culture).

Wietenberg B and Wietenberg C persist in southwest Transylvania until between 1350/1320 cal. BC.

It is possible to use Bayesian modelling techniques within OxCal to evaluate whether the ceramic decoration techniques are sequential phases. When modeled using a phase model in OxCal that assumes that the phases are sequential and do not overlap (contiguous phases) the model is rejected (A_{model}=0.00). When modeled to assume that the phases are sequential with some potential overlap (overlapping phases), the model is rejected (A_{model}=0.00). The Bayesian modeling suggests that there is practically no possible way that the ceramic types are sequential phases.

Based on the new radiocarbon dates, we must set aside the existing relative chronology for the internal development of the Wietenberg Culture. The ceramic styles that make the basis for the current chronology are not temporally discrete. As a result, there are two broad consequences. First, we must conceive of a different way of monitoring change through time within the Wietenberg Culture. Second, we must reevaluate what the variability in ceramic decoration that is documented with the Wietenberg types means. In the next section, I present a potential solution for the first issue, and the second will be tackled more fully in Chapters 10 and 11.

New Absolute Chronology for the Internal Development of the Wietenberg Culture

By overturning the existing chronological framework for the internal development of the Wietenberg Culture, we are left without a means of discussing change through time within the almost 700 years that the Wietenberg Culture could be found in Transylvania. Ideally, with enough absolute dates, we could develop a fine-grained regional chronology. However, this is not possible with the limited dates available.

At this point, we do not have enough information about how ceramics changed through time to develop a new ceramic chronology. We can no longer point to simple criteria (such as decoration technique) for marking change through time. However, this does not mean that there are no observable changes in the ceramics from 2000-1320 cal. BC. It is extremely likely that ceramics changed throughout the course of the Wietenberg Culture. For example, the motifs chosen, the tools used to make decoration, the fabric, production technique, or clay sources may have substantially changed through time.

We cannot assume that archaeologists will be able to identify discrete criteria for monitoring change through time in the production of Wietenberg ceramics. Instead, we need to develop an analytical basis for any new ceramic chronology. This begins with first generating numerous ceramic assemblages from well dated archaeological contexts (cemeteries or settlements). Next, we need to approach the ceramics with a holistic perspective, adding form, function, and fabric to the traditional assessments of decoration. Finally, we can monitor what ceramic elements change through time, see if any correlate with each other, and identify any widespread transformations only if time is measured independently. Unfortunately, we currently lack the large well-dated ceramic assemblages for the Wietenberg Culture that are needed to conduct these analyses.

Because of these limitations, I employ a coarser approach to the internal development of Wietenberg. Rather than using ceramics to mark discrete phases, this approach considers the overlap (or lack of overlap) in ceramic decoration techniques to be significant. I propose three phases of the Wietenberg Culture: (1) the *Formative Wietenberg* (c.2000-1875 cal. BC); (2) the *Classical Wietenberg* (1875-1500 cal. BC); and (3) the *Terminal Wietenberg* (1500-1320 cal. BC) (Table 7.9). These internal phases are not based on a particular material culture type, but rather on changing social contexts, distinguished by the variability in ceramic decoration, contexts in which ceramic signaling occurred, and supported by trends settlement and mortuary practices.

Table 7.9 - New phasing for Wietenberg Culture based on new radiocarbon dates.

Phase	Calibrated Dates (years cal. BC)	Analytical Basis
Formative Wietenberg *(Middle Bronze Age)*	2000-1875 cal. BC	Transition from EBA to MBA across the Carpathian Macroregion. End of EBA II and EBA III ceramics. Introduction of Wietenberg A decoration. Introduction of Wietenberg B and C late in this phase.
Classical Wietenberg *(Middle Bronze Age)*	1875-1500 cal. BC	End of Wietenberg A decoration. Introduction of Wietenberg D decoration. Continued (and expanded) use of Wietenberg B and Wietenberg C decoration.
Terminal Wietenberg *(Late Bronze Age)*	1500-1320 cal. BC	Transition to the LBA across the Carpathian Macroregion. End of Wietenberg D decoration. Continued use of Wietenberg B and Wietenberg C decoration.

The broad patterns of this new chronology will likely be further confirmed with additional radiocarbon dates. As with any new absolute chronology at this early stage, the quantity of phases and their exact temporal duration are likely to be modified with future dating and more ceramic analyses. More dates will likely push the MBA/LBA transition to some time between 1500-1450 cal. BC, and it is possible that refined dates will lengthen or shorten the temporal extent of the different ceramic decoration types.

The persistence of the Wietenberg Culture well into the Late Bronze Age (until 1350/1320 cal. BC) in southwest Transylvania is unique among other Middle Bronze Age cultures in the Carpathian Macroregion. Middle Bronze Age cultural groups in the Carpathian Basin (including Mureş, Vatya, Vatina, Gyulavarsand, and Otomani) end by the transition to the Late Bronze Age (see Figure 4.4). These cultural transitions are contemporaneous with significant changes in settlement and mortuary patterns (see O'Shea 2011). There is also strong evidence from Rotbav that the Wietenberg Culture did not persist in southeast Transylvania after Noua communities moved into the Transylvanian Plateau in earnest between 1500/1450 cal. BC (see Dietrich 2014a). As a result, the persistence of Wietenberg communities in southwest Transylvania (as well as Balta-Sarata communities in Hunedoara County) into the Late Bronze Age is a historic anomaly. It is important to consider whether the constellation of natural resources in southwest Transylvania (particularly copper, gold, tin, and salt) played a role in the persistence of Wietenberg communities. Dates and material evidence from non-Wietenberg communities in southwest Transylvania (especially at Teiuș-*Fântâna Viilor*) demonstrate that early Noua and Wietenberg communities were living in close proximity and interacting for nearly a century before the Wietenberg cultural identity was eventually lost or abandoned. The potential explanations for the persistence of Wietenberg in southwest Transylvania are explored further in Chapter 11.

In summary, the Wietenberg Culture began approximately 2000 cal. BC and ended (in southwest Transylvania) around 1320 cal. BC. The sequencing described in the existing ceramic chronology is not supported through radiocarbon dates. Instead, there are three primary subphases that are identifiable based on different constellations of ceramic decoration techniques: Formative Wietenberg (2000-1875 cal. BC), Classical Wietenberg (1875-1500 cal. BC), and Terminal Wietenberg (1500-1320 cal. BC).

Synthesis of New Absolute Chronology in Transylvania

When combined, the Early, Middle, and Late Bronze Age dates presented in this study establish a new analytical framework for studying community organization and social change in the Transylvanian Bronze Age (Figure 7.10). The Early Bronze Age has three phases. EBA I (2700-2500 cal. BC) is characterized by the Livezile group ceramics. EBA II (2500-2250 cal. BC) is characterized by the end of Livezile and beginning of Șoimuș group ceramics. EBA III (2250-2000 cal. BC) is characterized by the introduction of Iernut group ceramics and the persistence of Șoimuș group ceramics. The Middle Bronze Age begins with the Formative Wietenberg (2000-1875 cal. BC), characterized by Wietenberg A ceramics and start of Wietenberg B and Wietenberg C ceramics. The Classical Wietenberg (1875-1500 cal. BC) is characterized by the contemporaneous Wietenberg B, Wietenberg C, and Wietenberg D ceramics. The transition from the Middle Bronze Age to the Late Bronze Age is characterized by the persistence of Wietenberg and the introduction of Noua and other Late Bronze Age cultural groups into southwest Transylvania. The Terminal Wietenberg (1500-1320 cal. BC) consists of the continued use of Wietenberg B and Wietenberg C ceramics. This absolute chronology links well with other known trajectories in the Carpathian Basin. The start and end dates of the Early and Middle Bronze Ages (2700-2000 cal. BC and 2000-1500 cal. BC respectively) are similar to the transitions in other regions (see Boroffka 2013; Duffy 2010). The increased complexity of decoration that marks the shift from the Formative to Classical Wietenberg (approximately 1875 cal. BC) is contemporaneous with the increase in baroque ceramics in the Mureș Culture and the start of the florescent phase of the large regional center of Pecica-*Șanțul Mare* (see Nicodemus 2014). Unlike other regions, however, the Wietenberg Culture persists in southwest Transylvania. The reasons may be due to southwest Transylvania's unique geo-environmental context as a resource procurement zone. With this new framework in place, it is possible to examine settlement, mortuary, and artefactual evidence in southwest Transylvania across space and time.

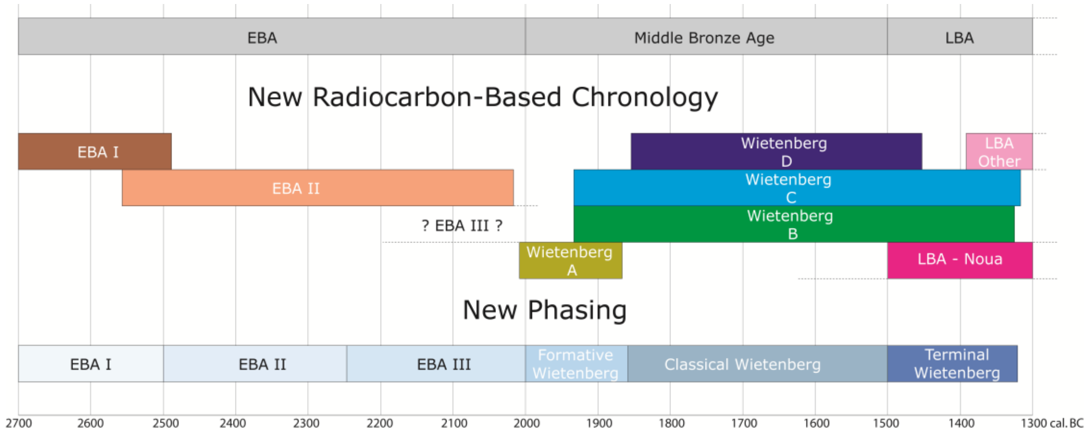

Figure 7.10 – New absolute chronology for the Bronze Age in southwest Transylvania.

Chapter Summary

The realignment of previously assumed cultural and chronological relationships is to be expected when absolute dates are incorporated into a regional chronology previously built on relative and stylistic dates (O'Shea 1991:102). The new dates from the Transylvanian Bronze Age have provided a first step in reshuffling and reorganizing these relationships. The general chronology of the Transylvanian Bronze Age, including the duration of and transition between the EBA, MBA, and LBA has been reaffirmed. However, the new absolute dating sequence has important consequences for (1) the chronological and cultural relationship between Șoimuș and Iernut EBA ceramic traditions, (2) the temporal duration and internal development of the Wietenberg culture, and (3) the chronological and cultural relationships of Transylvanian communities during the LBA. Additionally, the dates have provided a chronological anchor for comparing Transylvanian Bronze Age trajectories to contemporary trajectories across the Carpathian Basin (See Duffy 2010; Jaeger and Kulcsar 2013; O'Shea 1991). With the new insights of the absolute dating sequence, we can reframe our investigation of the development of social complexity at multiple spatial scales, from the Geoagiu Valley, to the Transylvanian Plateau, and the larger Carpathian Macroregion with a better understanding of integration, interaction, and the tempo of social transformations.

Chapter 8 - Settlement Systems in Southwest Transylvania

Chapter Introduction

This chapter presents the results of survey and settlement system analyses conducted at multiple scales within southwest Transylvania. Detailed site descriptions for all sites recorded by the BATS Project and used in this analysis can be found in Appendix A. I conducted four types of settlement pattern analyses: site- and rank-size analyses; nearest-neighbor analysis; network analysis; and catchment analysis. These archaeological measures present unique and complementary perspectives on the social and economic organization of Bronze Age communities in southwest Transylvania (Figure 8.1).

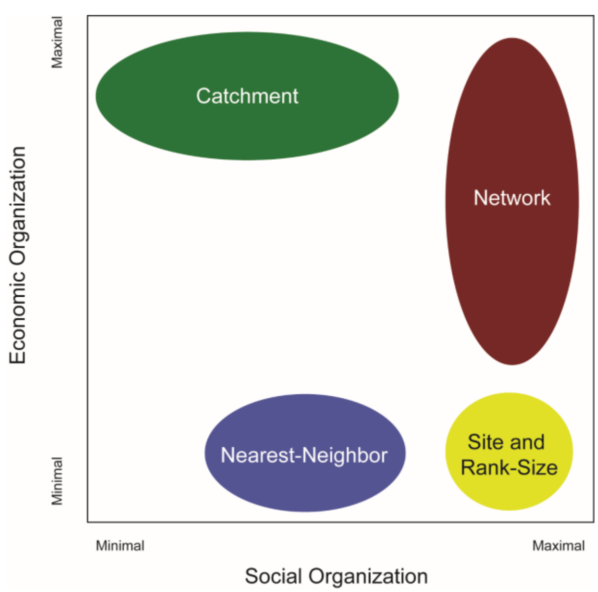

Figure 8.1 - A schematic of how different analyses contribute to the understanding of social and economic organization in Bronze Age communities.

Settlement site-size distributions are often examined to identify the presence of complex regional polities in middle-range societies (see Duffy 2015; Earle 1987; Earle and Kristiansen 2010; Gilman 1981; Johnson 1977, 1978; Kristiansen and Larsson 2005:125, 158; Nemeti and Molnár 2002, 2012). Specifically, the presence of site-size hierarchies, defined as a settlement pattern composed of a large number of small sites and a small number of large sites (Duffy 2015:85), may indicate the presence of regional centralization of political authority – the emergence of a political system with a central chief or chiefly lineage situated in the large regional center and exerting political control or influence over surrounding, small, settlements. However, there are several alternative mechanisms and settlement scenarios that can produce a settlement site size hierarchy as recovered by archaeologists without complex regional polities, including fission-fusion models (Blitz 1999), differences in catchment productivity, and seasonal or special purpose aggregations (also see Crumley 1979; Duffy 2015; Flannery 1976; Galaty 2005; Parkinson 2002; Peterson and Drennan 2011; Quinn and Barrier 2014). As such, settlement site-size distributions and rank-size distributions are just two of several archaeological measures used to identify the presence and mechanisms of genesis of site size hierarchies.

Rank-size analyses are another method to characterize how people were distributed across settlement systems. Rank-size analyses are based on a null-model of a log-normal site size distribution; the expectation that the second largest settlement (rank = 2) should be half as large as the largest settlement (rank = 3), the third largest settlement (rank = 3) should be half as large as the second largest settlement, and so on (Drennan and Peterson 2004:533; Zipf 1949). In general, rank-size analyses should be able to assess if populations distributed across different settlements matched expectations for more autonomous village societies (with sites of a similar size) or hierarchical community organization (with one large primate center and many smaller sites).

The distribution of settlements across the landscape affects, and is affected by, the presence of complex regional polities. The study of how settlements are distributed across the landscape has a long history in archaeology (see Earle 1976; Pinder et al. 1979; Plog 1974; Washburn 1974). In this study, I employ nearest-neighbor analyses to characterize the spatial distribution of sites in southwest Transylvania[2]. Nearest-neighbor analyses are built to evaluate a null hypothesis that sites are situated randomly on the landscape, independent of the location of any other sites. A rejection of the null hypothesis can be interpreted as a result of (1) the influence of the nature of the landscape (e.g., patchy resources, inhospitable locations); or (2) the influence of sites on the position of one another (Clark 1956:373; Pinder et al. 1979:437).

Network approaches have been increasingly used to understand regional-scale social, economic, and political systems in the past (e.g., Brughmans 2010, 2013; Duffy et al. 2013; Knappett 2011, 2012, 2013; Östborn and Gerding 2014). A *network* is a collection of points or nodes that are connected through lines or edges. Human social systems can be characterized as networks (e.g., people or sites as nodes, shared practices or economic transactions as linking edges), which is why network analyses are so useful in studying social networks in many disciplines (e.g., sociology, anthropology, economics, and political science). Network approaches have a long history in archaeology (see Flannery 1976). However, network analyses were underutilized until recent advances in computation, including cheap or freeware social network analysis platforms such as UCINET and Pajek, which reduced the costs, time, and programming expertise needed to conduct network analyses. Recent syntheses by Brughmans (2010, 2013) and Knappett (2013) have begun to set the agenda towards developing network analyses specifically designed to address archaeological data and questions.

The primary strengths of using network analyses for understanding regional social, economic, and political dynamics in middle-range societies are their focus on *interaction* and *centrality*. The nature of interaction between nodes are encoded in the edges of a network. In archaeological case studies, relationships between nodes can take the form of observed interactions or shared characteristics (e.g. edges between all sites that have a particular ceramic decoration motif) or hypothesized relationships (e.g. edges between all sites within a particular distance). Centrality is important because it allows

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[2] I do not employ spatial cluster analyses in this study because they are highly sensitive to sample sizes. Spatial cluster analyses (e.g., Ripley's K Function) are recommended for datasets with more than 30 samples. The number of sites in southwest Transylvania ranges only exceeds 30 in one of the five phases examined in this study.

for the identification of nodes that, because they occupy critical positions in the network, have better access to information and enhanced opportunities to spread information (Brughmans 2013:636; Valente et al. 2008). As such, centrality measures of hypothesized networks can be used to predict characteristics of sites within a settlement system (e.g., importance of a site within a settlement system).

Catchment analyses, as employed in this study, are designed to define the availability of economic resources for individual settlements. Economic resources in southwest Transylvania have different spatial distributions (see Chapter 3). For example, metal ores are primarily distributed in the uplands of the Apuseni Mountains while direct access to interregional trade is located along the lowland Mureș Valley. Due to the heterogeneous distribution of resources in southwest Transylvania, they rarely overlap. As a result, the landscape is a mosaic of different catchment types.

There is a recursive relationship between social and economic institutions – what resources are part of the economy and how resources are mobilized within a society – and where people choose to place their settlements. The choice to place a site in a particular part of the landscape is, at least in part, the byproduct of socially-mediated decisions that reflect the community's weighing of, and preferencing, different economic needs. Decisions to place settlements in the landscape are informed by existing economic institutions, but placement of sites in turn effected how social and economic institutions were organized. Understanding where people situated themselves in this heterogeneous landscape can reveal socio-economic priorities and help reconstruct the organization and evolution of social and economic institutions throughout the Bronze Age. By monitoring change through time in the catchment selection, it is possible to monitor changes in the importance of different resources to Bronze Age communities in southwest Transylvania.

Together, these archaeological measures of settlement patterns provide several complementary lines of evidence for understanding the organization of social and economic institutions in Bronze Age Transylvania. This section is broken down into five subsections. First, the sites employed in the subsequent analyses are identified. The next four sections are separated by the type of analysis conducted to investigate the organization and evolution of social and economic institutions in the Bronze Age. The theoretical justification and methods of these analyses were presented in Chapter 5.

Settlement Sites in Southwest Transylvania

Figure 8.2 and Table 8.1 present the 118 Bronze Age sites in Alba County used in the subsequent analyses.

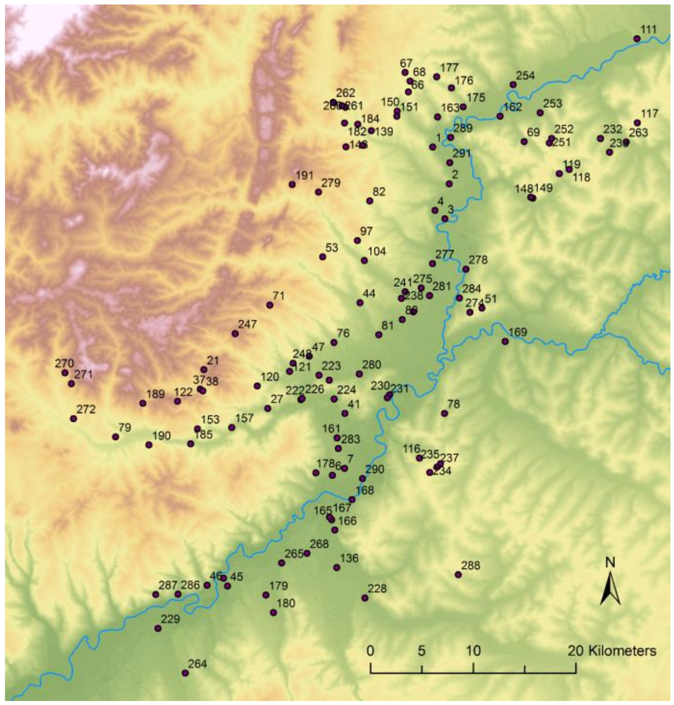

Figure 8.2 - All Bronze Age settlements in southwest Transylvania.

Table 8.1 - List of all Bronze Age settlements in southwest Transylvania.

ID	Site Name	ID	Site Name	ID	Site Name
1	Aiud-*(no name)*	139	Livezile-*Dealul Sârbului*	235	Straja-*La Cruce*
2	Aiud-*Castelul Bethlen*	143	Livezile-*Obirsie/Obursi*	237	Straja-*Sub Măgură*
3	Aiud-*Cetățuie*	148	Lopadea Nouă-*Cetățuie 1*	238*	Stremț-*Berc 1*
4	Aiud-*Tinod*	149	Lopadea Nouă-*Cetățuie 2*	241*	Stremț-*Fabrica de Alcool*
6	Alba Iulia-*Recea/Monolit*	150	Lopadea Veche-*Jidovină/Râpa Alba*	247	Țelna-*Gugu*
7	Alba Iulia-*Strada Sinia*	151	Lopadea Veche-*Pahui*	248	Țelna-*Măgură*
21	Ampoița-*La Bulz*	153	Meteș-*Piatră Peșteri*	251	Uioara de Jos-*Îtardeau/La Parloage*
27	Ampoița-*La Pietri*	157	Meteș-*Vârful Baii*	252	Uioara de Jos-*La Grui/Gruiul lui Sip*
37	Ampoița-*Pestera Liliecilor*	161	Micești-*Cigaș*	253	Uioara de Jos-*Strada Vanațorilor*
38	Ampoița-*Piatra Caprii*	162	Micoșlaca-*(no name)*	254	Unirea-*Dealul Camarii*
41	Bărăbanț-*(no name)*	163	Mirăslău-*CAP*	255	Vălișoara-*Peștera Bogsuta*
44	Benic-*(no name)*	165	Oarda de Jos-*Bulza*	260	Vălișoara-*Pleasa Cornii*
45	Blandiana-*La Brod*	166	Oarda de Jos-*Cutina*	261	Vălișoara-*Pleasa Pesterii*
46	Blandiana-*Teligrad*	167	Oarda de Jos-*Dublihan*	262	Vălișoara-*Peștera Pucula*
47	Burcedea Vinoasă-*Podei/Curături*	168	Oarda de Jos-*Sesul Orzii*	263	Vama Seacă-*Drumului cu Plopi*

51*	Capud-*Măgura Capudului*	169	Obreja-*Cânepi*	264	Vinerea-*(no name)*
53	Cetea-*La Bai/La Pietri/ Petriş/La Picuiata*	174	Oiejdea-*Bilag 2*	265	Vințu de Jos-*Deasupră Satului*
66	Cicău-*(no name)*	175	Ormeniş-*(no name)*	267	Vințu de Jos-*Lunca Fermei*
67	Cicău-*Cetăţel*	176	Ormeniş-*Cânepişte/Cânepi/La Pod*	268	Vințu de Jos-*Viile Lancranjenilor*
68	Cicău-*Sălişte*	177	Ormeniş-*Gruiul cu Mazăre*	270	Zlatna-*Colţul lui Blaj*
69	Cisteiu de Mureş-*Valea Poietii*	178	Pâclișa-*Podei*	271	Zlatna-*Dumbrăviţa*
71	Craiva-*Piatra Craivii*	179	Pianu de Jos-*Câmpu de Mijloc*	272	Zlatna-*Măgură Dudaşului*
76	Cricău-*Biserică Reformată*	180	Pianu de Jos-*Cleje*	274*	Capud-*(no name)*
78	Dumitra-*(no name)*	182	Poiana Aiudului-*Pe Ses/La Cânepi*	275*	Teiuș-*Fântâna Viilor*
79	Galați-*Bulbuci*	184	Poiana Aiudului-*Vatră Satului/Lângă Biserică*	276*	Teiuș-*Coastă*
80	Galda de Jos-*(no name)*	185	Poiana Ampoiului-*Piatra Corbului*	277*	Gârbova de Jos-*În Coastă*
81	Galda de Jos-*(no name)*	189	Presaca Ampoiului-*Peștera Şura de Piatră*	278*	Peţelca-*Cascadă*
82	Gârbova de Jos-*Piatră Dani*	190	Presaca Ampoiului-*Piatră Brații*	279*	Rameț-*Gugului*
97*	Geoagiu de Sus-*Fântâna Mare*	191*	Rameț-*Curmatura*	280	Oiejdea-*Bilag 1*
104*	Geoagiu de Sus-*Viile Satului*	222	Șard-*(no name)*	281*	Teiuș-*(no name)*
111	Gura Arieșului-*(no name)*	223	Șard-*Bilag 1*	283	Alba Iulia-*Bazin Olimpic*
116	Hăpria-*Valdul Morii*	224	Șard-*Bilag 2*	284*	Capud-*(no name)*
117	Heria-*Cetățuie*	226	Șard-*Casaluica*	286	Acmariu-*Şcoală*
118	Hopârta-*Pârâului Stirbului*	228	Sebeș-*Podul Pripocului*	287	Acmariu-*Valea Feneşului*
119	Hopârta-*Vaii Ratului*	229	Șibot-*Gară*	288	Șpring-*Cătun Carpen*
120	Ighiel-*Dealul Fierului*	230	Sântimbru-*La Tarmure/La Ieruga*	289	Gâmbaș-*(no name)*
121	Ighiu-*(no name)*	231	Sântimbru-*Obreje/La Tabaci*	290	Alba Iulia-*(no name)*
122	Isca-*Lac*	232	Șpâlnaca-*Fântâna lui Simon*	291	Aiud-*Groapa de Gunoi*
136	Lancrăm-*Glod*	233	Șpâlnaca-*(no name)*		
137	Livezile-*Baia*	234	Straja-*Fântâna Bornii*		

** - Site is in the Geoagiu Valley Survey Zone*

In the Geoagiu Valley survey zone, 14 Bronze Age sites were identified and 10 were investigated further with more extensive sub-surface testing (Figure 8.3).

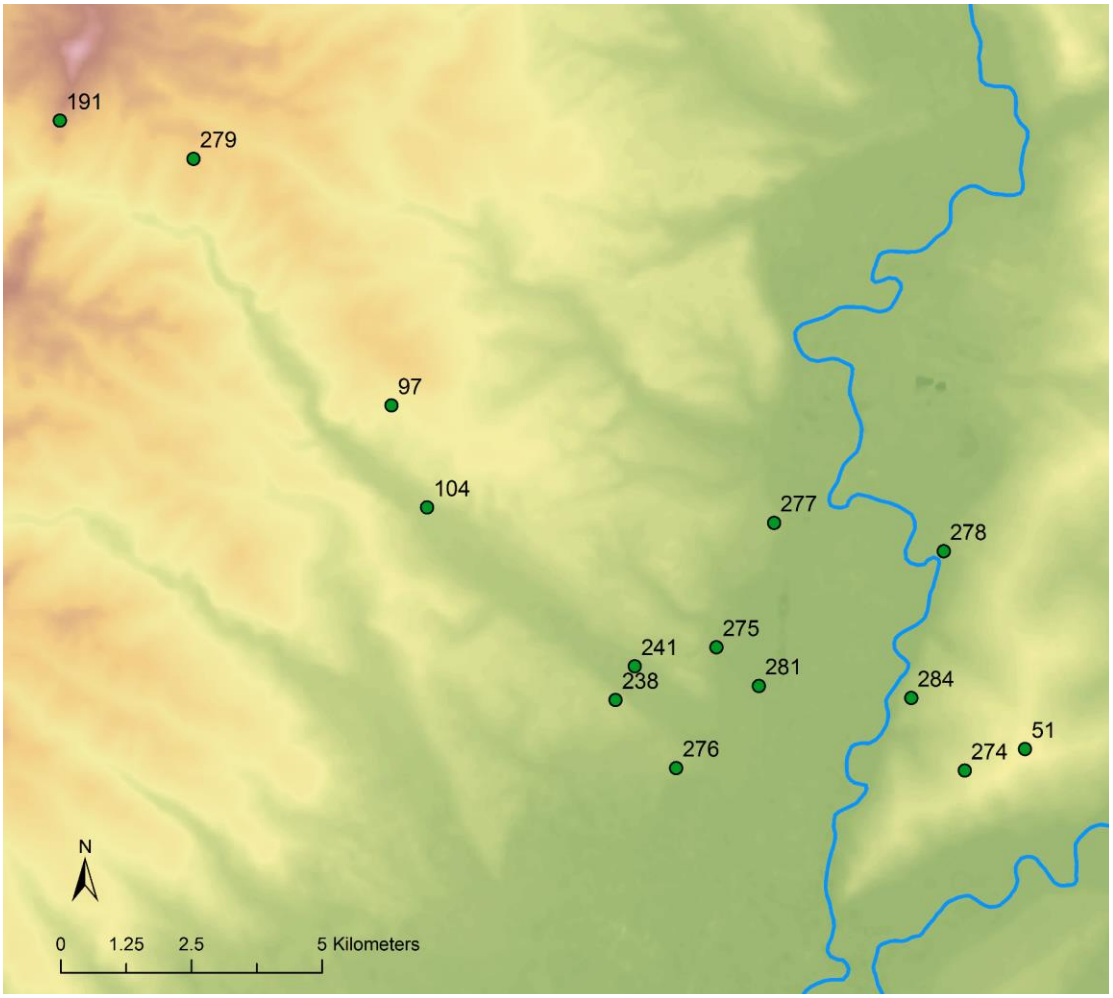

Figure 8.3 – All Bronze Age settlements in the Geoagiu Valley survey zone.

These settlements were used to conduct four different types of settlement pattern analyses: (1) site- and rank-size analysis; (2) nearest-neighbor analysis; (3) network analysis; and (4) site catchment analysis. Combined, these analyses provide models for community organization, including several social, political, and economic institutions, which are preliminary tested using data collected through the BATS Project.

Site and Rank-Size Analyses

For each chronological phase at the regional scale, I present (1) a histogram of site sizes (to identify distinct modes reflecting different hierarchical 'tiers' in settlement sizes), and (2) a rank-size graph with its shape characterized by the coefficient *A* developed by Drennan and Peterson (2004). The *A*-coefficient measures deviation from the ideal rank-size distribution (a negative linear relationship between the log-normal distribution of site sizes and log-normal distribution of settlement rank), with a primate distribution expected (*A*=negative) in settlement patterns with a large regional center and a convex distribution expected (*A*=positive) in settlement patterns that lack a significant regional hierarchy (Figure 8.4).

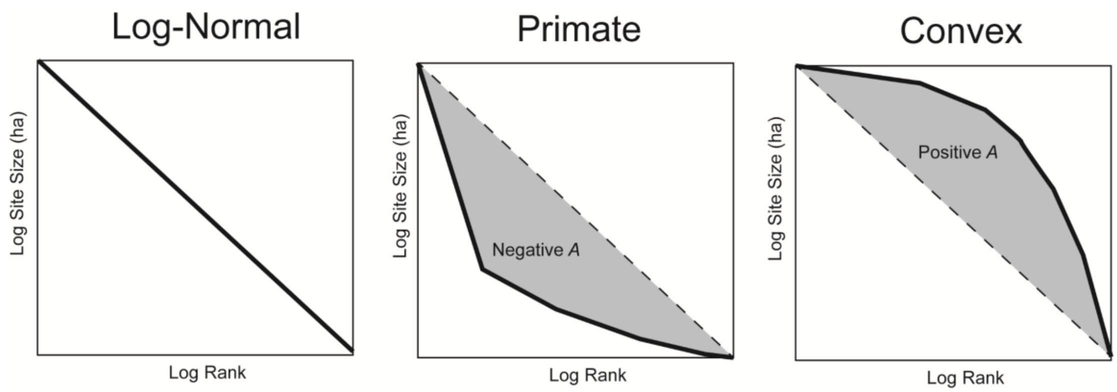

Figure 8.4 – Potential distributions of rank-size model. Log-normal and primate distributions are more consistent with hierarchical settlement systems while convex distributions are more consistent with more horizontally integrated settlement systems. The shaded area represents the deviation from the log-normal distribution measured through the A-coefficient.

The strength of the *A*-coefficient is that it facilitates comparisons between two or more observed patterns (such as time periods) (Drennan and Peterson 2004:535). The comparative potential of the *A*-coefficient is important because of the shortcomings in the southwest Transylvanian regional dataset (e.g. small sample size; underrepresentation of small sites identified and published through random chance in southwest Transylvania). The rank-size model is also sensitive to the presence of multiple polities within a region – where the second ranked site in the region, similar in size to the first ranked site, will result in a convex distribution (positive *A*-coefficient) though each individual polity may fit a primate or log-normal distribution. As such, the overall *A*-coefficient value and its association with log-normal, primate, and convex distributions are less important than monitoring when, and in how, settlement systems in Bronze Age southwest Transylvania underwent qualitative and quantitative changes.

Site sizes in southwest Transylvania were derived from fieldwork or through published maps. For several phases, there are only a few sites with recorded site sizes. It is important to note that for many multi-component sites, it is not clear how settlement size changed through time (if population grew, shrunk, or stayed constant; if settlement moved to create a large cumulative footprint). As a result, sites were omitted from this analysis if the size of a particular component was significantly overestimated by the overall size of the site. These issues can only be resolved with significantly more survey and sub-surface testing.

The overall distribution of known Early Bronze Age and Wietenberg site sizes is presented in Figure 8.5. Based on this distribution, it is possible to reclassify the sites into three ordinal size categories: Small sites (up to 3 hectares), medium-sized sites (3-6.5 hectares), and large sites (6.5-9 hectares) (Table 8.2).

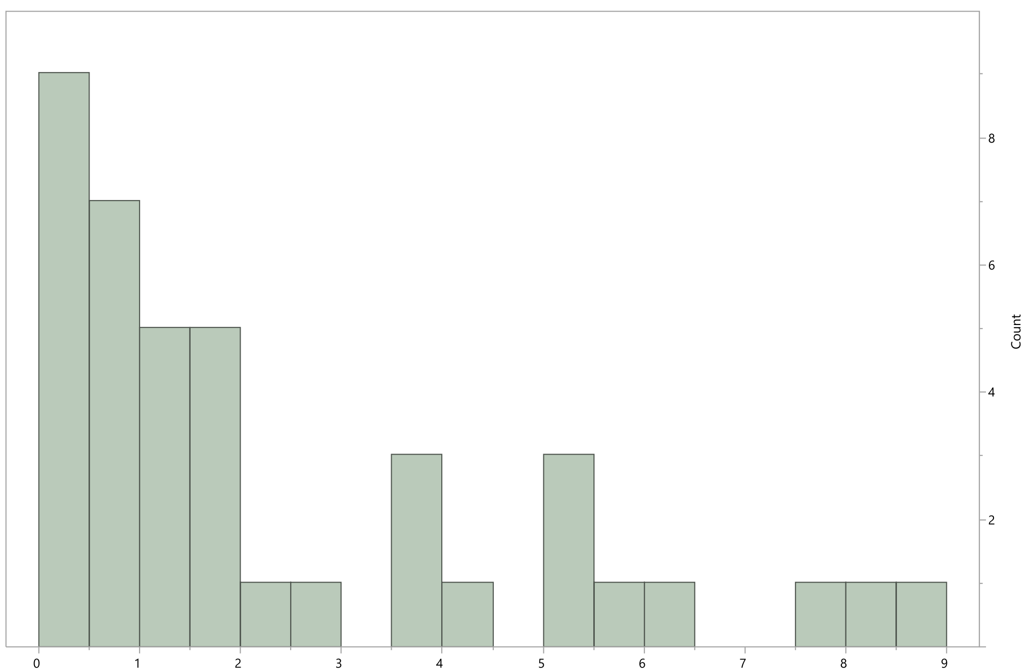

Figure 8.5 - Distribution of site sizes for all known Early Bronze Age and Wietenberg sites (40 total sites), which can be divided into small (0-3 ha), medium (3-6.5 ha) and large (6.5-9 ha) size categories.

Table 8.2 – Quantity of sites of different sizes in southwest Transylvania during the Bronze Age.

Size	Number of Sites in Southwest Transylvania
Small (0-3 ha)	28 (70.0%)
Medium (3-6 ha)	9 (22.5%)
Large (6-9 ha)	3 (7.5%)
	Total Sites: 40

EBA I: Southwest Transylvania Site and Rank-Size Analysis

Only 5 of 14 sites (35.7%) from EBA I (2700-2500 BC) have site size estimates (Table 8.3). All 5 sites are classified as small sites (under 3 hectares) (Figure 8.6). The rank-size graph (Figure 8.7) is close to a primate distribution (A=-1.032), which is normally associated with a single large site and many small sites. In this case, the largest site is Sântimbru-*Obreje/La Tabaci*, which is only 2.56 ha in size. This site is also occupied during the EBA II, and it is currently unclear if the total area of the site was fully occupied continuously through these two periods, or if the overall site size was produced through two smaller and mostly spatially distinct (though overlapping) occupations.

Table 8.3 - EBA I site sizes.

ID	Site Name	Site Size (ha)
51	Capud-*Măgura Capudului*	0.16538021759
137	Livezile-*Baia*	0.84512416841
185	Poiana Ampoiului-*Piatra Corbului*	0.10056771773
231	Sântimbru-*Obreje/La Tabaci*	2.56340003994
279	Rameț-*Gugului*	0.15882737526

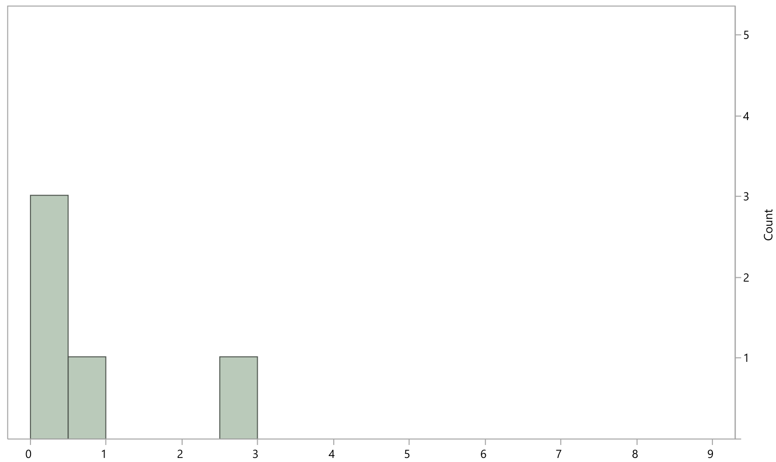

Figure 8.6 - EBA I site size distribution (in hectares).

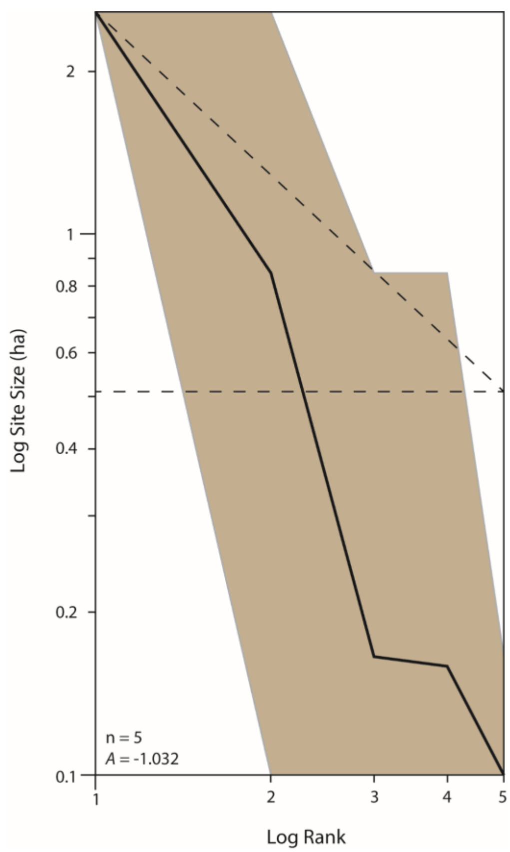

Figure 8.7 – Rank-size plot of EBA I settlements with approximate 90% confidence zone for rank-size curve.

EBA II: Southwest Transylvania Site and Rank-Size Analysis

A substantial portion of known EBA II sites, 15 of 21 (71.4%), have site size estimates (Table 8.4). All 15 sites are classified as small sites (under 3 hectares) (Figure 8.8). The rank-size graph (Figure 8.9) matches a convex distribution (*A*=0.417), which is normally associated with a settlement pattern without a large regional center. The largest site is Sântimbru-*Obreje/La Tabaci*, which is only 2.56 ha in size.

Table 8.4 - EBA II site sizes.

ID	Site Name	Site Size (ha)
3	Aiud-*Cetăţuie*	1.70097152625
37	Ampoiţa-*Pestera Liliecilor*	0.01841217094
97	Geoagiu de Sus-*Fântâna Mare*	1.22602725922
148	Lopadea Nouă-*Cetăţuie 1*	0.15308960391
162	Micoşlaca-*(no name)*	0.61200839248
167	Oarda de Jos-*Dublihan*	1.30524874187
175	Ormeniş-*(no name)*	1.27178793783
185	Poiana Ampoiului-*Piatra Corbului*	0.10056771773
222	Şard-*(no name)*	0.25571287703
224	Şard-*Bilag 2*	1.23366949248
231	Sântimbru-*Obreje/La Tabaci*	2.56340003994
238	Stremţ-*Berc 1*	0.50500452220
274	Capud-*(no name)*	0.73690801085
276	Teiuş-*Coastă*	1.90392247900
277	Gârbova de Jos-*În Coastă*	1.49381786954

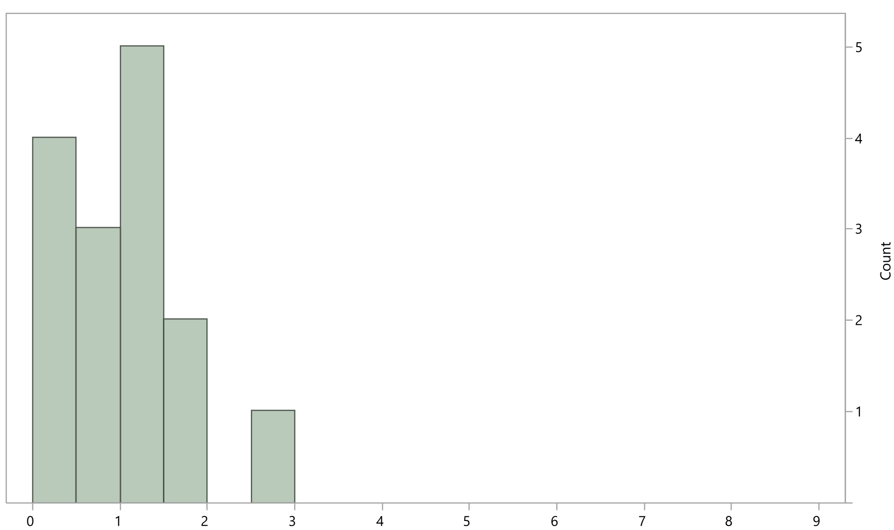

Figure 8.8 - EBA II site size distribution (in hectares).

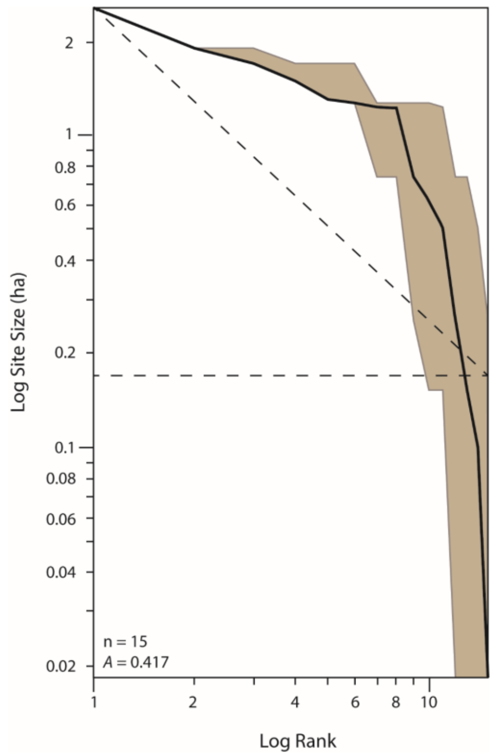

Figure 8.9 – Rank-size plot of EBA II settlements with approximate 90% confidence zone for rank-size curve.

EBA III: Southwest Transylvania Site and Rank-Size Analysis

Just under half of the sites with EBA III components, 5 of 11 (45.5%) have site size estimates (Table 8.5). Four sites (80.0% of EBA III sites) are classified as small sites (under 3 hectares), and one site (20.0% of EBA III sites) is classified as medium-sized (between 3 and 6.5 hectares) (Figure 8.10). The rank-size graph (Figure 8.11) most closely matches a log-normal distribution (*A*=0.097) associated with the presence of a site-size hierarchy. The largest site is Oarda de Jos-*Sesul Orzii*, which is 3.77 ha in size.

Table 8.5 - EBA III site sizes.

ID	Site Name	Site Size (ha)
136	Lancrăm-*Glod*	1.60842068679
167	Oarda de Jos-*Dublihan*	1.30524874187
168	Oarda de Jos-*Sesul Orzii*	3.77049409628
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	0.49037463410
276	Teiuş-*Coastă*	1.90392247900

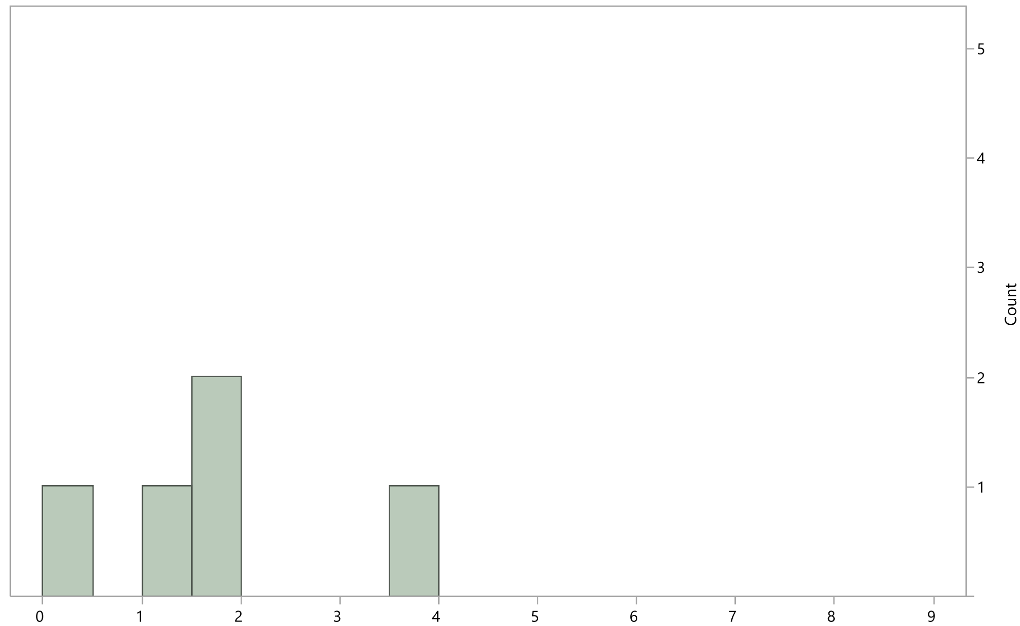

Figure 8.10 - EBA III site size distribution (in hectares).

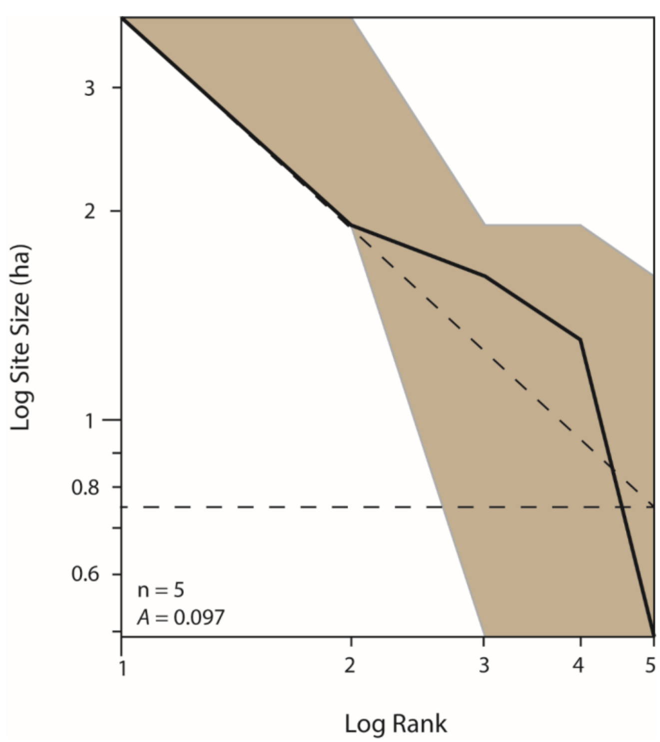

Figure 8.11 – Rank-size plot of EBA III settlements with approximate 90% confidence zone for rank-size curve.

Formative Wietenberg: Southwest Transylvania Site and Rank-Size Analysis

In southwest Transylvania, 8 of 14 settlements (57.1%) of Formative Wietenberg sites (sites with Wietenberg Type A ceramics) have site size estimates (Table 8.6). While some sites with Wietenberg Type B and C ceramics may date to the second half of the formative Wietenberg, they are omitted from this analysis because they cannot be attributed to the Formative Wietenberg without radiocarbon dates. Four of the sites (50.0% of Formative Wietenberg sites) are classified as small sites (under 3 hectares), two sites (25.0% of Formative Wietenberg sites) are classified as medium-sized (between 3 and 6.5 hectares), and two sites (25.0% of Formative Wietenberg sites) are classified as large sites (over 6.5 hectares) (Figure 8.12). The rank-size graph (Figure 8.13) is slightly concave (*A*=0.197), which is normally associated with a settlement pattern without a large regional center. The largest sites are Pețelca-*Cascadă* (8.81 ha) and Alba Iulia-*Recea/Monolit* (8.40 ha), which may represent two distinct regional centers within southwest Transylvania.

Table 8.6 - Formative Wietenberg site sizes (Wietenberg Type A).

ID	Site Name	Site Size (ha)
6	Alba Iulia-*Recea/Monolit*	8.39894596661
51	Capud-*Măgura Capudului*	0.16538021759
68	Cicău-*Săliște*	0.77017743637
97	Geoagiu de Sus-*Fântâna Mare*	3.53158315546
136	Lancrăm-*Glod*	1.60842068679
230	Sântimbru-*La Tarmure/La Ieruga*	2.25637342921
241	Stremț-*Fabrica de Alcool*	3.73152474901
278	Pețelca-*Cascadă*	8.80784618233

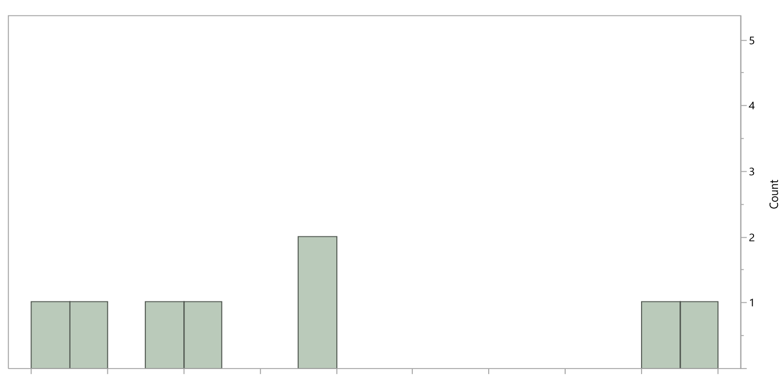

Figure 8.12 - Formative Wietenberg site size distribution (Wietenberg Type A) (in hectares).

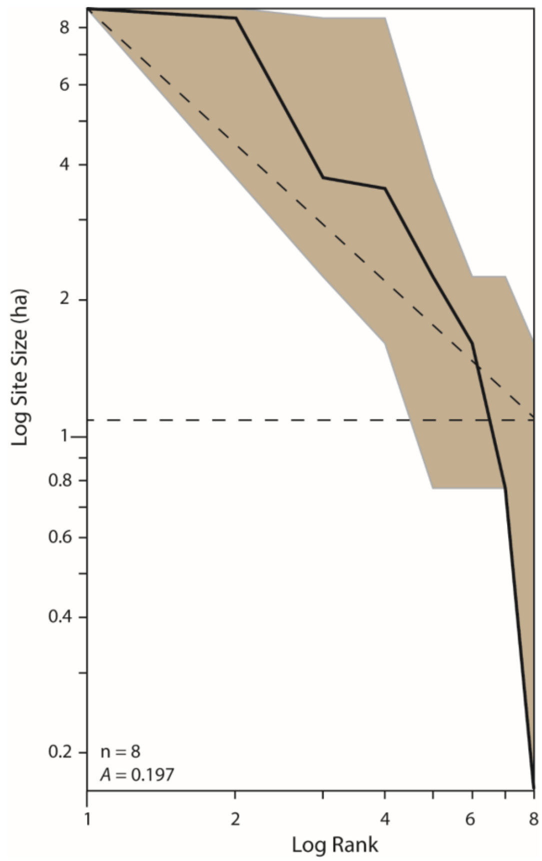

Figure 8.13 – Rank-size plot of Formative Wietenberg settlements with approximate 90% confidence zone for rank-size curve.

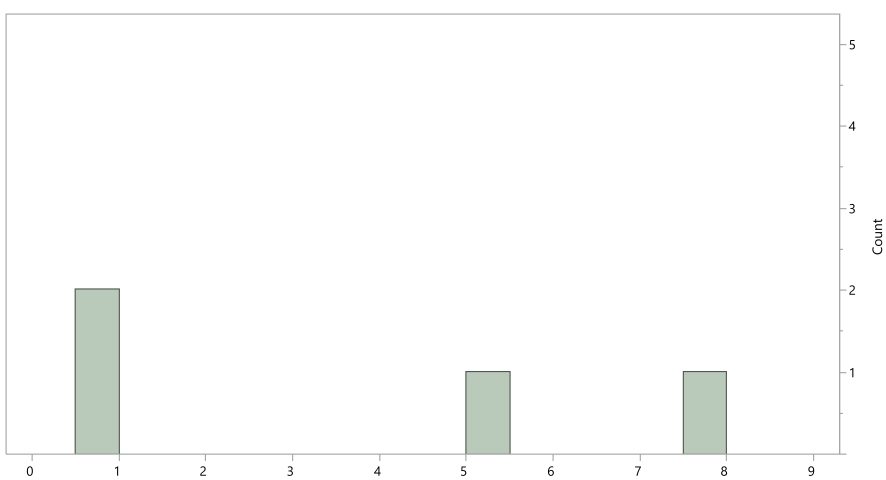

Figure 8.14 - Classical Wietenberg site size distribution (Wietenberg Type D) (in hectares).

Classical Wietenberg: Southwest Transylvania Site and Rank-Size Analysis

Because of the lack of radiocarbon dates at most sites in southwest Transylvania, I present two alternative views of the Classical Wietenberg based on different ceramic distributions. In both cases, sites that have radiocarbon dates from the Formative or Terminal Wietenberg phases though have ceramic finds associated with Classical phase are omitted from the analysis. First, I present the site size distribution of settlements with Wietenberg Type D ceramics, as these ceramics are primarily found in the Classical Wietenberg phase (but not all Classical Wietenberg sites had Wietenberg Type D). In this restrictive analysis, only 4 of 12 sites with Wietenberg Type D ceramics (33.3%) have site size estimates (Table 8.7). Two of the sites (50.0% of Wietenberg Type D sites) are classified as small sites (under 3 hectares), one site (25.0% of Wietenberg Type D sites) is classified as medium-sized (between 3 and 6.5 hectares), and one site (25.0% of Wietenberg Type D sites) is classified as large sites (over 6.5 hectares) (Figure 8.14).

Table 8.7 - Classical Wietenberg site sizes (Wietenberg Type D).

ID	Site Name	Site Size (ha)
68	Cicău-*Sălişte*	0.77017743637
104	Geoagiu de Sus-*Viile Satului*	0.94546110990
161	Miceşti-*Cigaş*	7.61207839661
231	Sântimbru-*Obreje/La Tabaci*	2.56340003994

Second, a broader attempt was made to present settlement sizes for the Classical Wietenberg phase by including all sites with ceramic types that date to this phase, particularly Wietenberg Types B, C, and D (though excluding sites that have been directly dated to the Terminal Wietenberg phase). It is important to note that because the temporal span of Wietenberg Types B and C expands prior to, and after, the end of this phase, caution must be made when interpreting these results. Indeed, some of the sites included in this sample were likely occupied during the Formative or Terminal Wietenberg phases and not the Classical Wietenberg phase. Of the sites that may be from the Classical Wietenberg Phase, 19 of 44 (43.2%) have site size estimates (Table 8.8). Nine of the sites (47.4% of Classical Wietenberg sites) are classified as small sites (under 3 hectares), five sites (36.8% of Classical Wietenberg sites) are classified as medium-sized (between 3 and 6.5 hectares), and three sites (15.8% of Classical Wietenberg sites) are classified as large sites (over 6.5 hectares) (Figure 8.15). The rank-size graph (Figure 8.16) matches a concave distribution (A=0.486), which is normally associated with a settlement pattern without a large regional center. The largest sites are Pețelca-*Cascadă* (8.81 ha) and Alba Iulia-*Recea/Monolit* (8.40 ha), which may represent two distinct regional centers within southwest Transylvania. The third large site, Micești-*Cigaș* covers 7.61 ha though it is a single component site (cultural deposits <20 cm in depth) unlike the deeply stratified sites of Pețelca-*Cascadă* and Alba Iulia-*Recea/Monolit*.

Table 8.8 - Classical Wietenberg site sizes (Wietenberg Types B, C, and D).

ID	Site Name	Site Size (ha)
3	Aiud-*Cetățuie*	1.70097152625
6	Alba Iulia-*Recea/Monolit*	8.39894596661
41	Bărăbanț-*(no name)*	5.64303043924
68	Cicău-*Săliște*	0.77017743637
78	Dumitra-*(no name)*	0.23990372724
97	Geoagiu de Sus-*Fântâna Mare*	3.53158315546
104	Geoagiu de Sus-*Viile Satului*	0.94546110990
136	Lancrăm-*Glod*	1.60842068679
161	Micești-*Cigaș*	7.61207839661
176	Ormeniş-*Cânepiște/Cânepi/La Pod*	0.74368708325
230	Sântimbru-*La Tarmure/La Ieruga*	5.01268083627
241	Stremț-*Fabrica de Alcool*	3.73152474901
251	Uioara de Jos-*Îtardeau/La Parloage*	0.17426187250
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	0.49037463410
278	Pețelca-*Cascadă*	8.80784618233
280	Oiejdea-*Bilag 1*	4.46265270622
286	Acmariu-*Şcoală*	5.073918
287	Acmariu-*Valea Feneşului*	1.644249
288	Șpring-*Cătun Carpen*	6.188635

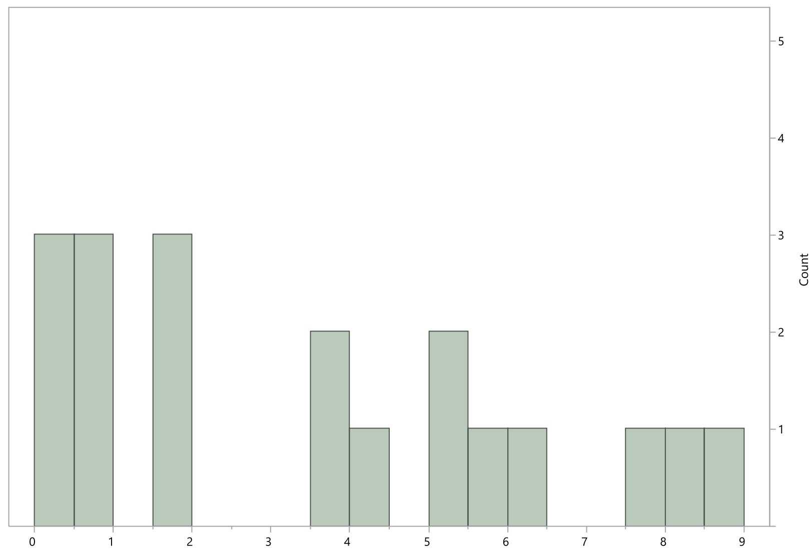

Figure 8.15 - Classical Wietenberg site size distribution (Wietenberg Types B, C, and D) (in hectares).

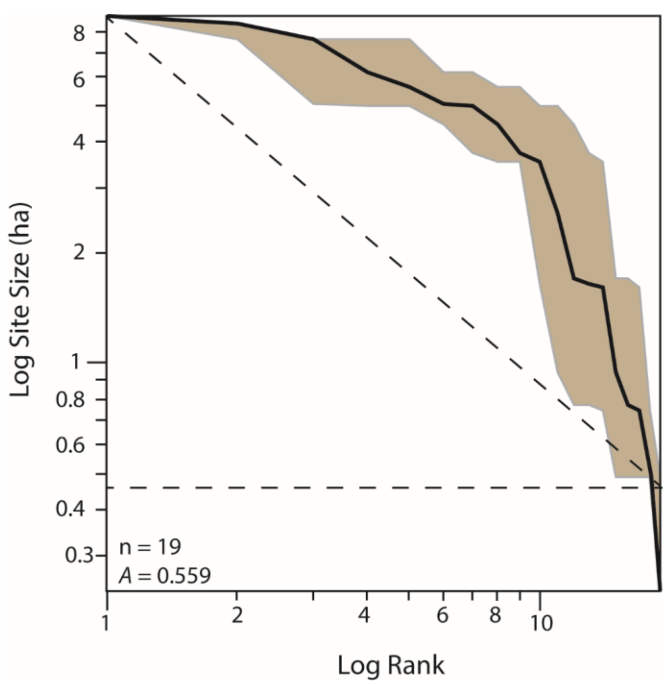

Figure 8.16 – Rank-size plot of Classical Wietenberg settlements with approximate 90% confidence zone for rank-size curve.

Terminal Wietenberg: Southwest Transylvania Site and Rank-Size Analysis

With no Wietenberg ceramic styles that are temporally diagnostic to the Terminal Wietenberg, this site-size analysis is limited to sites within the Geoagiu Valley that have been more intensively studied and dated. There are 4 sites that date to the Terminal Wietenberg with site size estimates (Table 8.9). One of the sites (25.0% of Wietenberg Type D sites) is classified as small sites (under 3 hectares), two sites (50.0% of Wietenberg Type D sites) are classified as medium-sized (between 3 and 6 hectares), and one site (25.0% of Wietenberg Type D sites) is classified as large sites (over 6 hectares) (Figure 8.17). The rank-size graph (Figure 8.18) is slightly concave (*A*=0.149), which is normally associated with a settlement pattern without a large regional center. The largest site is Pețelca-*Cascadă* (8.81 ha).

Table 8.9 - Terminal Wietenberg site sizes (sites in Geoagiu Valley).

ID	Site Name	Site Size (ha)
97	Geoagiu de Sus-*Fântâna Mare*	3.53158315546
191	Rameț-*Curmatura*	1.77010882695
275	Teiuș-*Fântâna Viilor*	5.38294906406
278	Pețelca-*Cascadă*	8.80784618233

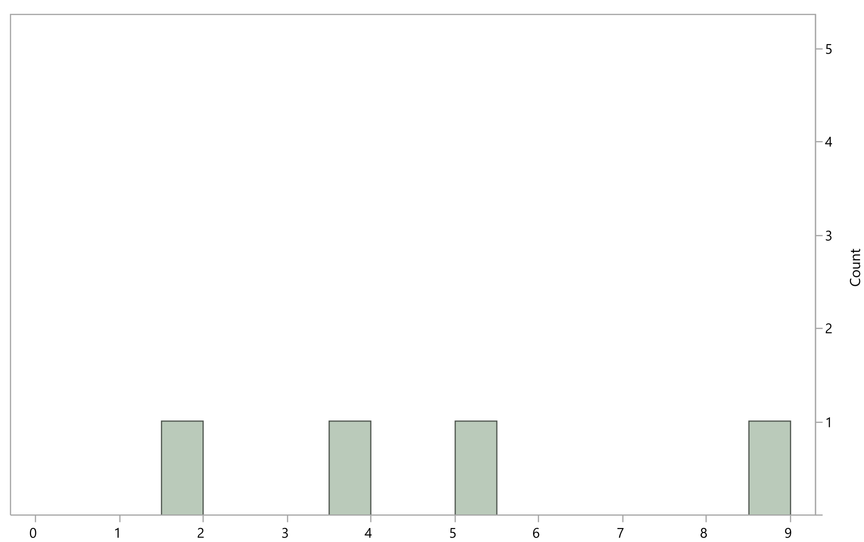

Figure 8.17 - Terminal Wietenberg site size distribution (in hectares).

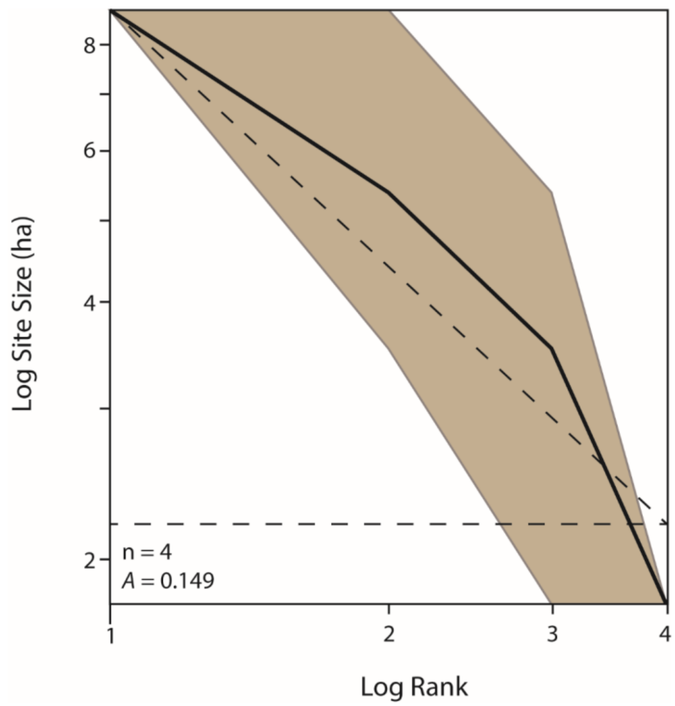

Figure 8.18 – Rank-size plot of Terminal Wietenberg settlements with approximate 90% confidence zone for rank-size curve.

Geoagiu Valley Site-Size Analysis

In the Geoagiu Valley, where sites have been investigated through test excavations, it is possible to use the new radiocarbon dates to develop a fine-grained record of settlement history within the valley (Figure 8.19). The fine-grained modeling of settlement patterns in the Geoagiu Valley is only possible for Wietenberg sites (2000-1300 BC), as only a portion of the Early Bronze Age settlements in the Geoagiu Valley have been accurately dated with absolute dating techniques (see Chapter 7). In particular, dates are not available for Early Bronze Age occupations at Stremț-*Berc 1*, Capud-*No name* and Rameț-*Gugului*. For the Middle and Late Bronze Ages, I present (1) change in the number of tiers of settlement (small, medium, or large settlements) occupied through time, (2) change in the largest settlement occupied through time, and (3) change in the total hectares occupied in the Geoagiu Valley through time (Figure 8.20). For this analysis, I used 1-sigma distributions of calibrated dates at 50-year time slices from 2000-1300 BC.

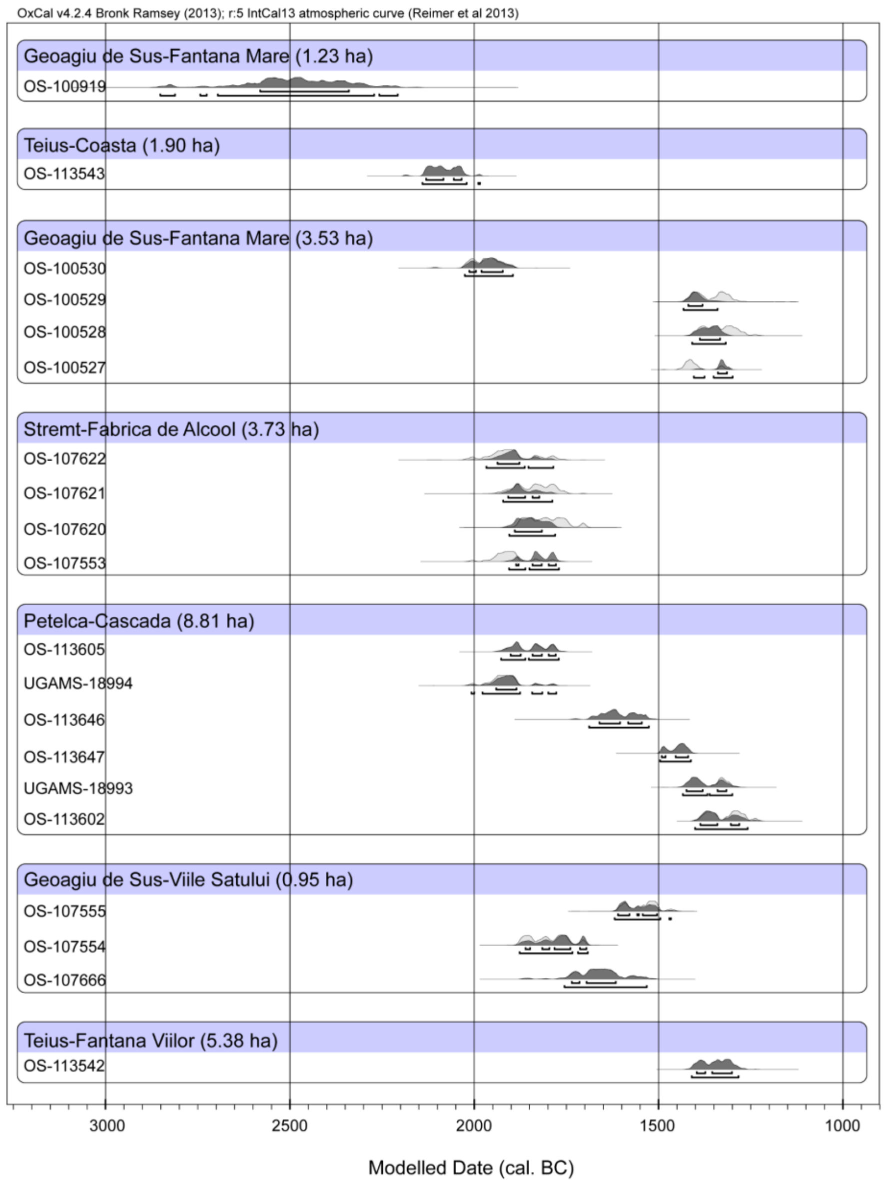

Figure 8.19 - Geoagiu Valley site sizes and occupations.

The site-size hierarchy within the settlement system fluctuated throughout the Middle Bronze Age and early Late Bronze Age in the Geoagiu Valley. For all of the MBA, contemporaneously occupied settlements only represented one or two tiers of settlement sizes. There is a reorganization of settlements approximately every 100-150 years. With the introduction of Noua communities in the LBA, Wietenberg communities reorganized and were characterized by a three-tier settlement hierarchy for the first time.

The new tier of sites is represented by the small community at Rameț-*Curmatura*, high in the Trascău Mountains on the pass between the Mureș Valley and the Metal Mountains. This new settlement configuration was brief, as it, as well as the Wietenberg Culture in southwest Transylvania, collapsed after 100-150 years (by 1300 cal. BC).

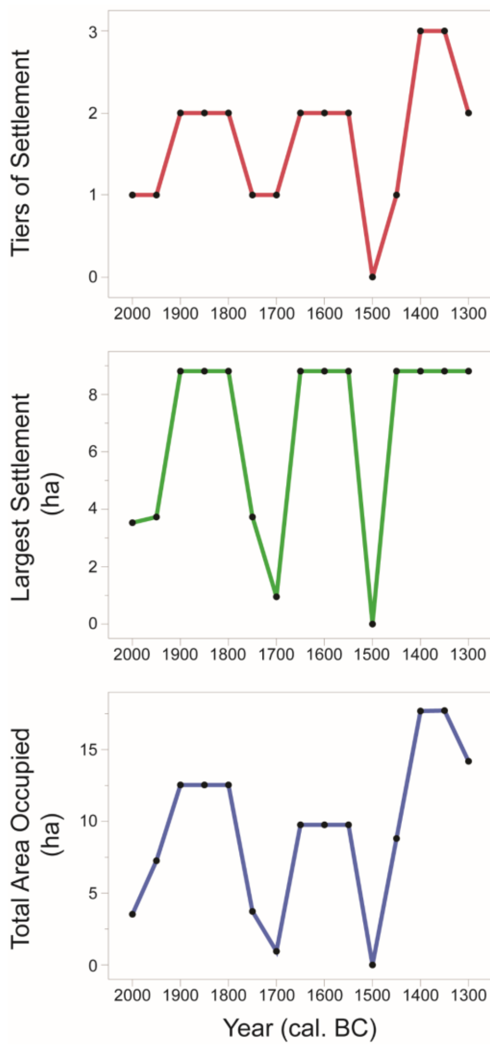

Figure 8.20 - Settlement dynamics in the Geoagiu Valley between 2000-1300 cal. BC.

The dynamic settlement in the Geoagiu Valley fits with other cases of fine-grained changes in settlement organization in middle range societies (see Anderson 1994; Blitz 1999; Parkinson 2002). By comparing these settlement systems with archeological evidence from other realms, it will be possible to examine whether these aggregation and dispersal processes match expectations of cycling, in which societies oscillate between more and less political integration, or if it is a social phenomenon of community fission-fusion without changes in regional political organization.

Dynamics of Settlement Site- and Rank-Size in the Bronze Age

There is a general trend towards an increase in the frequency of large sites throughout the Bronze Age in southwest Transylvania (Figure 8.21). In EBA I and EBA II, all sites are below 3ha in size. In EBA III, one settlement (Oarda de Jos-*Sesul Orzii*) was over 3ha. By the start of the Middle Bronze Age (Formative Wietenberg), large towns (over 8 ha) began to develop. This general pattern of multiple contemporaneously occupied large sites within the region continued throughout rest of the Middle Bronze Age (Classical Wietenberg).

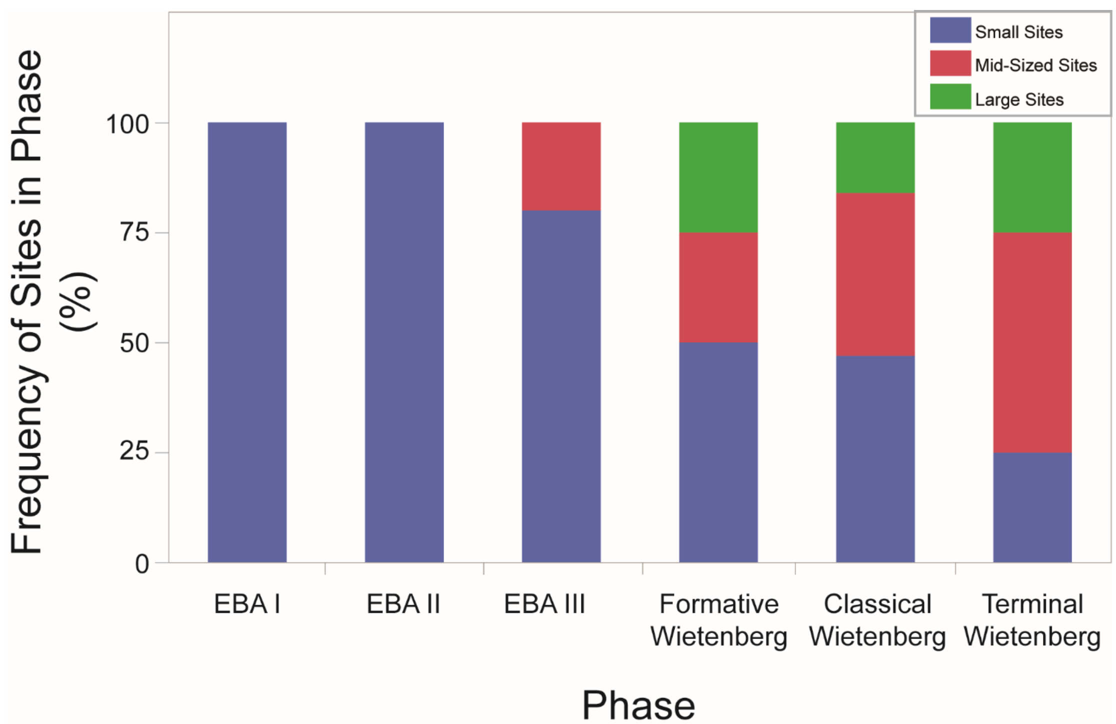

Figure 8.21 – Distribution of southwest Transylvanian sites by ordinal categories of small (0-3 ha), medium (3-6.5 ha) and large (6.5-9 ha) by period.

Despite the emergence of large towns at the start of the Middle Bronze Age, a three-tier settlement hierarchy only appeared in southwest Transylvania during the Late Bronze Age (Terminal Wietenberg). The dynamic settlement pattern of the dated sites in the Geoagiu Valley (see Figure 8.20) suggests that while the large sites were likely occupied throughout the Middle Bronze Age, the small- and medium-sized sites were not contemporaneously occupied. Instead, these smaller sites were abandoned and new sites established approximately every 70-120 years.

The organization of the settlement systems, as measured through rank-size analysis, also changed over the Bronze Age (Figure 8.22). The EBA I pattern fits a more primate distribution. While all sites are considered small, one site (Sântimbru-*Obreje/La Tabaci*) is significantly larger than the rest. The EBA II settlement pattern more closely fit a concave distribution. The beginning of the EBA III saw a shift back towards a log-normal distribution. With the start of the Formative Wietenberg, and continuing with the Classical Wietenberg, settlement distributions became slightly more concave. The rank-size analysis suggests that there were minimal changes in the basic settlement dynamic from EBA II through the Classical Wietenberg.

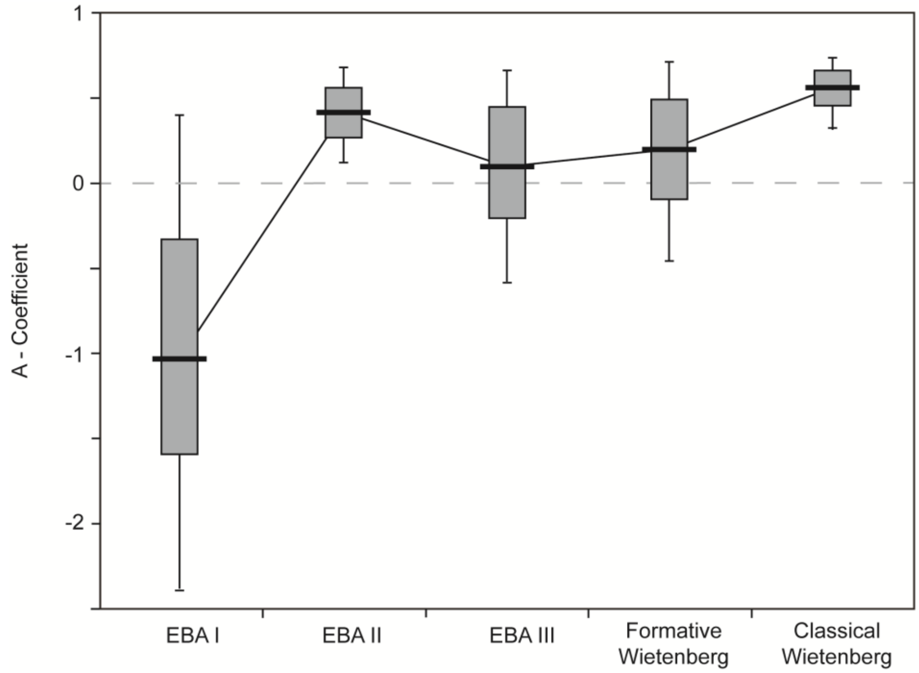

Figure 8.22 – Ranks-size A-coefficient for southwest Transylvanian settlement systems by phase (horizontal black line) with 1-standard deviation (box) and 2-standard deviations (whiskers). 0 value of the A-coefficient (dotted line) represents a log-normal distribution.

The concave distribution in the Middle Bronze Age, despite the emergence of large sites can be attributed to there being multiple large sites in southwest Transylvania (Alba Iulia-*Recea/Monolit*; Pețelca-*Cascadă*; Micești-*Cigaș*). Of these, Alba Iulia-*Recea/Monolit* and Pețelca-*Cascadă* are stratigraphically deep as well as horizontally large. If these two large sites represent central settlements within an integrated network, then it is likely that there were at least two networks in southwest Transylvania during this time.

Together, the size- and rank-size analysis suggest that there were three qualitative and quantitative shifts in the distribution of people in settlements during the Bronze Age. First, from EBA I to EBA II, people were distributed more evenly across settlements. Second, from EBA III to the Formative Wietenberg, people began to aggregate in larger settlements. Third, and finally, from the Classical Wietenberg to Terminal Wietenberg, a three-tier site size hierarchy was established, then collapsed after less than 200 years.

Nearest-Neighbor Analysis

Nearest-neighbor analyses provide a means of quantifying and assessing the statistical significance of different spatial distributions of settlement systems, particularly between three alternative configurations along spectrum: (1) clustered, (2) random, and (3) dispersed (Figure 8.23).

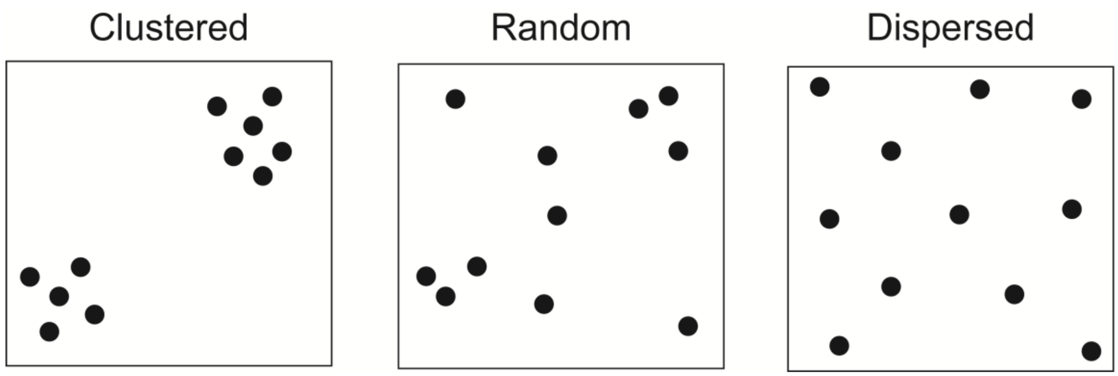

Figure 8.23 - Different spatial configurations of the same number of settlements relative to each other. These different distributions can be quantitatively assessed using nearest-neighbor analysis.

The reliability of the nearest-neighbor analysis in southwest Transylvaniais limited due to several factors: (1) there are few sites dated to each phase in the region, (2) Euclidean distance is not culturally meaningful in a mountainous landscape, and (3) the rugged landscapes means that not all potential places in the landscape are habitable. While recognizing these challenges, the analyses remain useful for identifying general patterns between time periods. As another measure of settlement network structure, I compare the distribution of least cost path links between each site and other sites within a four hours walk. In the next section, I present network analyses that use least cost path analysis to create links between settlements that are within 4 hours walk (approximately a half day's journey). While the methods are described in detail in that section, in the dynamics subsection I present histograms of all links between sites under 4 hours to complement the general patterns seen in the nearest-neighbor analyses.

It is expected that different scales of socio-political integration in middle-range societies will be materialized variability in the spatial clustering or dispersal of settlements (Figure 8.24). It is expected that highly autonomous communities will position themselves at equal distance from each other to maximize individual catchments and diminish inter-community competition for land and resources. It is expected that regional networks characterized by asymmetric social relationships but lacking centralized political authority will tend towards more spatial clustering as people are drawn to emerging social, political, and economic hubs and the opportunities they offer. At the vertically-integrated end of the spectrum, it is expected that settlement systems will trend back towards dispersal as strong elite groups exert influence over groups with less authority to maximize access to more distant resources, encourage craft and procurement specialization, and provide a potential social buffer against competing polities in the surrounding landscape.

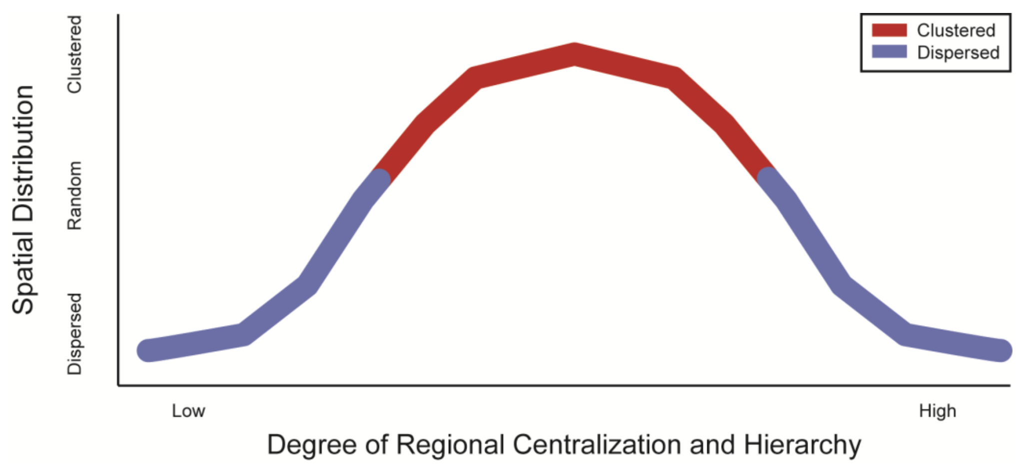

Figure 8.24 – Model for the relationship between regional political centralization and spatial clustering.

Nearest-neighbor analyses measure the average Euclidean distance between each site and its next closest site and compares this average distance with the expected average distance if the same number of sites were randomly distributed in the research area. The resulting nearest-neighbor ratio (R_n) can range from 0.00 (a completely clustered distribution, with very short distances to the nearest-neighbor) to 2.15 (a completely dispersed distribution, with the longest possible distances to the nearest-neighbor). The nearest-neighbor ratio (R_n) fits a random distribution when it is 1.00. As a result, an R_n value less than 1.00 means the average distance between nearest-neighbors is *less* than expected from a random distribution, which suggests that sites fit a relatively clustered pattern (Pinder et al. 1979:431). Conversely, an R_n value over 1.00 means the average distance between nearest-neighbors is *greater* than expected from a random distribution, which suggests that sites fit a relatively dispersed pattern (Pinder et al. 1979:431).

There are many factors that impact the utility of nearest-neighbor analyses (see Bevan and Conolly 2006; Pinder et al. 1979; Whallon 1973, 1974). In particular, how the study area is defined and the assumption of contemporaneity of all settlements within the analysis pose significant challenges to archaeologists. In this study, the challenges defining study area and assumptions of contemporaneity impact the strength of analyses (see Chapter 8). Nevertheless, nearest-neighbor analysis can be a useful tool when used in conjunction with several other archaeological measures. More than the statistical significance of the distributions in this study, this measure provides a way to compare different time periods and shows the general tendency of the pattern.

I present the results of the nearest-neighbor analysis for each individual phase of the Bronze Age[3]. Then I compare how spatial clustering changed throughout the Bronze Age to identify quantitative and qualitative changes over time.

EBA I: Nearest-Neighbor Analysis

The average nearest-neighbor ratio (R_n) for the 14 EBA I settlements in southwest Transylvania is 1.39. Based on this ratio, it is possible to reject the null hypothesis that settlements were placed randomly (Figure 8.25). It is possible that the two closest pairs of settlements (Zlatna-*Colțul lui Blaj* and Zlatna-*Dumbrăvița*; Livezile-*Baia* and Livezile-*Obirsie/Obursi*) were sequentially rather than contemporaneously occupied.

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[3] The Terminal Wietenberg was omitted from this analysis because there are only four sites from this period and they are only located in the Geoagiu Valley.

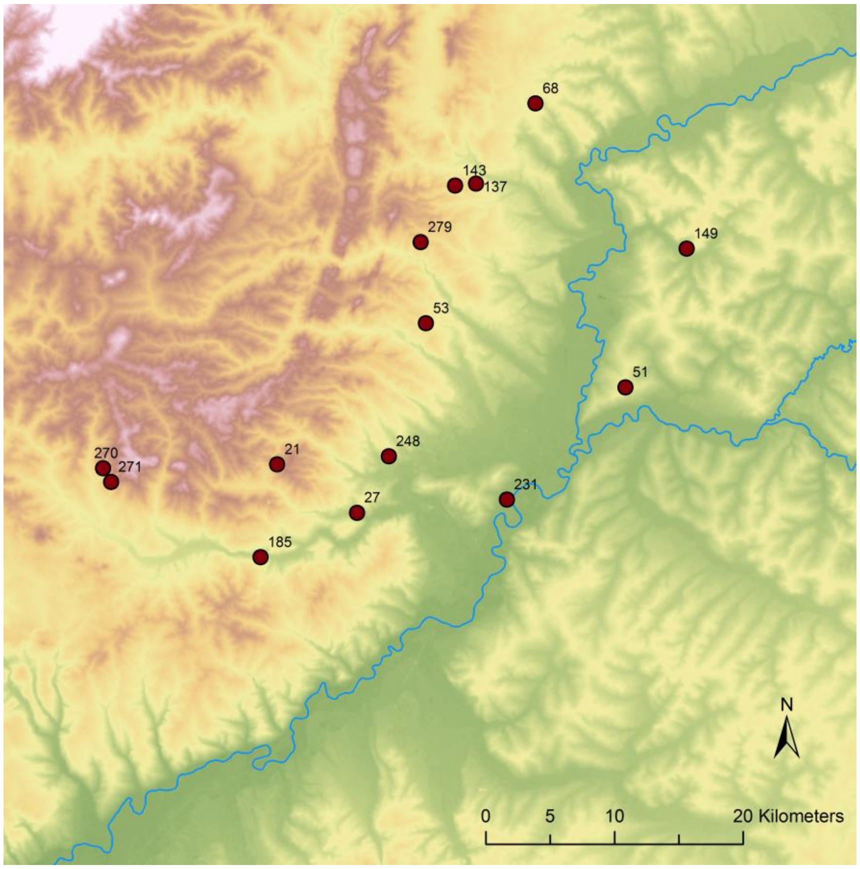

Figure 8.25 - EBA I sites in southwest Transylvania.

EBA II: Nearest-Neighbor Analysis

The average nearest-neighbor ratio (R_n) for the 21 EBA II settlements in southwest Transylvania is 1.07. Based on this ratio, it is not possible to reject the null hypothesis that settlements were placed randomly. The settlement system does trend towards dispersal (p=.552) (Figure 8.26).

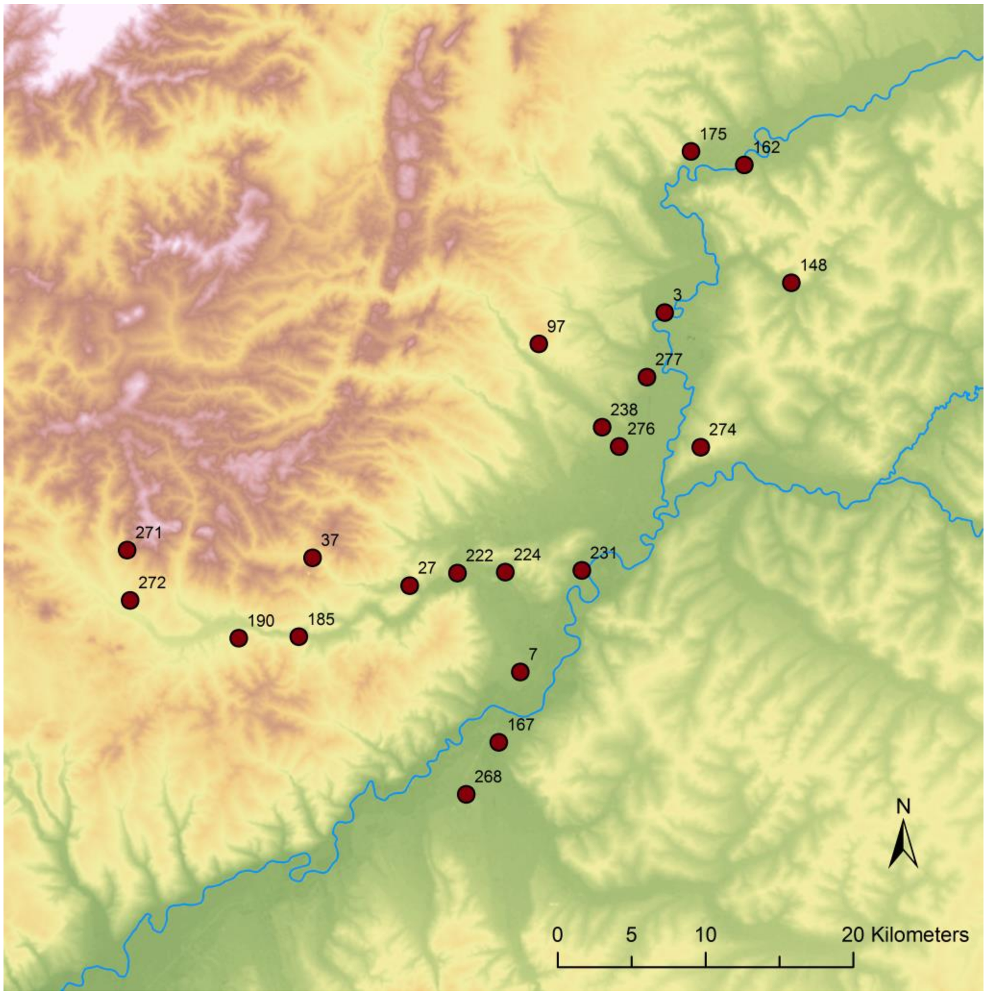

Figure 8.26 - EBA II sites in southwest Transylvania.

EBA III: Nearest-Neighbor Analysis

The average nearest-neighbor ratio (R_n) for the 11 EBA III settlements in southwest Transylvania is 1.48. Based on this ratio, it is possible to reject the null hypothesis that settlements were placed randomly. Instead, the settlements are dispersed (Figure 8.27). The interpretation of the EBA III settlement system is negatively impacted by the inability to use additional spatial cluster analysis techniques (due to small sample sizes). The majority of sites (7 of 11) are clustered in one area within southwest Transylvania: in close proximity to the confluence of the Ampoi and Mureș Rivers.

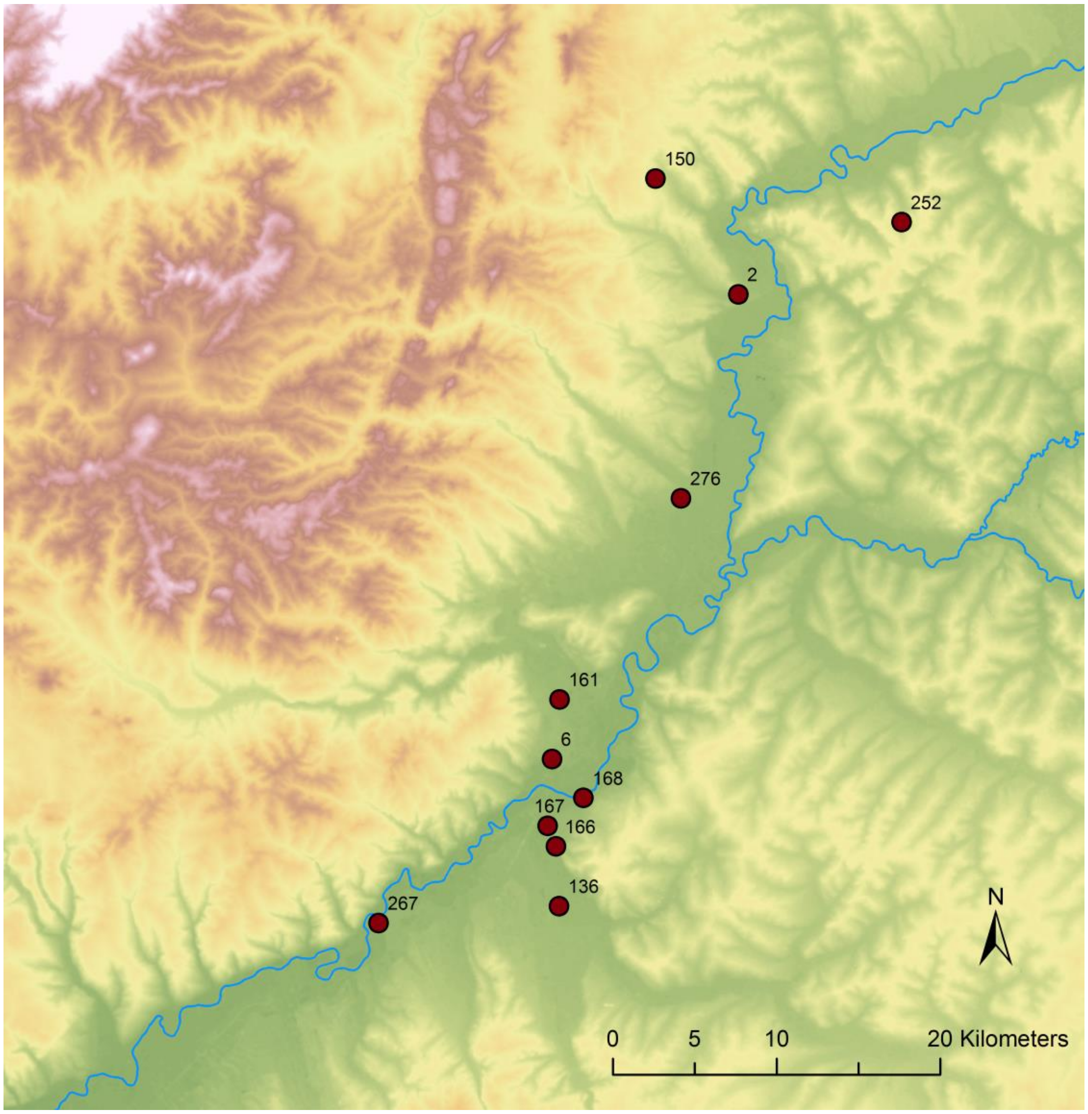

Figure 8.27 - EBA III sites in southwest Transylvania.

Formative Wietenberg: Nearest-Neighbor Analysis

The average nearest-neighbor ratio (R_n) for the 14 Formative Wietenberg settlements in southwest Transylvania is 1.27. Based on this ratio, it is not quite possible to reject the null hypothesis that settlements were placed randomly. The settlements are dispersed (Figure 8.28).

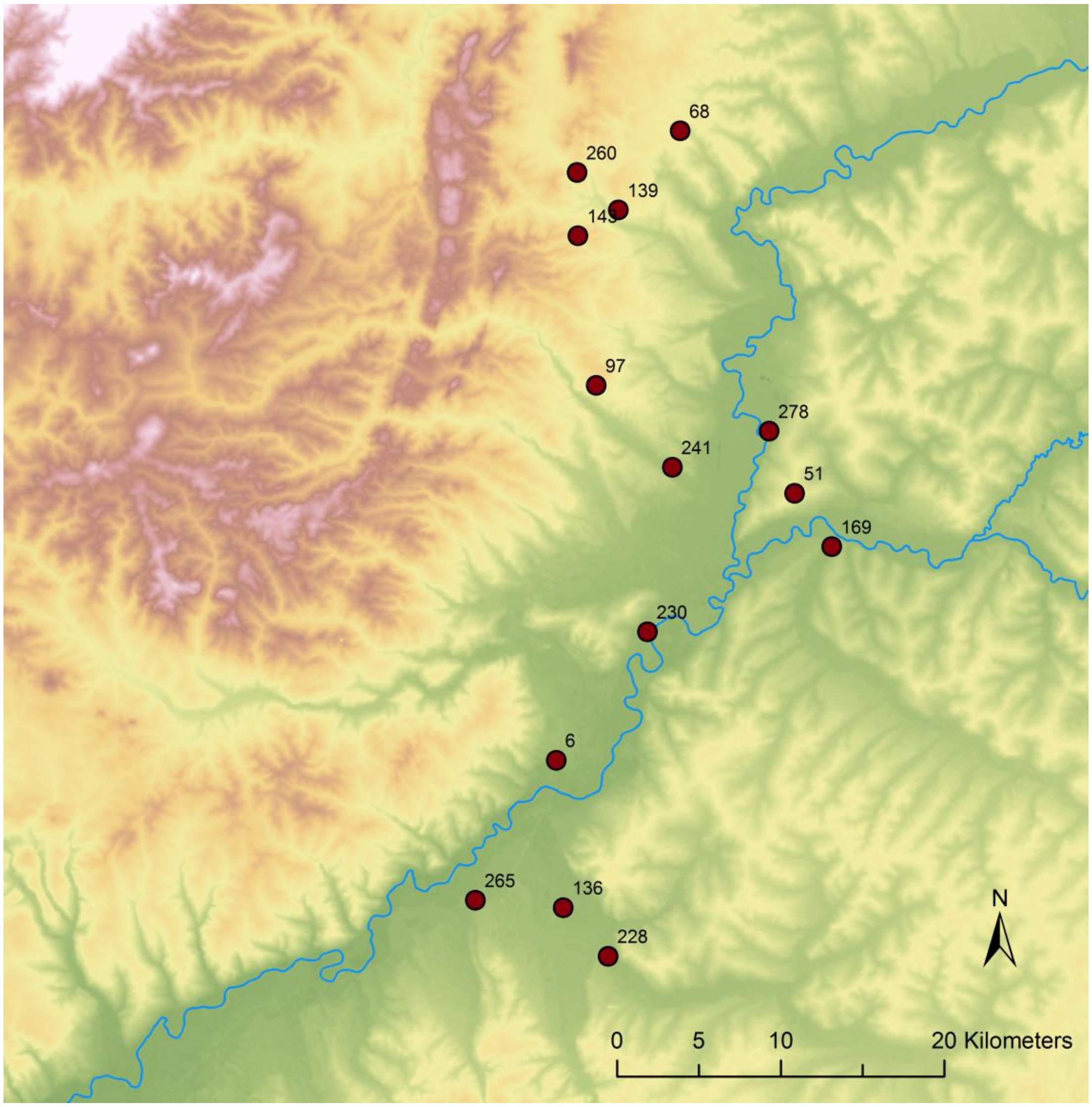

Figure 8.28 – Formative Wietenberg sites in southwest Transylvania.

Classical Wietenberg: Nearest-Neighbor Analysis

The average nearest-neighbor ratio (R_n) for the 44 Classical Wietenberg settlements in southwest Transylvania is 0.97. Based on this ratio, it is not possible to reject the null hypothesis that settlements were placed randomly. The settlement system does trend towards clustering (Figure 8.29).

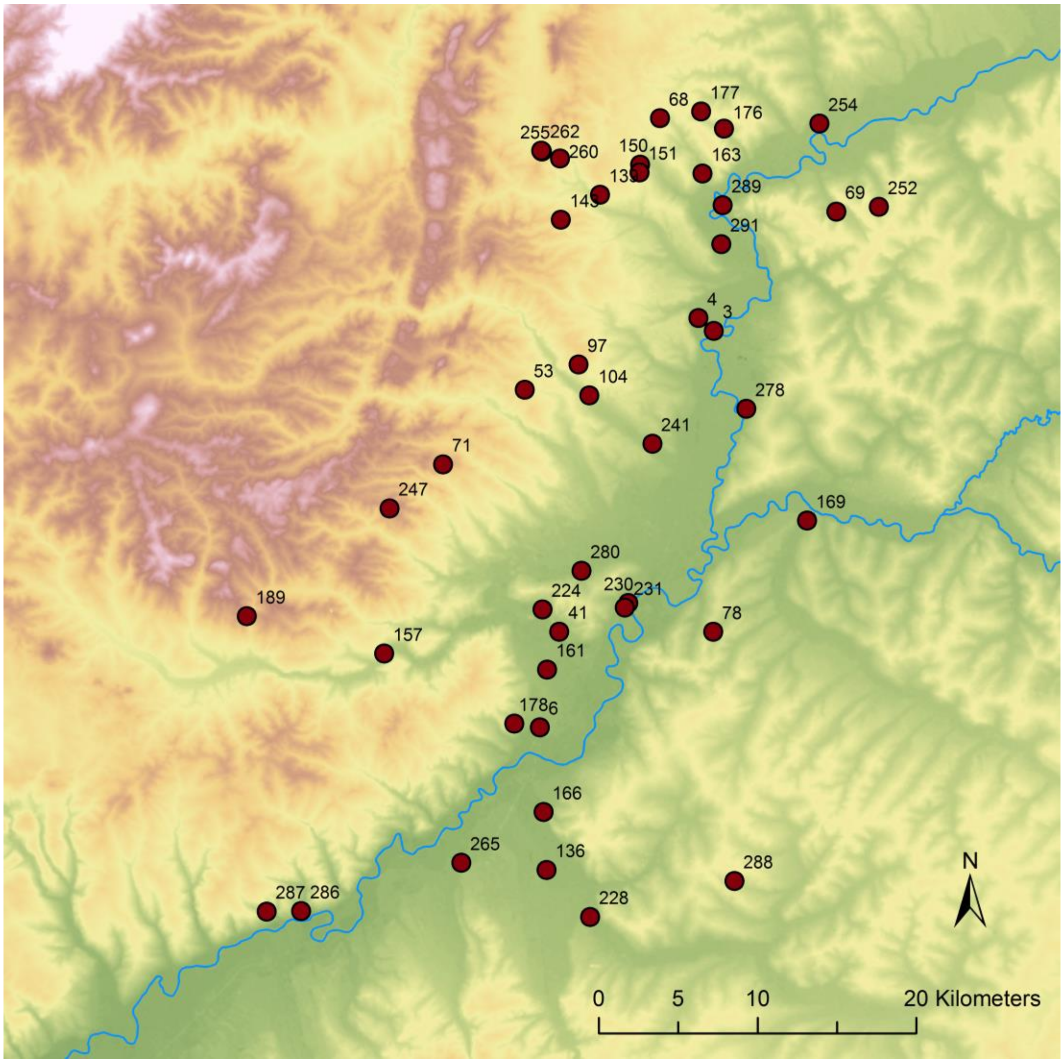

Figure 8.29 – Classical Wietenberg sites in southwest Transylvania.

Dynamics of Nearest-Neighbor Analysis in the Bronze Age

Nearest-neighbor analysis suggests that there are some broad patterns in how settlements were distributed across the landscape during the Bronze Age (Figures 8.30, 8.31). At the start of the Early Bronze Age, it appears that communities intentionally placed their settlements at an even distance from each other. There are fewer links between communities within 2.5 hours of each other in the EBA I than in any other time period. This social decision resulted in a dispersed settlement system. By the EBA II, however, sites were not placed to either deliberately pack together or maintain a certain social distance across the landscape. The dispersed distribution measured by the nearest-neighbor ratio during the EBA III is misleading, as the settlements were not evenly dispersed across southwest Transylvania. There was a higher portion of settlements in the EBA III within one hour walk of each other than in any other time period. Throughout the rest of the Bronze Age there are quantitative shifts in site distribution, though some of these, such as the trend towards settlement clustering in the Classical Wietenberg, may be influenced by potentially incorrect assumptions of contemporaneity of settlements. The only qualitative shift in settlement orientation appears to have been between EBA I and EBA II, as maintaining distance between the nearest-neighbor settlement became less important.

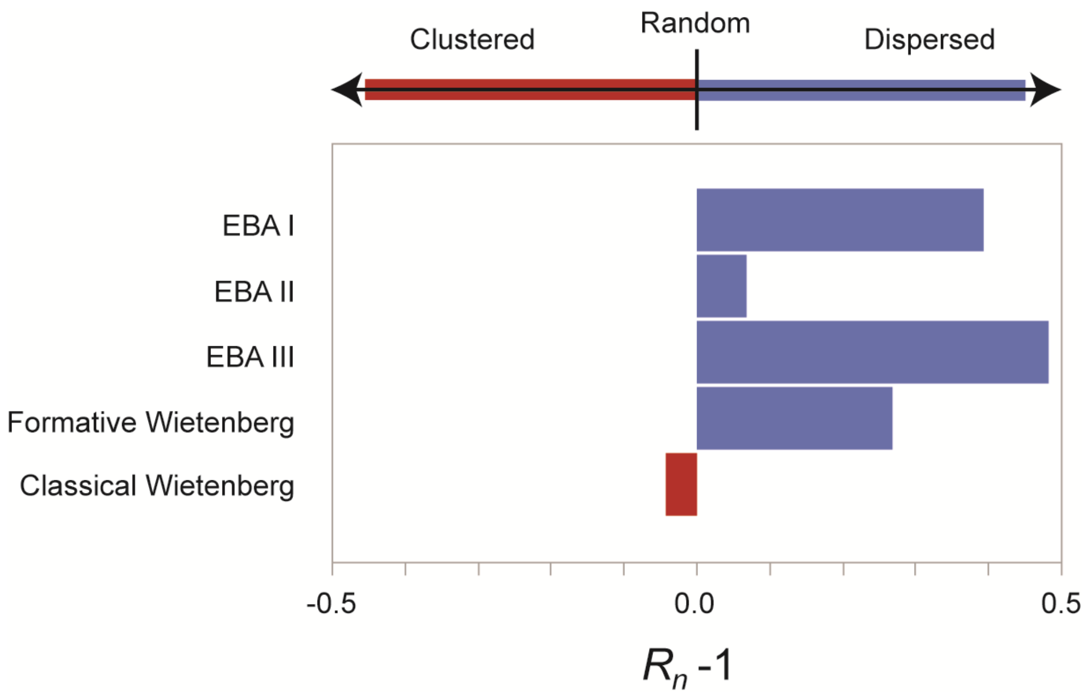

Figure 8.30 – Changes in the nearest-neighbor ratio over time. The x-axis has been calibrated by subtracting 1 from R_n to more clearly illustrate deviations from the null hypothesis of a random distribution.

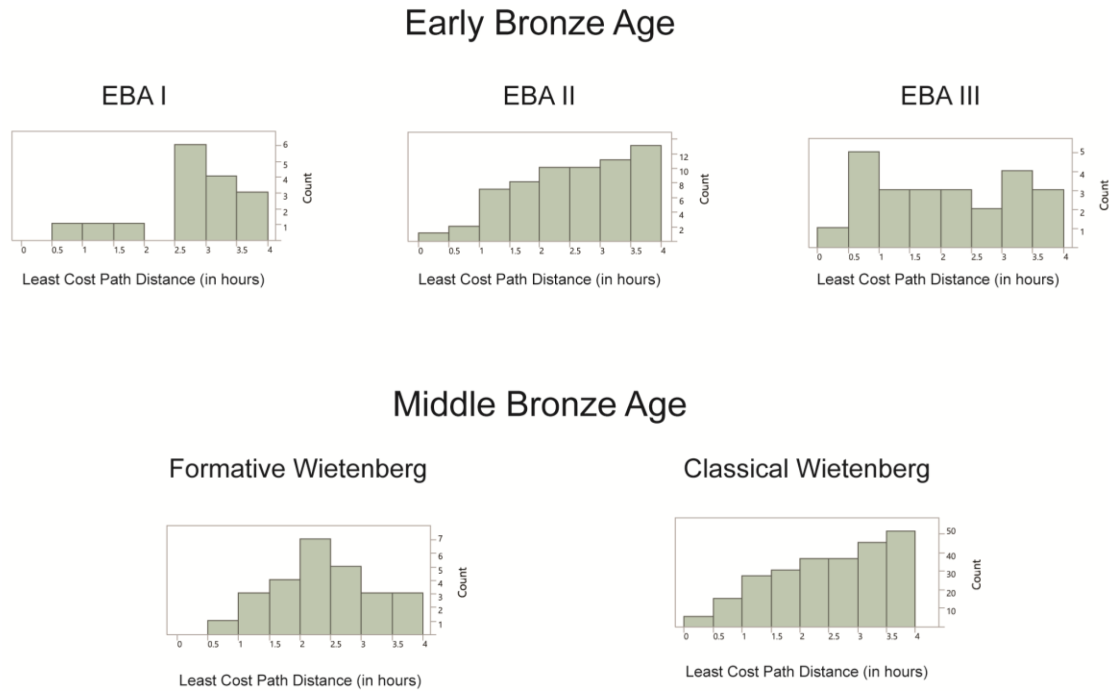

Figure 8.31 – Distribution of least cost path links under 4 hours for each time period.

Network Analysis

There are several different measures of network centrality that can be applied in the analysis of social networks (see Bonacich 1972; Freeman 1979; Valente et al. 2008). In archaeology, the most commonly applied measures are *degree centrality*, *betweenness centrality,* and *eigenvector centrality* (e.g., Brughman 2013; Mills et al. 2013a, 2013b, 2015; Peeples et al. 2016). While considerable conceptual overlap exists between these different measures of an actor's prominence in a network, they can be conceptually distinct (Valente et al. 2008). Degree measures the number of other nodes to which a node is connected. Nodes with high degree centrality can directly influence the most number of other nodes in the network. Betweenness measures the extent to which a node lies between other actors in a network. Nodes with high betweenness centrality can influence the spread of information through a network. Eigenvector takes into account the overall network structure and measures connectivity of nodes with other nodes (similar to degree) as well as the centrality of the nodes to which they are connected. Nodes with high eigenvector centrality are able to directly and indirectly influence the most other nodes in the network.

Even in the same network, these three alternative network centrality measures may identify different critical nodes in the network. For example, Figure 8.32 highlights that within the same network, the three alternative network centrality measures will identify different critical nodes. The node that may be able to directly influence the most other nodes (e.g., degree centrality) will often be different than the node that can most efficiently restrict the flow of information or resources through a network (e.g., betweenness centrality).

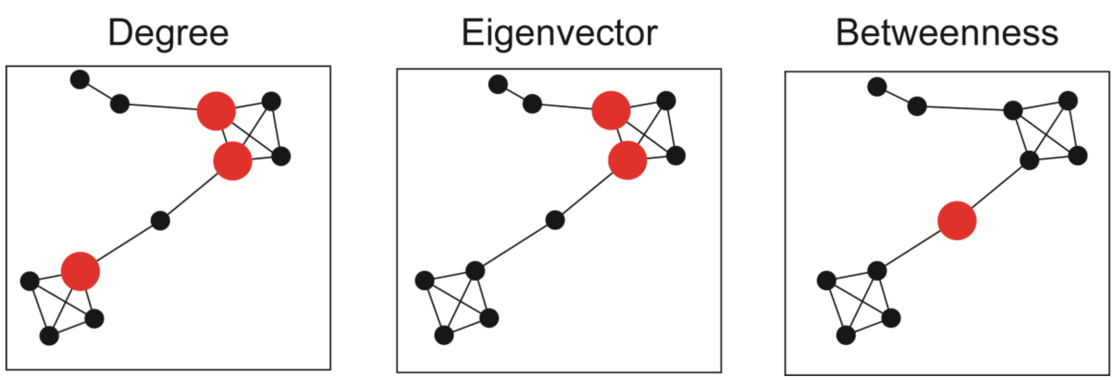

Figure 8.32 – The same network configuration with different critical nodes (in red) identified based on different network centrality measures.

The differences between network centrality measures have significant implications for the study of prehistoric social networks and settlement systems. First, there is no single "correct" centrality measure that will identify the most important sites within any prehistoric social network or settlement system. Sometimes the key sites will be high in degree centrality but low in betweenness centrality, or vice versa. Second, some networks may have more coherence across centrality measures than others. For example, in one network the key settlement might be high in either degree, eigenvector, *or* betweenness centrality, and in another network the key settlement might be high in all three centrality measures. Because of these characteristics of network centrality measures, archaeologist must always use multiple measures to explore the diversity within any social network or settlement system in the past.

The use of multiple centrality measures can actually assist archaeologists test alternative models of social and economic organization of communities at a regional scale. Each network centrality measure quantifies a different set of social and economic processes. Settlements that have high degree centrality are able to directly influence the most other communities, suggesting that they may be able to mobilize the most people for communal labor projects, warfare, and defense. Settlements that have high betweenness centrality will be able to control the flow of information and non-local goods and resources through a system, creating bottlenecks that emergent elite may be able to manipulate. Settlements that have high eigenvector centrality are able to exert influence, directly and indirectly, over the most people in the network, likely controlling local production and the flow of local materials, goods, and resources through the settlement system. As a consequence, if the largest site in a settlement system is predicted to be important based on betweenness centrality (but not degree or eigenvector centrality), for example, we might conclude that its size and complexity may be attributed to elites converting the ability to restrict and control the flow of information and non-local resources into political authority (if there is regional hierarchical political control) or people placing a high priority on, and being drawn to, economic opportunities associated with long-distance trade and exchange (if there is no regional hierarchical political control). By comparing the sites that are predicted to be important based on these three centrality measures with the known archaeological record, we can better understand the single socio-economic strategy, or multiple strategies, involved in the emergence of these key sites.

The potential spatial overlap, or lack of overlap, between key sites identified by different network centrality measures may indicate whether settlement patterns encode the presence of complex regional polities. It is expected that the more social and economic dimensions that could be controlled by elite communities, the stronger their hierarchical regional control would be. As such, settlement patterns in which certain sites are highly central across multiple measures (degree, betweenness, *and* eigenvector centrality) are more likely to reflect settlement systems characterized by complex regional polities than settlement patterns with no overlap between different centrality measures in which no single settlement could have exerted influence over multiple dimensions of the economy (e.g., labor, long-distance exchange, local procurement and production) (Table 8.10). Additionally, if there are multiple large sites within a settlement system, and they are predicted to be large based on different network measures (e.g., one site has a high degree but low betweenness, another site has high betweenness but low degree), then it is possible that communities across the region grew in size and importance on the basis of multiple distinct socio-economic strategies. In this case, there is no one socio-economic path to increased regional importance (e.g. controlling metal procurement), but rather multiple pathways towards regional inequality.

Table 8.10 - A model for the socio-economic basis for the emergence of important sites based on pairwise-comparisons of network centrality measures. This model highlights the link between network measures and socio-economic institutions. Note, for clarity this model only compares two measures, though this study will compare across all three measures.

	Degree		**Betweenness**	
	High	Low	High	Low
Degree High	n/a	n/a	-	-
Low	n/a	n/a	-	-
Betweenness High	Potential for elite control of system based on labor and exchange	Site relies on influencing exchange	n/a	n/a
Low	Site relies on influencing labor	Unknown socio-economic basis	n/a	n/a
Eigenvector High	Potential for elite control of system based on labor, local procurement and production	Site relies on influencing local procurement and production	Potential for elite control of system based on exchange, local procurement and production	Site relies on influencing local procurement and production
Low	Site relies on influencing labor	Unknown socio-economic basis	Site relies on influencing exchange	Unknown socio-economic basis

The analysis of southwest Transylvanian settlement systems using network approaches requires constructing a network. However, in southwest Transylvania, the only reliable data we have across all known sites are site locations. In the future, it may be possible to construct alternative network organization based on shared raw material sources or ceramic motifs, but for now I rely on site location data alone.

To connect the individual sites to make a network, we need an empirically-grounded basis for creating edges between nodes. I construct the hypothetical interaction networks for each phase of the Bronze Age based on an estimated scale of daily interaction in middle-range societies derived from the ethnographic record and tested in archaeological cases. Anthropologists and archaeologists have established that chiefly societies are usually limited in spatial extent by a need to control their territory while lacking internally specialized administrative units (of more complex state-level societies) that can allow for delegation of authority to lower-tier settlements (Livingood 2012; Spencer 1987, 1990, 1993; Wright 1977, 1984). In particular, the upper-level distance from the center of a regional polity that political control could extend is limited to within a half-day's journey (Bauer and Covey 2002:847-848; Cohen and Schlegel 1968:136; Helms 1979:515-53; Johnson 1987; Little 1967:240; Livingood 2012:174-175; Spencer 1990:6-8). This distance would allow a chief to interact with all communities in the polity without having to impose on their hospitality, and mobilize a force to defend more distant settlements and return within a day (Livingood 2012:175). For non-elites, being located within a half day's journey of the center would also allow them to access social and economic opportunities in the regional center (Livingood 2012:175). This last point is critical for middle-range societies lacking centralized political authority, as even without chiefs, interaction will be much more common between communities within a half day's journey than with communities at greater distances.

To create the links between sites at a half-day's distance, I conducted a least-cost path (LCP) analysis. LCP analyses have become a staple of landscape archaeological approaches (see Anderson 2012; Branting 2012; Howey 2007, 2011; Hudson 2012; Livingood 2012; Nolan and Cook 2012; Phillips and Leckman 2012; Rademaker et al. 2012; Richards-Rissetto 2012; Rissetto 2012; Ullah and Bergin 2012; Wright 2012). LCP analyses creates a path between two known features that minimizes the costs for the traveler. Costs can be measured in many ways, but the most common are time and energy (e.g., calories spent). In this study, I measure cost-distance in terms of time (e.g., hours it would take to walk from Site A to Site B). In many cases, particularly in mountainous landscapes like southwest Transylvania, LCPs are often significantly different than straight-line Euclidean distance "as the crow flies" (see Livingood 2012). LCP analyses are ideal for identifying sites within a half-day's walk from a particular site, which is how the networks in this dissertation were created.

I would like to draw attention to some important aspects of the analysis. First, the cost surface was calculated only taking into account slope. In the Apuseni Mountains, slope will be the most critical factor affecting the time it takes to traverse a landscape. I deliberately chose to keep the analysis minimalist in order to see how networks were constructed on this single cost. It is will be possible to add in other cost factors (e.g., costs of crossing streams and rivers; decreased or increased costs if some travel was conducted along rivers or by horseback) in the future. I also assumed that the primary mode of transportation would be walking, or another mode (e.g. oxcarts) that would be equivalent to walking in terms of speed. Walking speed was calculated using Tobler's Hiking Function (Tobler 1993). Once cost-paths were created between settlements, edges for the network were only created when the time to walk from one site to another was less than 4 hours (approximately one half-day's walk). Beyond the ethnographic reasons for choosing this time, the distribution of cost paths in some time periods reflected a modal break in the number of sites within and beyond 4 hours (Figure 8.33). With these connections, it was then possible to examine the structure of the network using social network analysis tools, particularly the specific network centrality measures introduced above.

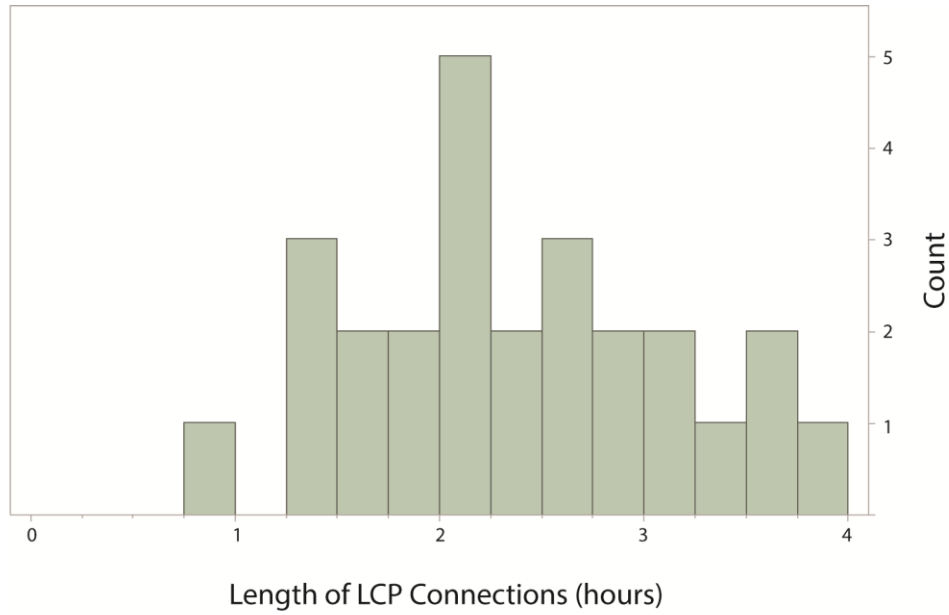

Figure 8.33 - Distribution of Formative Wietenberg least cost path connections under 4 hours.

With the network in place, it was possible to create predictive models of both site characteristics and overall socio-economic organization based on different centrality measures. For each time period, I present summary network characteristics for the network and examine the potential co-variance of different network centrality measures[4]. Finally, I test the predictive models of network characteristics and identifying key settlements with available data on site size and socioeconomic activities. Specifically, I compare the results of different network centrality measures with known site-size distributions to identify which measures, if any, were able to identify the largest, most important, sites in the settlement system[5]. These results provide a key line of evidence towards reconstructing the social, economic, and political organization of communities in southwest Transylvania throughout the Bronze Age.

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[4] The strength of co-variance analyses is limited due to small sample sizes.

[5] The strength of the relationships between network centrality measures and site size are significantly affected by the very small sample sizes. For this reason, I also examine where the largest known site(s) fall(s) on the distribution of the alternative network centrality measures.

EBA I: Network Analysis

Fourteen sites from the EBA I (2700-2500 BC) were included in the network analysis (Table 8.11, Figures 8.34 and 8.35).

Table 8.11 - Network centrality measures for EBA I sites.

ID	Site	Degree	Eigenvector	Betweenness
21	Ampoița-*La Bulz*	3	0.45	0.5
27	Ampoița-*La Pietri*	4	0.547	5
51	Capud-*Măgura Capudului*	2	0.146	5
53	Cetea-*La Bai/La Pietri/ Petriș/La Picuiata*	1	0	0
68	Cicău-*Săliște*	2	0	0
137	Livezile-*Baia*	3	0	1
143	Livezile-*Obirsie/Obursi*	3	0	1
149	Lopadea Nouă-*Cetățuie 2*	1	0.049	0
185	Poiana Ampoiului-*Piatra Corbului*	2	0.334	0
231	Sântimbru-*Obreje/La Tabaci*	3	0.387	8
248	Țelna-*Măgură*	3	0.463	1.5
270	Zlatna-*Colțul lui Blaj*	1	0	0
271	Zlatna-*Dumbrăvița*	1	0	0
279	Rameț-*Gugului*	3	0	3

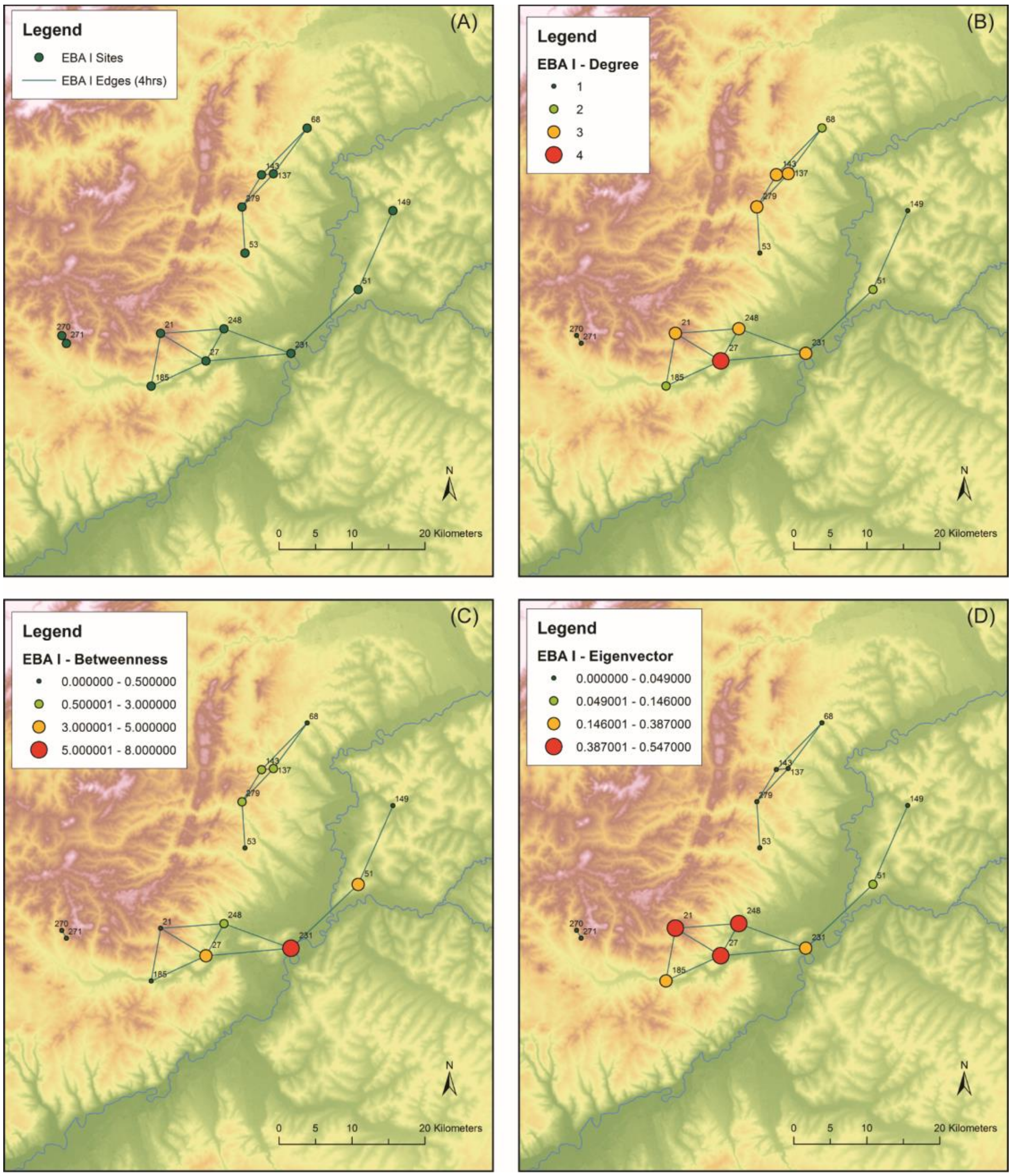

Figure 8.34 – EBA I network analysis maps: (a) overall network; settlement centrality based on (b) degree, (c) betweenness, and (d) eigenvector.

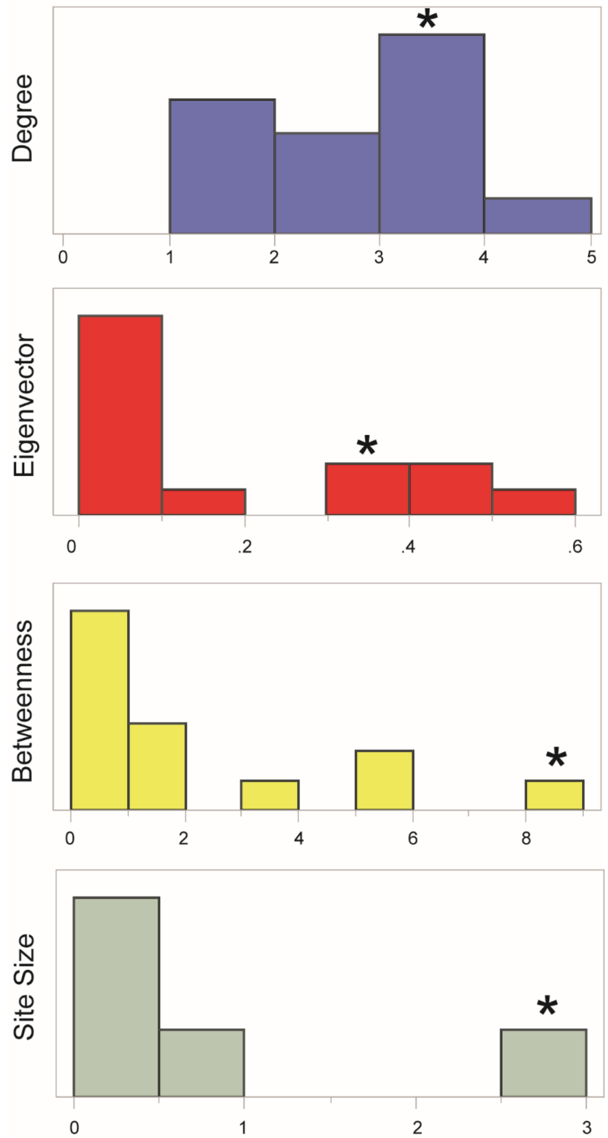

Figure 8.35 – Distribution of centrality measures and site sizes for EBA I. Largest site (Sântimbru-*Obreje/La Tabaci*) is marked with asterisk (*).

Degree centrality ranges from 1 to 4. Ampoița-*La Pietri* is the site with the highest degree centrality. Eigenvector centrality forms two modes, with nine sites with centrality values below .2 and five sites between .3 and .6. As with degree centrality, Ampoița-*La Pietri* has the highest eigenvector centrality. Betweenness centrality has an even larger spread, with ten sites having very low betweenness centrality (below 2) and only one single site at the highest edge of the range (a value of 8). The site with the highest betweenness centrality is Sântimbru-*Obreje/La Tabaci*.

There is weak positive correlation among the three network measures (Table 8.12). As expected, the strongest correlation is between degree and eigenvector centrality (r^2=.361), which both rely upon the quantity of network connections. It is important to note that the correlation between degree and eigenvector centrality is the lowest r^2 value for this relationship across any Bronze Age phase.

Table 8.12 - Correlation of different network centrality measures (r^2) in EBA I.

	Degree	Eigenvector	Betweenness
Degree	n/a	-	-
Eigenvector	.361	n/a	-
Betweenness	.299	.212	n/a

When we compare the known archaeological site-size distribution (n=5) with different network centrality measures, there is weak positive correlation with degree (r^2=.304) and eigenvector (r^2=.254) centrality, but relatively strong positive correlation with betweenness centrality (r^2=.510). In fact, the correlation between site size and betweenness centrality in EBA I is the highest r^2 value for this relationship across any Bronze Age phase.

The largest site in the EBA I is Sântimbru-*Obreje/La Tabaci* (2.56 ha). This site has the highest betweenness centrality (8), is tied for second highest degree centrality (3), and has the third highest eigenvector centrality (.387) (see Figure 8.34). Because the largest settlement is predicted to be the highest by betweenness centrality, it is likely that the site's importance is related to the ability to access the flow of information and non-local resources into southwest Transylvania. The community at Sântimbru-*Obreje/La Tabaci* is also relatively well positioned to benefit from, or influence, the flow of local resources and products and mobilization of labor in the region. These broad economic opportunities may have drawn people to this location, resulting in population growth.

EBA II: Network Analysis

Twenty-one sites from the EBA II (2500-2250 BC) were included in the network analysis (Table 8.13, Figures 8.36 and 8.37).

Table 8.13 - Network centrality measures for EBA II sites.

ID	Site	Degree	Eigenvector	Betweenness
3	Aiud-*Cetățuie*	8	0.248	20.41
7	Alba Iulia-*Strada Sinia*	6	0.21	3.727
27	Ampoița-*La Pietri*	7	0.216	28.499
37	Ampoița-*Pestera Liliecilor*	5	0.146	6.663
97	Geoagiu de Sus-*Fântâna Mare*	5	0.208	0
148	Lopadea Nouă-*Cetățuie 1*	5	0.139	2.221
162	Micoşlaca-*(no name)*	3	0.07	0
167	Oarda de Jos-*Dublihan*	5	0.183	1.654
175	Ormeniş-*(no name)*	4	0.106	0.86
185	Poiana Ampoiului-*Piatra Corbului*	5	0.111	17.135
190	Presaca Ampoiului-*Piatră Brații*	5	0.074	19.594
222	Șard-*(no name)*	9	0.312	36.168
224	Șard-*Bilag 2*	9	0.311	25.146
231	Sântimbru-*Obreje/La Tabaci*	9	0.349	39.585
238	Stremț-*Berc 1*	8	0.33	22.321
268	Vințu de Jos-*Viile Lancranjenilor*	3	0.1	0
271	Zlatna-*Dumbrăvița*	2	0.015	0
272	Zlatna-*Măgură Dudașului*	3	0.028	1.516
274	Capud-*(no name)*	7	0.269	8.944
276	Teiuş-*Coastă*	8	0.33	22.321
277	Gârbova de Jos-*În Coastă*	8	0.283	21.236

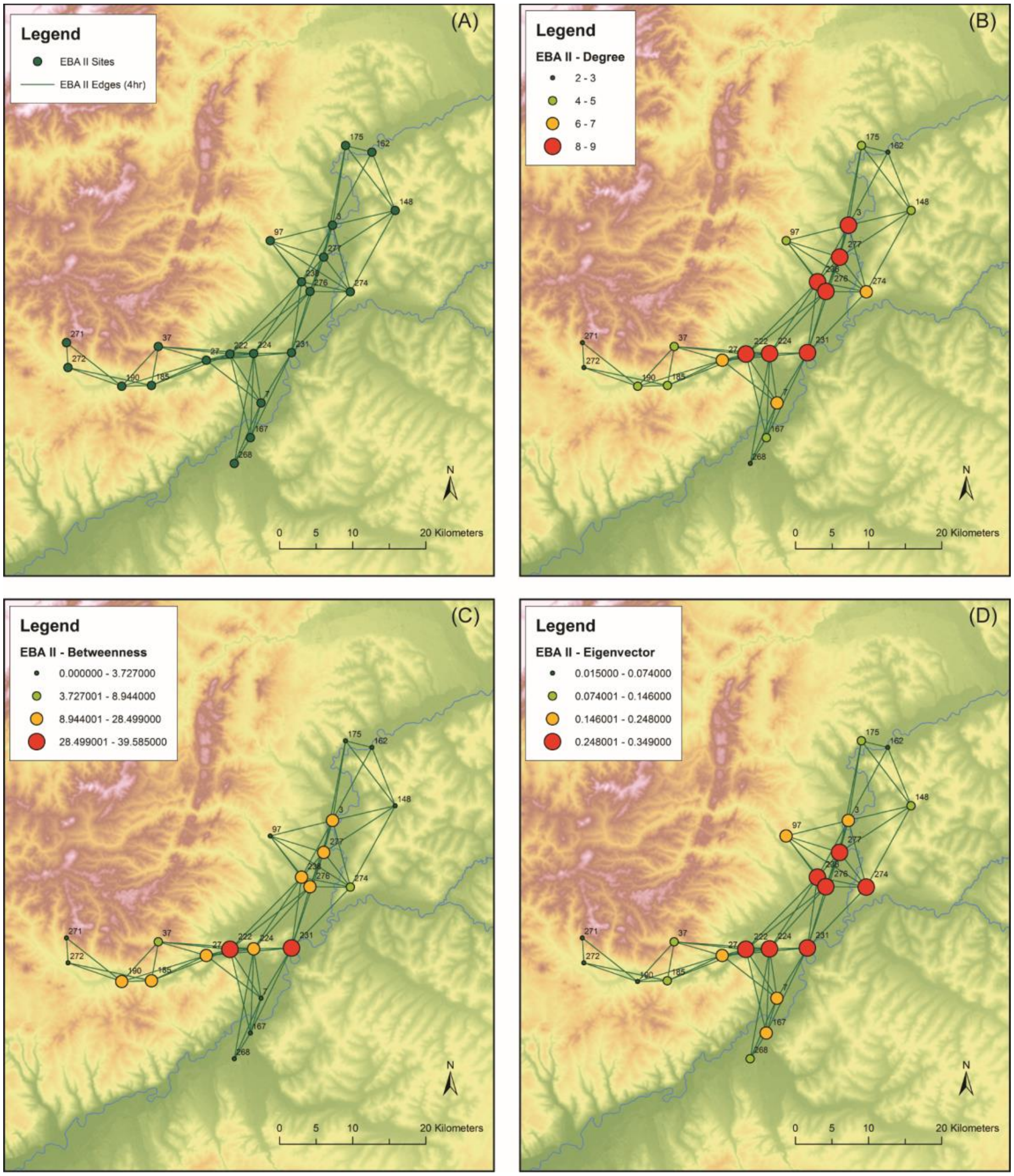

Figure 8.36 – EBA II network analysis maps: (a) overall network; settlement centrality based on (b) degree, (c) betweenness, and (d) eigenvector.

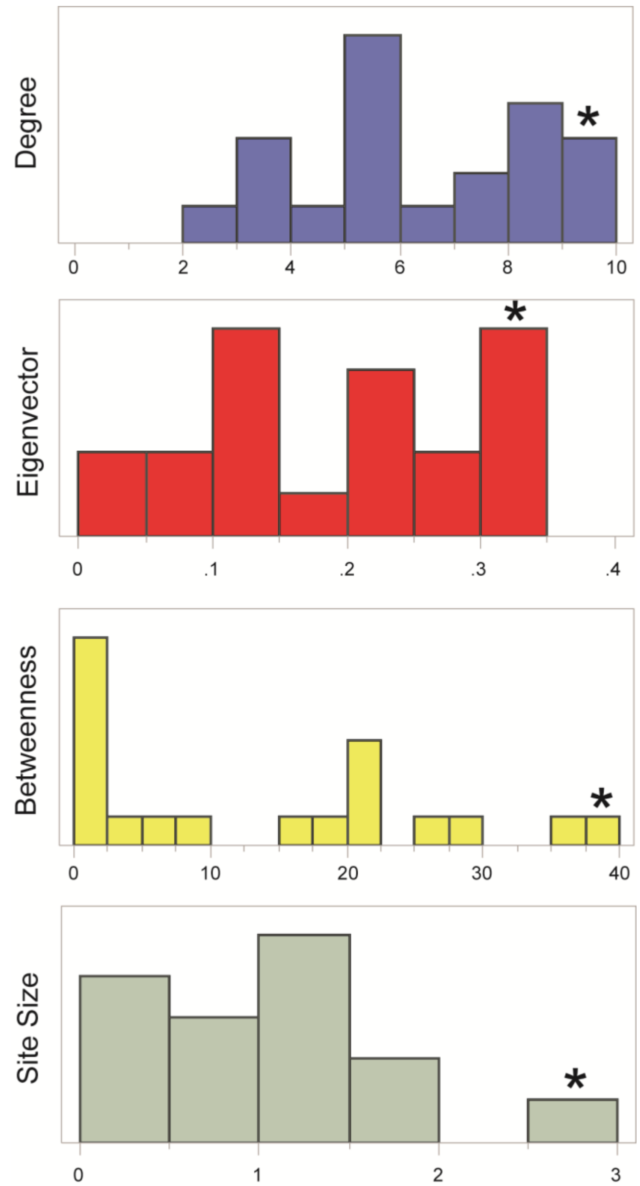

Figure 8.37 – Distribution of centrality measures and site sizes for EBA II. Largest site (Sântimbru-*Obreje/La Tabaci*) is marked with asterisk (*).

Degree centrality ranges from 2 to 9, with a three peaks in the distribution at 3, 5, and 8. There are three sites with the highest degree centrality: Sântimbru-*Obreje/La Tabaci*, Șard-*Bilag 2*, and Șard-*(no name)*. Eigenvector centrality also has three peaks within its distribution near .1, .2, and .3. The site with the highest eigenvector centrality is Sântimbru-*Obreje/La Tabaci* (.349). Betweenness centrality has wider spread with three modes: low betweenness (below 10; n=11) medium betweenness (between 17 and 30; n=8), and high betweenness (above 30; n=2). The site with the highest betweenness centrality is Sântimbru-*Obreje/La Tabaci* (39.585).

There is a strong positive correlation among the three network measures (Table 8.14). As expected, the strongest correlation is between degree and eigenvector centrality (r^2=.899), which both rely upon the quantity of network connections. These EBA II network has the strongest correlations across all three network centrality measures for any Bronze Age phase. This means that important sites are centrally positioned to take advantage of a broad range of socio-economic factors, and also that less important sites had few opportunities to influence the flow of information, goods, resources, and people throughout the network.

Table 8.14 - Correlation of different network centrality measures (r^2) in EBA II.

	Degree	Eigenvector	Betweenness
Degree	n/a	-	-
Eigenvector	.899	n/a	-
Betweenness	.724	.519	n/a

When we compare the known archaeological site-size distribution (n=15) with different network centrality measures, there is weak positive correlation with eigenvector centrality (r^2=.246), though minimal correlation between site-size and degree (r^2=.175) and betweenness (r^2=.122) centrality.

The largest site in the EBA II is Sântimbru-*Obreje/La Tabaci* (2.56 ha). This site is predicted to be the most important site in the network based on site location across all three network measures (see Figure 8.36). The community at Sântimbru-*Obreje/La Tabaci* is well positioned to benefit from, or influence, the flow of information, non-local resources, local resources and material products, and mobilization of labor in the region. These broad economic opportunities may have drawn people to this location, resulting in population growth.

EBA III: Network Analysis

Eleven sites from the EBA III (2250-2000 BC) were included in the network analysis (Table 8.15, Figures 8.38 and 8.39).

Table 8.15 - Network centrality measures for EBA III sites.

ID	Site	Degree	Eigenvector	Betweenness
2	Aiud-*Castelul Bethlen*	3	0.012	17
6	Alba Iulia-*Recea/Monolit*	6	0.39	1
136	Lancrăm-*Glod*	6	0.39	1
150	Lopadea Veche-*Jidovină/Râpa Alba*	1	0.002	0
161	Micești-*Cigaș*	6	0.349	24
166	Oarda de Jos-*Cutina*	6	0.39	1
167	Oarda de Jos-*Dublihan*	6	0.39	1
168	Oarda de Jos-*Sesul Orzii*	6	0.39	1
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	1	0.002	0
267	Vințu de Jos-*Lunca Fermei*	5	0.338	0
276	Teiuș-*Coastă*	2	0.063	21

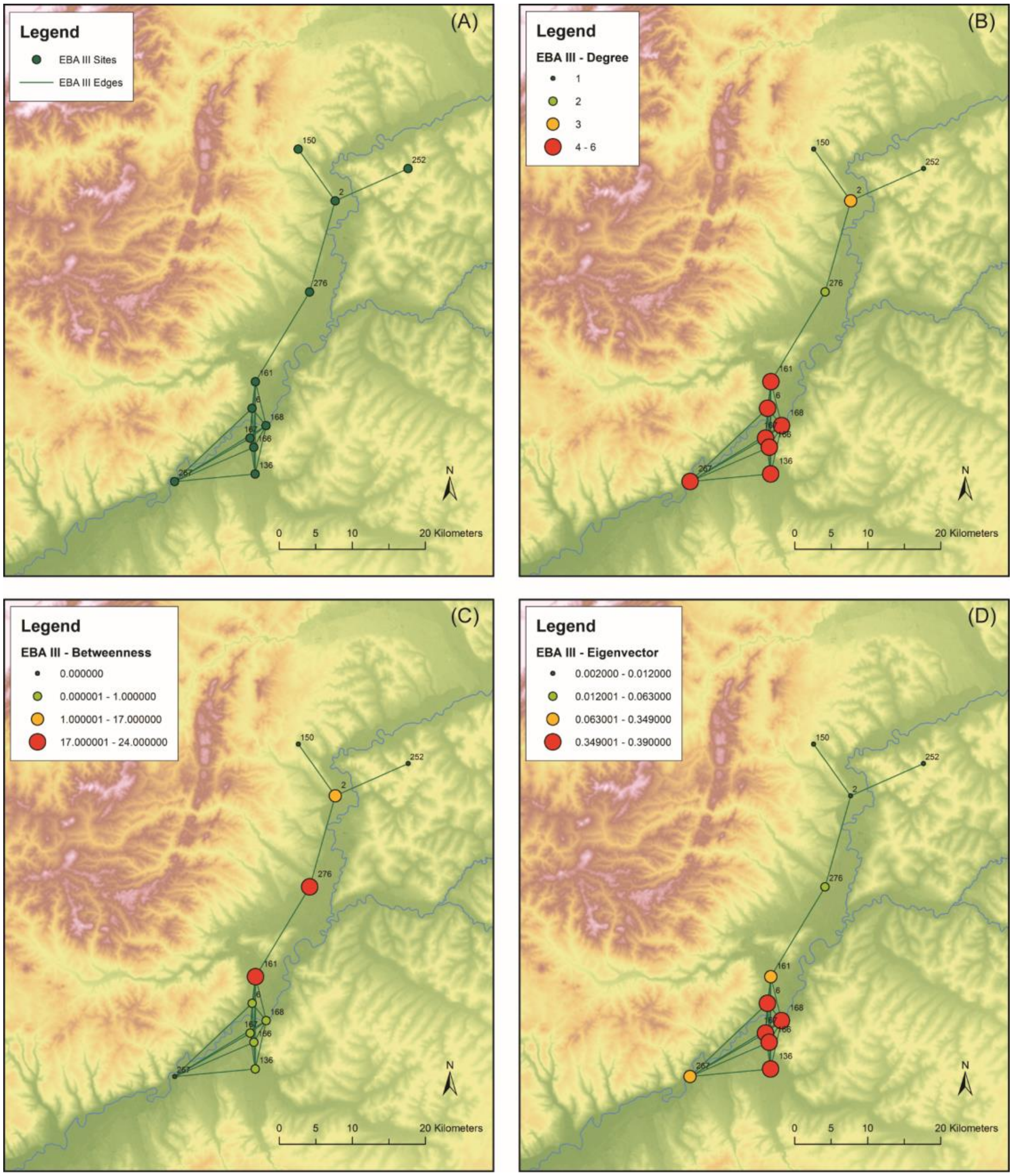

Figure 8.38 – EBA III network analysis maps: (a) overall network; settlement centrality based on (b) degree, (c) betweenness, and (d) eigenvector.

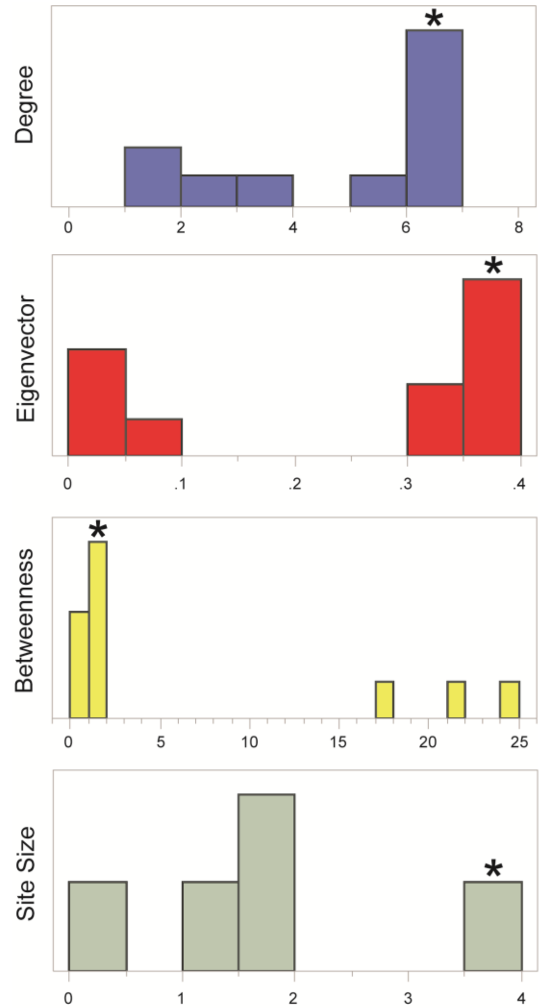

Figure 8.39 – Distribution of centrality measures and site sizes for EBA III. Largest site (Oarda de Jos-*Sesul Orzii*) is marked with asterisk (*).

Degree centrality has two modes, from 1 to 3 (n=4) and 5 to 6 (n=7). The most common degree centrality is also the largest (6), which is shared by six settlements: Alba Iulia-*Recea/Monolit*, Lancrăm-*Glod*, Micești-*Cigaș*, Oarda de Jos-*Cutina*, Oarda de Jos-*Dublihan*, and Oarda de Jos-*Sesul Orzii*. Eigenvector centrality also has two distinct modes, for values below .1 (n=4) and values above .3 (n=7). Five sites are tied for the highest eigenvector centrality (.349): Alba Iulia-*Recea/Monolit*, Lancrăm-*Glod*, Oarda de Jos-*Cutina*, Oarda de Jos-*Dublihan*, and Oarda de Jos-*Sesul Orzii*. Betweenness centrality is spread into two general modes: low betweenness (0 to 1; n=8) and high betweenness (above 16; n=3). The site with the highest betweenness centrality is Micești-*Cigaș* (24).

Only one pair of network measures is positively correlated (Table 8.16). As expected, the strongest correlation is between degree and eigenvector centrality (r^2=.939), which both rely upon the quantity of network connections. This is the highest correlation of any two network measures for any phase of the Bronze Age. The other two pairs of network centrality measures are not correlated. This is the first phase of the Bronze Age for which there is poor agreement across all network measures.

Table 8.16 - Correlation of different network centrality measures (r^2) in EBA III.

	Degree	Eigenvector	Betweenness
Degree	n/a	-	-
Eigenvector	.939	n/a	-
Betweenness	.015	.074 (negative)	n/a

When we compare the known archaeological site-size distribution (n=5) with different network centrality measures, there is weak positive correlation with degree (r^2=.269) and eigenvector (r^2=.258) centrality, and no correlation with betweenness centrality (r^2=.005).

The largest site in the EBA III is Oarda de Jos-*Sesul Orzii* (3.77 ha). This site is tied for the highest degree (6) and eigenvector (.39) centrality in the network, but has a very low betweenness centrality (1) (see Figure 8.38). The community at Oarda de Jos-*Sesul Orzii* is well positioned to benefit from, and influence, the flow of local resources and products and mobilize labor from nearby communities. This community is not well positioned to control the flow of information and long-distance resources, primarily because the numerous other sites in close proximity would have provided opportunities for people to bypass this site within the network.

Formative Wietenberg: Network Analysis

Fourteen sites from the Formative Wietenberg (2000-1875 BC) were included in the network analysis (Table 8.17, Figures 8.40 and 8.41).

Table 8.17 - Network centrality measures for Formative Wietenberg sites.

ID	Site	Degree	Eigenvector	Betweenness
6	Alba Iulia-*Recea/Monolit*	4	0.125	18
51	Capud-*Măgura Capudului*	5	0.438	2
68	Cicău-*Săliște*	3	0	0
97	Geoagiu de Sus-*Fântâna Mare*	3	0.294	0
136	Lancrăm-*Glod*	3	0.05	0
139	Livezile-*Dealul Sârbului*	3	0	0
143	Livezile-*Obirsie/Obursi*	3	0	0
169	Obreja-*Cânepi*	4	0.385	0
228	Sebeș-*Podul Pripocului*	3	0.05	0
230	Sântimbru-*La Tarmure/La Ieruga*	5	0.408	20
241	Stremț-*Fabrica de Alcool*	5	0.438	2
260	Vălișoara-*Pleasa Cornii*	3	0	0
265	Vințu de Jos-*Deasupră Satului*	3	0.05	0
278	Pețelca-*Cascadă*	5	0.438	2

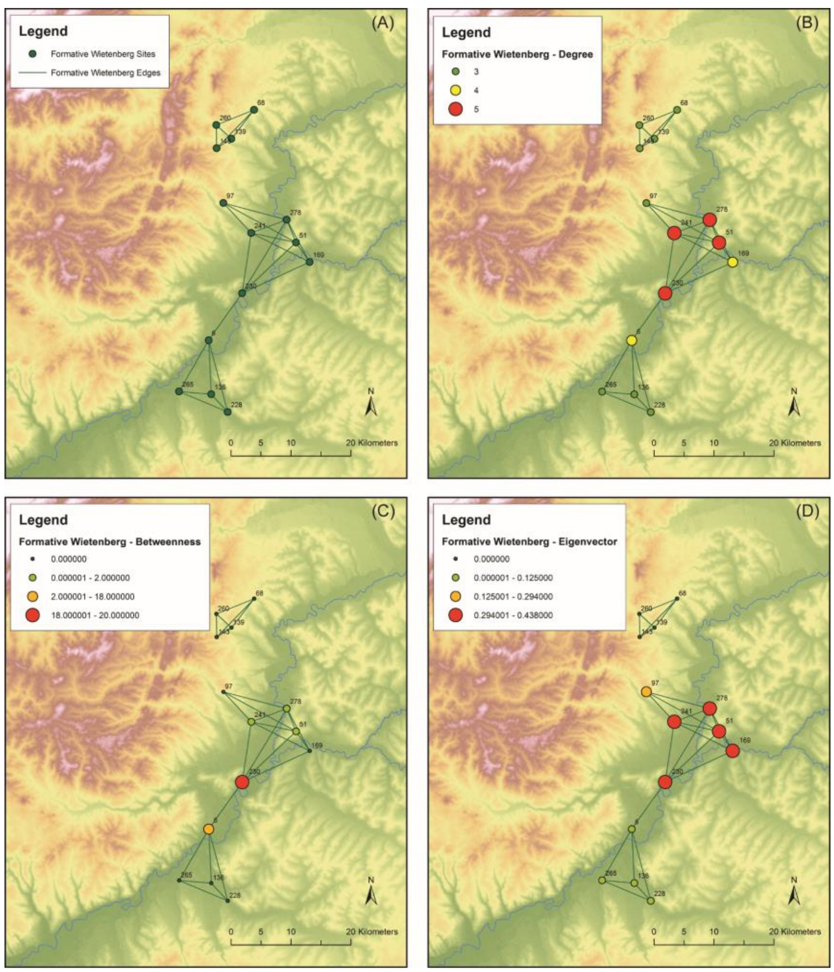

Figure 8.40 – Formative Wietenberg network analysis maps: (a) overall network; settlement centrality based on (b) degree, (c) betweenness, and (d) eigenvector.

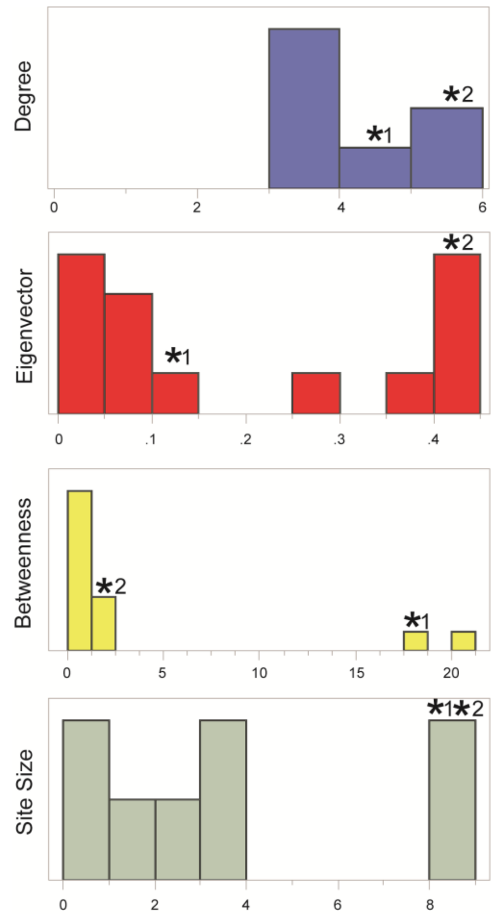

Figure 8.41 – Distribution of centrality measures and site sizes for Formative Wietenberg. Largest sites (1 - Alba Iulia-*Recea/Monolit*; 2 - Petelca-*Cascadă*) are marked with asterisk (*).

Degree centrality ranges from 3 to 5. There are four sites with the highest degree centrality (5): Capud-*Măgura Capudului*, Sântimbru-*La Tarmure/La Ieruga*, Stremț-*Fabrica de Alcool*, and Pețelca-*Cascadă*. Eigenvector centrality is more dispersed, with two distinct modes: low eigenvector (0-.15) and high eigenvector (.25-.45). There are three sites tied for the highest eigenvector centrality (.438): Capud-*Măgura Capudului*, Stremț-*Fabrica de Alcool*, and Pețelca-*Cascadă*. Betweenness centrality also has two modes: low betweenness (below 3; n=12) and high betweenness (above 17; n=2). The site with the highest betweenness centrality is Sântimbru-*La Tarmure/La Ieruga* (20).

Only one pair of network measures is strongly positively correlated (Table 8.18). As expected, the strongest correlation is between degree and eigenvector centrality

(r^2=.787), which both rely upon the quantity of network connections. There is weak positive correlation between degree and betweenness centrality. There is no correlation between eigenvector and betweenness centrality.

Table 8.18 - Correlation of different network centrality measures (r^2) in Formative Wietenberg.

	Degree	Eigenvector	Betweenness
Degree	n/a	-	-
Eigenvector	.787	n/a	-
Betweenness	.230	.073	n/a

When we compare the known archaeological site-size distribution (n=8) with different network centrality measures, there no correlation with degree (r^2=.056), eigenvector (r^2=.022), or betweenness (r^2=.099) centrality. This lack of correlation between archaeological site size and any of the predictive network centrality measures is troubling, and may suggest that the underlying assumptions of the network model may be incorrect for this settlement system. However, if we focus on the two largest sites, we can see why there is minimal correlation between site size and any single network statistic: the two largest Wietenberg sites in southwest Transylvania occupy distinct positions within the network.

The largest sites in the Formative Wietenberg are Alba Iulia-*Recea/Monolit* (8.40 ha) and Pețelca-*Cascadă* (8.80 ha). Alba Iulia-*Recea/Monolit* is predicted to be the second most important site by the betweenness centrality measure, but has relatively low degree and eigenvector centrality (see Figure 8.40). Conversely, Pețelca-*Cascadă* is predicted to be the most important site based on degree and eigenvector centrality, though it has low betweenness centrality. While the community at Alba Iulia-*Recea/Monolit* is well positioned to benefit from, or influence, the flow of information and non-local resources through the system, the community at Pețelca-*Cascadă* is well positioned to influence the flow of local resources and material products, and mobilization of labor in the region.

Classical Wietenberg: Network Analysis

Forty-four sites from the Classical Wietenberg (1875-1500 BC) were included in the network analysis (Table 8.19, Figures 8.42 and 8.43).

Table 8.19 - Network centrality measures for Classical Wietenberg sites.

ID	Site	Degree	Eigenvector	Betweenness
3	Aiud-*Cetățuie*	19	0.255735	98.43287
4	Aiud-*Tinod*	19	0.267585	89.5816
6	Alba Iulia-*Recea/Monolit*	13	0.030471	49.23605
41	Bărăbanț-*(no name)*	12	0.036671	38.87785
53	Cetea-*La Bai/La Pietri/ Petriș/La Picuiata*	8	0.074895	28.33945
68	Cicău-*Săliște*	16	0.251916	9.674859
69	Cisteiu de Mureș-*Valea Poietii*	13	0.215037	9.388646
71	Craiva-*Piatra Craivii*	4	0.013336	6.755961
78	Dumitra-*(no name)*	11	0.046928	27.10977
97	Geoagiu de Sus-*Fântâna Mare*	8	0.092125	10.53287
104	Geoagiu de Sus-*Viile Satului*	11	0.102259	61.48038
136	Lancrăm-*Glod*	8	0.011947	7.879819
139	Livezile-*Dealul Sârbului*	14	0.22428	7.892541
143	Livezile-*Obirsie/Obursi*	12	0.193699	7.256144
150	Lopadea Veche-*Jidovină/Râpa Alba*	16	0.251916	9.674859
151	Lopadea Veche-*Pahui*	16	0.251916	9.674859
157	Meteș-*Vârful Baii*	7	0.016849	42
161	Micești-*Cigaș*	12	0.029973	35.15247
163	Mirăslău-*CAP*	17	0.26423	37.68776
166	Oarda de Jos-*Cutina*	11	0.022081	54.23547
169	Obreja-*Cânepi*	7	0.052482	11.29153
176	Ormeniș-*Cânepiște/Cânepi/La Pod*	14	0.232139	1.690796
177	Ormeniş-*Gruiul cu Mazăre*	15	0.232549	8.476603
178	Pâclișa-*Podei*	13	0.030471	49.23605
189	Presaca Ampoiului-*Peștera Șura de Piatră*	1	0.001187	0
224	Șard-*Bilag 2*	14	0.043757	75.79749
228	Sebeș-*Podul Pripocului*	6	0.007561	2.508285
230	Sântimbru-*La Tarmure/La Ieruga*	13	0.055111	58.14103
231	Sântimbru-*Obreje/La Tabaci*	13	0.055111	58.14103
241	Stremț-*Fabrica de Alcool*	14	0.111214	120.021
247	Țelna-*Gugu*	2	0.004022	0
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	9	0.155149	0.135965
254	Unirea-*Dealul Camarii*	12	0.204886	0.469298
255	Vălișoara-*Peștera Bogsuta*	9	0.139671	0.398226
260	Vălișoara-*Pleasa Cornii*	12	0.18984	2.804755
262	Vălișoara- *Peștera Pucula*	8	0.122281	0.090909
265	Vințu de Jos-*Deasupră Satului*	8	0.009435	82.2
278	Pețelca-*Cascadă*	15	0.154247	154.0169
280	Oiejdea-*Bilag 1*	16	0.066636	110.6728
286	Acmariu-*Școală*	2	0.000715	0
287	Acmariu-*Valea Feneșului*	2	0.000715	0
288	Șpring-*Cătun Carpen*	3	0.00293	0
289	Gâmbaș-*(no name)*	16	0.255038	17.22928
291	Aiud-*Groapa de Gunoi*	19	0.27515	90.81384

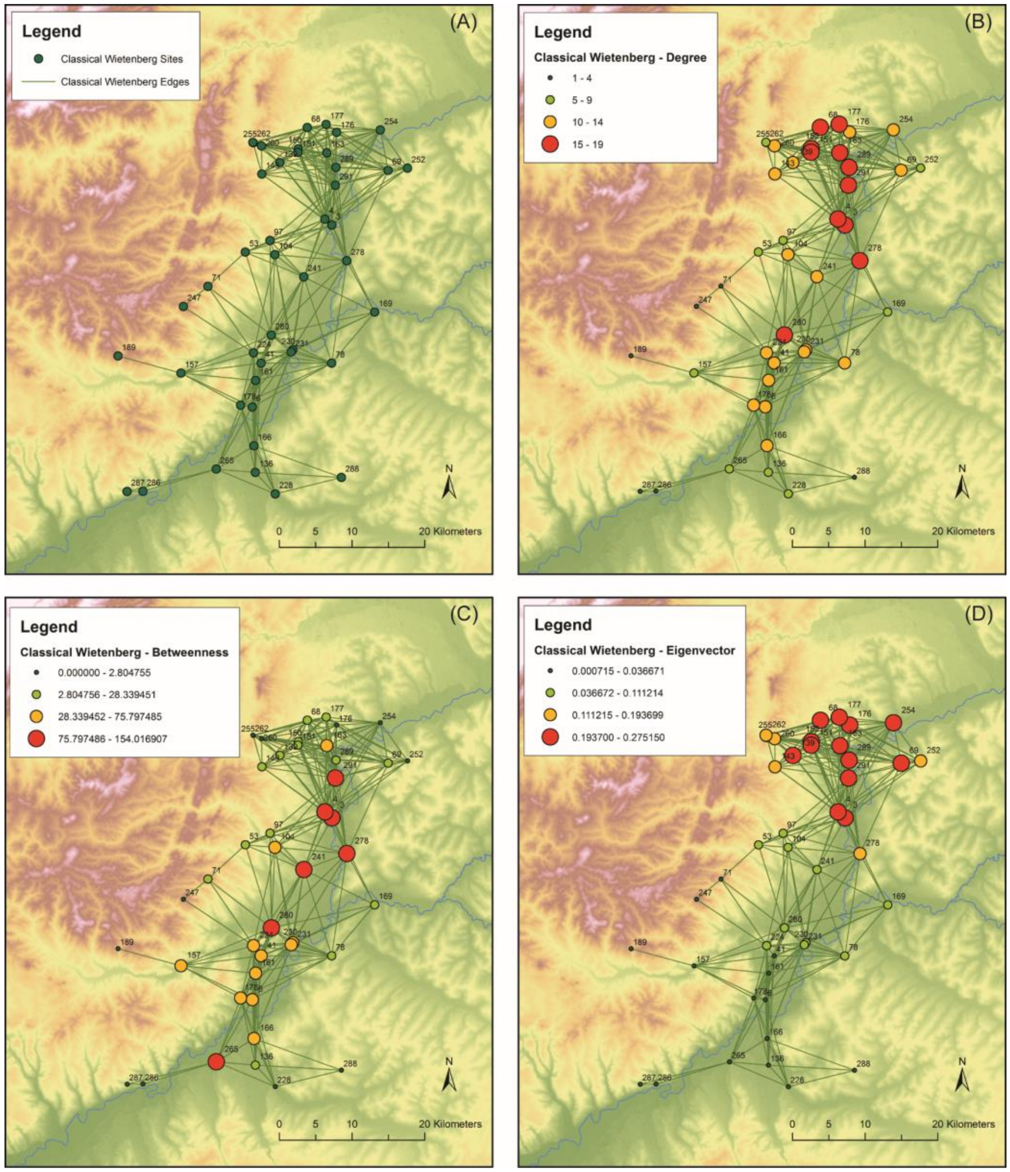

Figure 8.42 – Classical Wietenberg network analysis maps: (a) overall network; settlement centrality based on (b) degree, (c) betweenness, and (d) eigenvector.

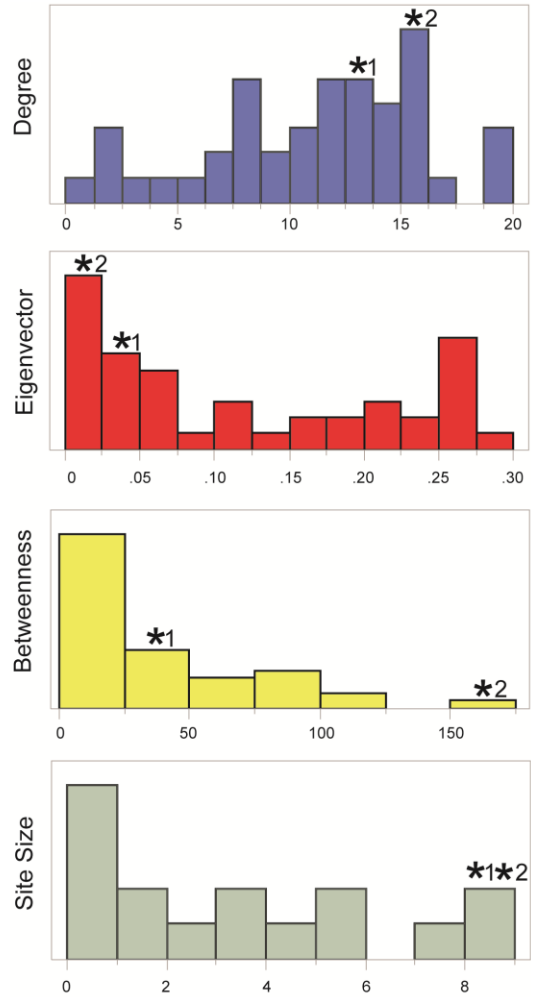

Figure 8.43 – Distribution of centrality measures and site sizes for Classical Wietenberg. Largest sites (1 - Alba Iulia-*Recea/Monolit*; 2 - Pețelca-*Cascadă*) are marked with asterisk (*).

Degree centrality ranges from 1 to 19. There are three sites with the highest degree centrality (19): Aiud-*Cetățuie*, Aiud-*Groapa de Gunoi*, and Aiud-*Tinod*. Eigenvector centrality also dispersed, with a mode below .5 and another above 2.5. The site with the highest eigenvector centrality (.275) is Aiud-*Groapa de Gunoi*. Betweenness centrality is significantly right-skewed. A single site, Pețelca-*Cascadă*, has the highest betweenness (154.02), significantly higher than the next closest site.

There is a relatively strong positive correlation, as expected, between degree and eigenvector centrality (r^2=.565), which both rely upon the quantity of network connections (Table 8.20). There is a weak positive correlation between degree and betweenness centrality. There is no correlation between eigenvector and betweenness centrality.

Table 8.20 - Correlation of different network centrality measures (r^2) in Formative Wietenberg.

	Degree	Eigenvector	Betweenness
Degree	n/a	-	-
Eigenvector	.565	n/a	-
Betweenness	.262	.002	n/a

When we compare the known archaeological site-size distribution (n=19) with different network centrality measures, there no correlation with degree centrality (r^2=.021), a very weak negative correlation with eigenvector centrality (r^2=.161), and a weak positive correlation with betweenness centrality (r^2=.231).

The largest sites in the Classical Wietenberg are Alba Iulia-*Recea/Monolit* (8.40 ha) and Pețelca-*Cascadă* (8.80 ha). Alba Iulia-*Recea/Monolit* has a mid-level degree centrality and low eigenvector and betweenness centrality (see Figure 8.42). Alternatively, Pețelca-*Cascadă* is predicted to be the most important site based on betweenness centrality, is tied for the fifth most important site by degree centrality, but has very low eigenvector centrality. Based on this analysis, the demographic centralization at Alba Iulia-*Recea/Monolit* during the Classical Wietenberg does not appear to be related to the ability of that community to exert control over any aspect of the regional social network. The community at Pețelca-*Cascadă*, however, was well positioned to influence the flow of information and non-local resources through the system. The sites with the best ability to influence the flow of local resources and goods and mobilize the most labor within the network are located in the northern section of southwest Transylvania, near Aiud. Unfortunately, few of these sites have accurate site-size estimates. None of the known sites, however, come close to the size of Alba Iulia-*Recea/Monolit* or Pețelca-*Cascadă*. Based on the current state of knowledge, socio-political prominence in southwest Transylvania does not appear to be linked to the ability to mobilize labor or control the flow of local resources and products during the Classical Wietenberg.

Dynamics of Network Analysis in the Bronze Age

At the settlement system scale, the rank-size method can be used as a heuristic tool to evaluate how network centrality measures changed over time. If network measures changed in a similar way to the known archaeological site-size distribution, then it is possible that the socio-economic implications of those centrality measures are closely linked to regional settlement dynamics. During the Early Bronze Age, all three network measures follow a general trend similar to the rank-size distribution of site-sizes (Figure 8.44). There is a strong trend towards a more concave distribution of settlements from EBA I to EBA II, then a slight shift towards a more log-normal distribution from EBA II to EBA III.

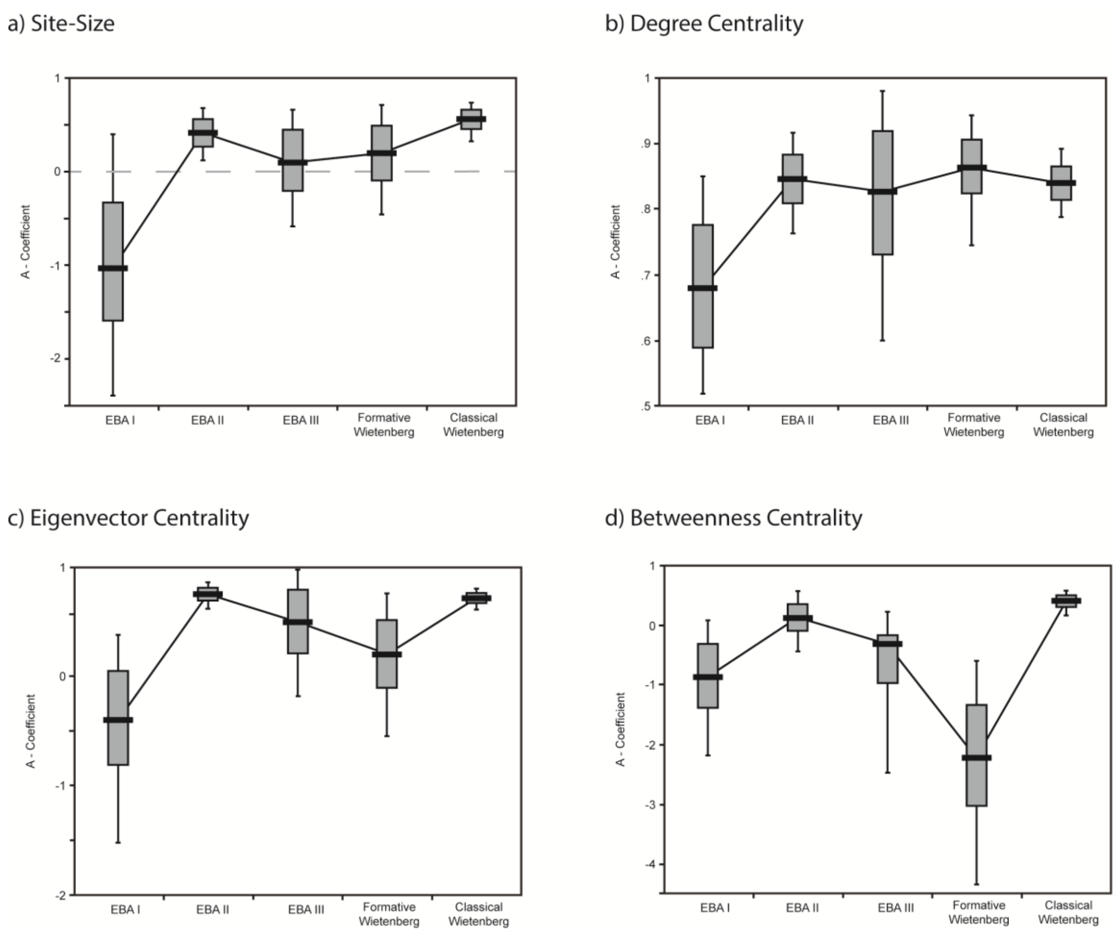

Figure 8.44 - Rank-Size analysis of site-size (a) across network centrality measures: (b) degree, (c) eigenvector, and (d) betweenness centrality.

At the start of the Middle Bronze Age, the rank-size distribution of network centrality measures begin to diverge from the rank-size distribution of site sizes. While degree centrality slightly increases from EBA III to Formative Wietenberg, similar to site-size, eigenvector and betweenness centrality become more primate in distribution. The situation is reversed at the shift from the Formative Wietenberg to Classical Wietenberg. Degree centrality becomes slightly more primate and eigenvector and betweenness centrality become more concave, similar to the concave distribution of site-sizes.

At the site scale, the largest site during EBA I and EBA II (Sântimbru-*Obreje/La Tabaci*) is high in centrality across all three network measures. This suggests that there is a significant link between demographic centralization and ability of that community to exert broad socio-economic influence throughout the network. Things began to change during the EBA III, where the largest site (Oarda de Jos-*Sesul Orzii*) would have had limited ability to control the flow of non-local resources within the settlement system, but would have been able to more strongly influence the flow of labor and local resources. However, the ability of the network measures based on site location alone to predict this site's prominence in both degree and eigenvector centrality suggests that, as with EBA I and EBA II, a central position within the settlement system was linked to the organization of the regional social network.

With the start of the Wietenberg Culture and the Middle Bronze Age, the settlement system began to segment. At the start of the Formative Wietenberg, different network measures were associated with different emerging centers at Alba Iulia-*Recea/Monolit* (betweenness) and Pețelca-*Cascadă* (degree and eigenvector). This segmentation in the network measures may reflect a diversification of economic strategies that lead to demographic centralization in the Formative Wietenberg. This is a socio-economic reorganization from the Early Bronze Age where a single site often was strategically situated within the regional network to optimize access and influence across a wide range of economic activities. With the Classical Wietenberg, the segmentation became even more pronounced. While the prominence of the community at Pețelca-*Cascadă* can be explained by its ability exert influence over the flow of information and non-local resources through the network (as measured by a high betweenness centrality), the size of the community at Alba Iulia-*Recea/Monolit* cannot be explained by a central position along any of the three network centrality measures. This is the only large site within southwest Transylvania that is not associated with high centrality in at least one of the network measures for its phase. While it is possible that this lack of association may in part be due to the duration of the Classical Wietenberg phase and the treatment of sites as contemporary when they are not necessarily contemporaneously occupied (see above), it may also reflect that the community at Alba Iulia-*Recea/Monolit* benefited from a different type of social, economic, or ideological significance and not from a central position within the regional settlement system. Indeed, one factor that might be contributing to this rise – the direct accessibility of economic resources at the site – is explored with the next analysis.

Catchment Analysis

There are three primary resources that are used to define site catchments: (1) land use (agricultural or pastoral land), (2) the main interregional trade route, and (3) availability of raw metal ores. Land use is derived from slope of the land rather than modern land use practices. In this model, it assumes that land forms with slopes of six degrees and higher will be unsuitable for agriculture. Additionally, hydrology was taken into account for determining agricultural potential. The flood plains of the major rivers (Mureș and Târnava Rivers) would have been subject to seasonal inundation, particularly during the wetter periods before 1500 BC. As a result, the flood plains would have made poor agricultural land but adequate seasonally available pasture land. The interregional trade corridor was defined as a 500m buffer around the Mureș and Târnava River flood plains. Sites more than 500m from the flood plains are considered to be located off the interregional trade route as they would have had not been able to constantly monitor the movement of people, goods, and resources along the river. Metal access was derived from Romanian geological maps. Neogene volcanic deposits known to contain major metal ore were assigned a high value. Because small hydrothermal vents that carry metal ore were mostly overlooked in the geological maps (see Chapter 3), limestone deposits that are not covered by more recent sediments were assigned a value where metal may possibly be located nearby. The rest of the landscape, where no metal was likely to be located or accessible, was considered to lack metal. In the subsequent analysis, I consider the site distributions relative to these three primary resources, as well as relative to the 12 possible permutations of resources in the landscape (though only 10 of the 12 possible combinations were present in the southwest Transylvanian landscape) (Table 8.21).

Table 8.21 - All catchment combinations in analysis. Note that Catchments 3 and 4 do not occur in southwest Transylvania.

Catchment Category	Land Use	Trade	Metal
1	Agricultural	No Trade	Metal High
2	Pastoral	No Trade	Metal High
3*	Agricultural	Trade	Metal High
4*	Pastoral	Trade	Metal High
5	Agricultural	No Trade	Metal Possible
6	Pastoral	No Trade	Metal Possible
7	Agricultural	Trade	Metal Possible
8	Pastoral	Trade	Metal Possible
9	Agricultural	No Trade	No Metal
10	Pastoral	No Trade	No Metal
11	Agricultural	Trade	No Metal
12	Pastoral	Trade	No Metal

By looking at the distribution of all sites within a particular phase, we can identify how access to resources influenced the location of settlement. Resources towards which sites are intentionally positioned more than expected through random chance can be seen as being more prominent in people's culturally mediated decision-making framework. To quantify whether settlement patterns prioritized access to particular resources I considered a null hypothesis (H_0): Site catchments are simply the product of the overall abundance and distribution of different catchment types in the landscape. To test this hypothesis, I compare the distribution of catchments from sites for each Bronze Age phase with a random distribution of sites. The random sample of sites was created in ArcGIS through a random generation of 100 sites in the area where sites were found (Figure 8.45). This process was run 50 times, producing 5000 sites distributed randomly throughout the landscape. I then compiled the distribution of sites in different types of catchments (Table 8.22). Using Fisher's Exact Tests, I evaluated whether the observed site distribution was statistically different from the random sample[6] for each phase of the Bronze Age. If the catchment distributions are not statistically different, then we cannot reject the null hypothesis. If the catchment distributions are statistically different, then we can attribute deviation from a random sample to human agency; people preferencing certain catchments in which to place settlements.

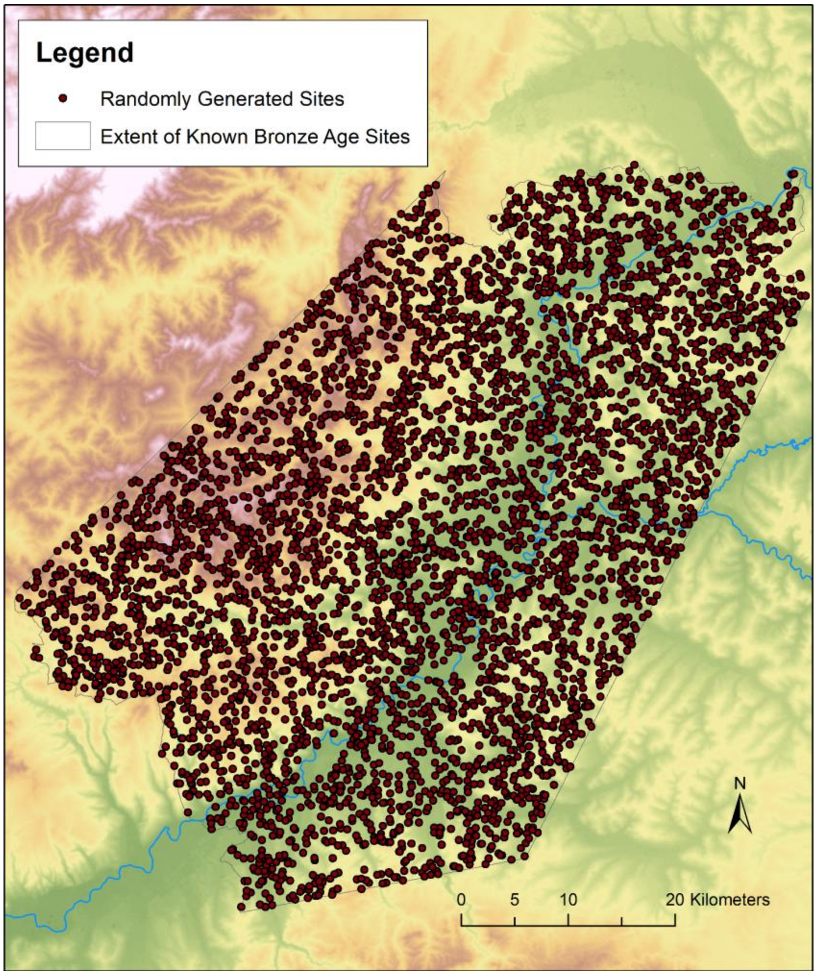

Figure 8.45 – 5000 randomly placed sites generated through ArcGIS (100 sites run 50 times) for use in catchment analyses.

[6] For comparing the access to metal between different periods, I omitted the sites from the random sample where the nearby metal access is high (n=32; 0.6%), to be able to have a 2x2 contingency table, as no known Bronze Age sites were found in that type of catchment.

Table 8.22 – Distribution of catchments for 5000 randomly placed sites in southwest Transylvania.

	Count	Percent
Land Use		
Agricultural	1619	32.4%
Pastoral	3381	67.6%
Trade Access		
Yes	590	11.8%
No	4410	88.2%
Metal Access		
Yes	32	0.6%
Possible	2196	43.9%
No	2772	55.4%
Combined		
1 (Agricultural; No Trade; Metal Yes)	6	0.1%
2 (Pastoral; No Trade; Metal Yes)	26	0.5%
3 (Agricultural; Trade; Metal Yes)	0	0.0%
4 (Pastoral; Trade; Metal Yes)	0	0.0%
5 (Agricultural; No Trade; Metal Possible)	245	4.9%
6 (Pastoral; No Trade; Metal Possible)	1938	38.8%
7 (Agricultural; Trade; Metal Possible)	7	0.1%
8 (Pastoral; Trade; Metal Possible)	6	0.1%
9 (Agricultural; No Trade; No Metal)	1224	24.5%
10 (Pastoral; No Trade; No Metal)	971	19.4%
11 (Agricultural; Trade; No Metal)	137	2.7%
12 (Pastoral; Trade; No Metal)	440	8.8%

EBA I: Catchment Analysis

The 14 EBA I (2700-2500 BC) settlements were positioned in a variety of catchments (Tables 8.23 and 8.24; Figure 8.46). Most of the settlements (85.7%) were located in pastoral land. Only one site (7.1%) was located with direct access to trade along the Mureș corridor. Nine settlements (64.3%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangements were Catchment 6 (64.3% of sites) and Catchment 10 (21.4% of sites).

Table 8.23 - EBA I settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
21	Ampoiţa-*La Bulz*	Pastoral	No	Possible	6
27	Ampoiţa-*La Pietri*	Pastoral	No	Possible	6
51	Capud-*Măgura Capudului*	Pastoral	No	No	10
53	Cetea-*La Bai/La Pietri/Petriş/La Picuiata*	Pastoral	No	Possible	6
68	Cicău-*Sălişte*	Agricultural	No	No	9
137	Livezile-*Baia*	Pastoral	No	Possible	6
143	Livezile-*Obirsie/Obursi*	Pastoral	No	Possible	6
149	Lopadea Nouă-*Cetăţuie 2*	Pastoral	No	No	10
185	Poiana Ampoiului-*Piatra Corbului*	Pastoral	No	Possible	6
231	Sântimbru-*Obreje/La Tabaci*	Agricultural	Yes	No	11
248	Ţelna-*Măgură*	Pastoral	No	No	10
270	Zlatna-*Colţul lui Blaj*	Pastoral	No	Possible	6
271	Zlatna-*Dumbrăviţa*	Pastoral	No	Possible	6
279	Rameţ-*Gugului*	Pastoral	No	Possible	6

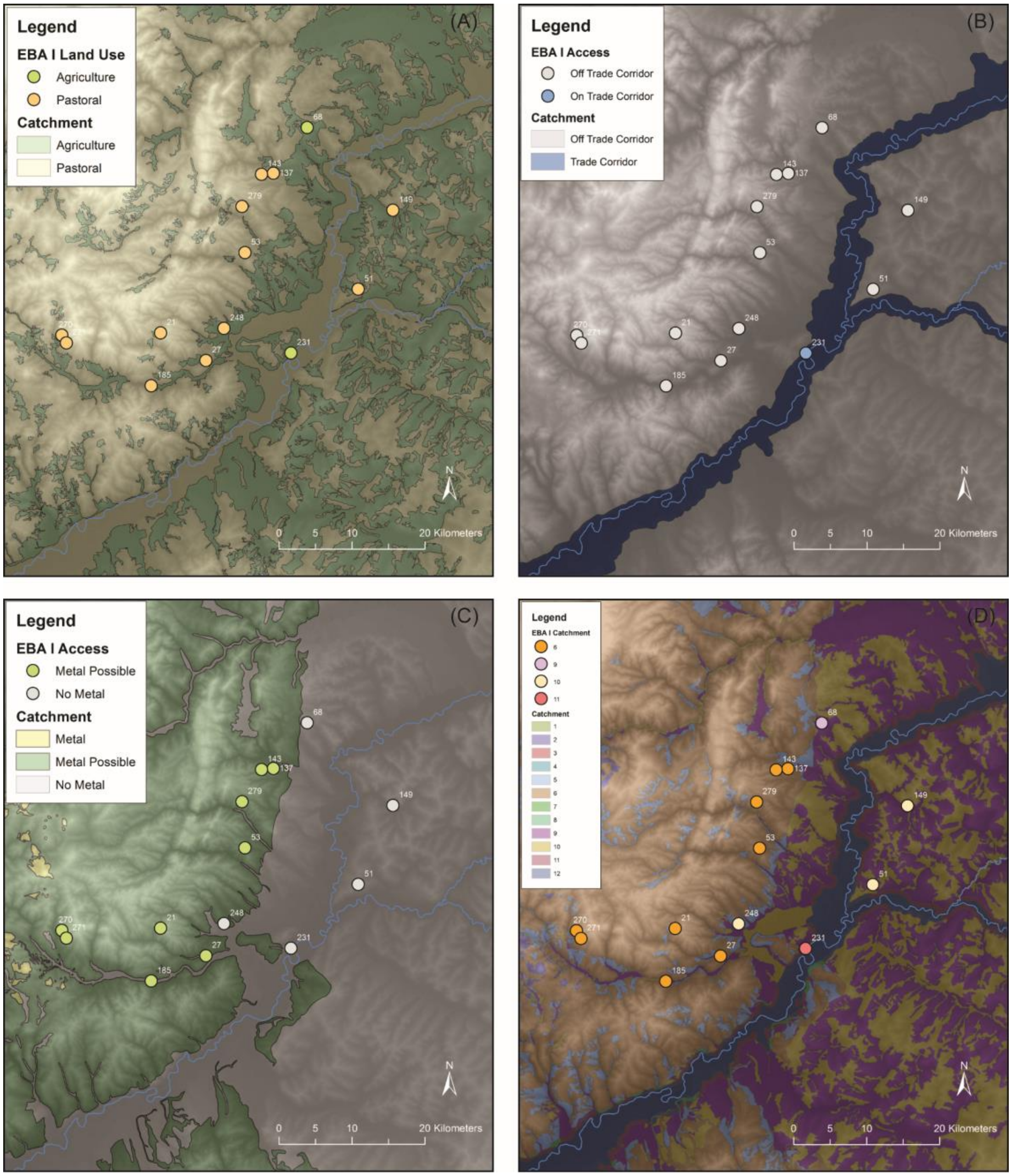

Figure 8.46 – EBA I catchment analysis maps: (a) subsistence land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Table 8.24 - Distribution of catchments for EBA I settlements.

	Count	Percent	Fisher's Exact Test
Land Use			Cannot reject H_0 (p=.2503)
Agricultural	2	14.3%	
Pastoral	12	85.7%	
Trade Access			Cannot reject H_0 (p=1.0000)
Yes	1	7.1%	
No	13	92.9%	
Metal Access			Cannot reject H_0 (p=.1777)
Yes	0	0.0%	
Possible	9	64.3%	
No	5	35.7%	
Combined			
5	0	0.0%	5: Cannot reject H_0 (p=1.0000)
6	9	64.3%	6: Cannot reject H_0 (p=.0581)
7	0	0.0%	7: Cannot reject H_0 (p=1.0000)
9	1	7.1%	9: Cannot reject H_0 (p=.2107)
10	3	21.4%	10: Cannot reject H_0 (p=.7427)
11	1	7.1%	11: Cannot reject H_0 (p=.3238)
12	0	0.0%	12: Cannot reject H_0 (p=.6273)

There is no statistically significant difference in access to any economic resources between the EBA I settlement locations and the random site distribution (see Table 8.24). It is not possible to reject the null hypothesis that the catchment distribution matches the distribution of catchments within southwest Transylvania. Consequently, there is no evidence that EBA I communities uniformly positioned themselves in the landscape to prioritize access to the same economic resource.

EBA II: Catchment Analysis

The 21 EBA II (2500-2250 BC) settlements were positioned in a variety of catchments (Tables 8.25 and 8.26; Figure 8.47). A slight majority of settlements (57.1%) were located in agricultural land. Eight settlements (38.1%) were located with direct access to trade along the Mureș corridor. Eight settlements (38.1%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangements were Catchment 11 (38.1% of sites) and Catchment 6 (33.3% of sites).

Table 8.25 - EBA II settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
3	Aiud-*Cetățuie*	Agricultural	Yes	No	11
7	Alba Iulia-*Strada Sinia*	Agricultural	Yes	No	11
27	Ampoița-*La Pietri*	Pastoral	No	Possible	6
37	Ampoița-*Pestera Liliecilor*	Pastoral	No	Possible	6
97	Geoagiu de Sus-*Fântâna Mare*	Agricultural	No	Possible	5
148	Lopadea Nouă-*Cetățuie 1*	Pastoral	No	No	10
162	Micoşlaca-*(no name)*	Agricultural	Yes	No	11
167	Oarda de Jos-*Dublihan*	Agricultural	Yes	No	11
175	Ormeniş-*(no name)*	Agricultural	Yes	No	11
185	Poiana Ampoiului-*Piatra Corbului*	Pastoral	No	Possible	6
190	Presaca Ampoiului-*Piatră Brații*	Pastoral	No	Possible	6
222	Șard-*(no name)*	Pastoral	No	Possible	6
224	Șard-*Bilag 2*	Agricultural	No	No	9
231	Sântimbru-*Obreje/La Tabaci*	Agricultural	Yes	No	11
238	Stremț-*Berc 1*	Pastoral	No	No	10
268	Vințu de Jos-*Viile Lancranjenilor*	Agricultural	No	No	9
271	Zlatna-*Dumbrăvița*	Pastoral	No	Possible	6
272	Zlatna-*Măgură Dudașului*	Pastoral	No	Possible	6
274	Capud-*(no name)*	Agricultural	No	No	9
276	Teiuș-*Coastă*	Agricultural	Yes	No	11
277	Gârbova de Jos-*În Coastă*	Agricultural	Yes	No	11

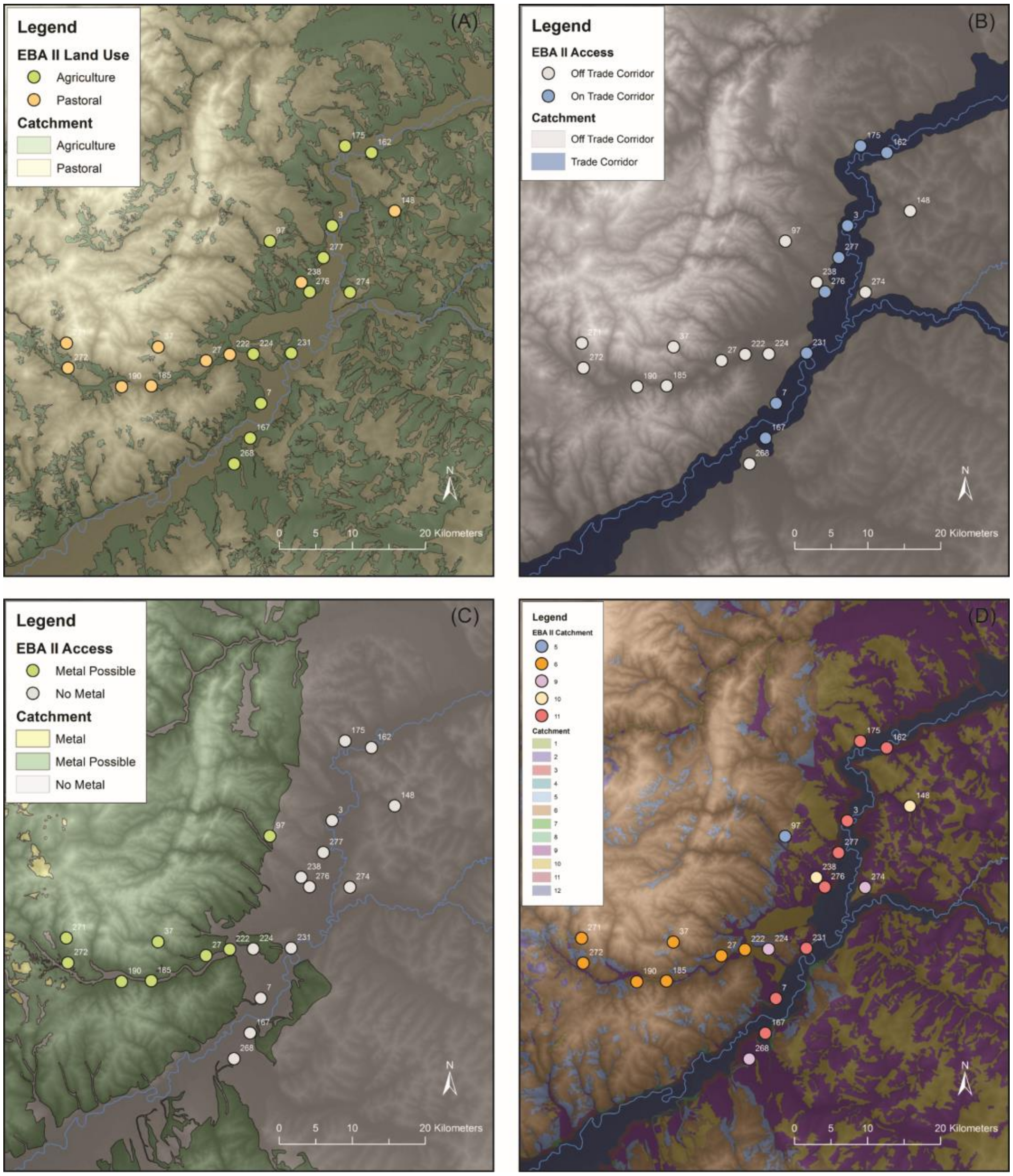

Figure 8.47 – EBA II catchment analysis maps: (a) subsistence land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Table 8.26 - Distribution of catchments for EBA II settlements.

	Count	Percent	Fisher's Exact Test
Land Use			Reject H_0 (p=.0198)
Agricultural	12	57.1%	*More sites in agricultural land than*
Pastoral	9	42.9%	*expected*
Trade Access			Reject H_0 (p=.0019)
Yes	8	38.1%	*More sites near trade routes than*
No	13	61.9%	*expected*
Metal Access			Cannot reject H_0 (p=.6630)
Yes	0	0.0%	
Possible	8	38.1%	
No	13	61.9%	
Combined			
5	1	5.8%	5: Cannot reject H_0 (p=1.0000)
6	7	33.3%	6: Cannot reject H_0 (p=.6613)
7	0	0.0%	7: Cannot reject H_0 (p=1.0000)
9	3	14.3%	9: Cannot reject H_0 (p=.4438)
10	2	9.5%	10: Cannot reject H_0 (p=.4047)
11	8	38.1%	11: Reject H_0 (p=.0001)
12	0	0.0%	12: Cannot reject H_0 (p=.2509)

There are statistically significantly more EBA II settlements in agricultural land and with direct access to interregional trade routes than expected (see Table 8.26). There is no statistically significant difference in the relative access to metal between settlement locations and the random site distribution. The only combined catchment type that is statistically significantly over represented is Catchment 11, which are landscapes in agricultural land with access to trade but no access to metal. As a result, we can conclude that EBA II communities differentially positioned themselves in the southwest Transylvanian landscape to prioritize access to agricultural land and trade routes, but did not prioritize direct access to metal sources.

EBA III: Catchment Analysis

The 11 EBA III (2250-2000 BC) settlements were positioned in a variety of catchments (Tables 8.27 and 8.28; Figure 8.48). All but one settlement (90.9%) were located in agricultural land. A slight majority of settlements (54.5%) were located with direct access to trade along the Mureș corridor. Only two settlements (18.2%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangements were Catchment 9 (36.4% of sites) and Catchment 11 (36.4% of sites).

Table 8.27 - EBA III settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
2	Aiud-*Castelul Bethlen*	Agricultural	No	No	9
6	Alba Iulia-*Recea/Monolit*	Agricultural	Yes	Possible	7
136	Lancrăm-*Glod*	Agricultural	No	No	9
150	Lopadea Veche-*Jidovină/Râpa Alba*	Agricultural	No	Possible	5
161	Micești-*Cigaș*	Agricultural	No	No	9
166	Oarda de Jos-*Cutina*	Agricultural	Yes	No	11
167	Oarda de Jos-*Dublihan*	Agricultural	Yes	No	11
168	Oarda de Jos-*Sesul Orzii*	Agricultural	Yes	No	11
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	Agricultural	No	No	9
267	Vințu de Jos-*Lunca Fermei*	Pastoral	Yes	No	12
276	Teiuș-*Coastă*	Agricultural	Yes	No	11

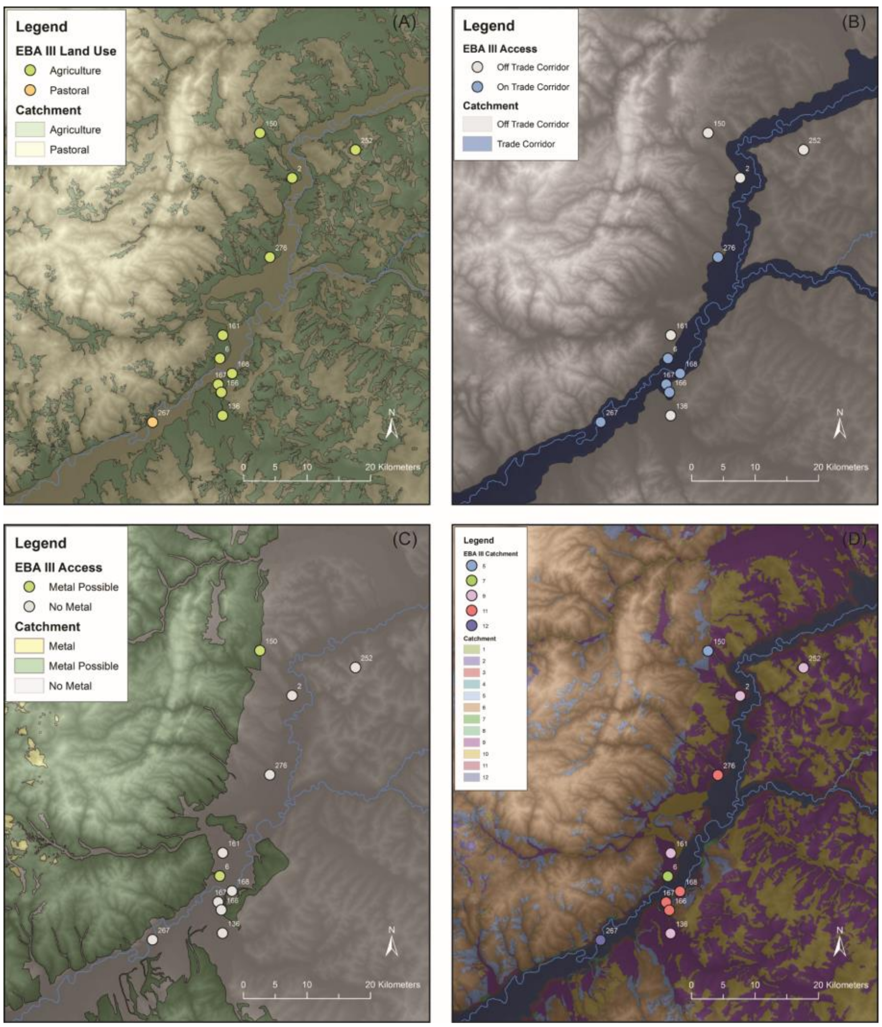

Figure 8.48 – EBA III catchment analysis maps: (a) subsistence land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Table 8.28 - Distribution of catchments for EBA III settlements.

	Count	Percent	Fisher's Exact Test
Land Use			Reject H_0 (p=.0001)
Agricultural	10	90.9%	*More sites in agricultural land than*
Pastoral	1	9.1%	*expected*
Trade Access			Reject H_0 (p=.0008)
Yes	6	54.5%	*More sites near trade routes than*
No	5	45.5%	*expected*
Metal Access			Cannot reject H_0 (p=.1265)
Yes	0	0.0%	
Possible	2	18.2%	
No	9	81.8%	
Combined			
5	1	9.1%	5: Cannot reject H_0 (p=.4255)
6	0	0.0%	6: Reject H_0 (p=.0091)
7	1	9.1%	7: Reject H_0 (p=.0174)
9	4	36.4%	9: Cannot reject H_0 (p=.4802)
10	0	0.0%	10: Cannot reject H_0 (p=.1377)
11	4	36.4%	11: Reject H_0 (p=.0002)
12	1	9.1%	12: Cannot reject H_0 (p=.6142)

There are statistically significantly more EBA III settlements in agricultural land and with direct access to interregional trade routes than expected (see Table 8.28). There is no statistically significant difference in the relative access to metal between settlement locations and the random site distribution. There are two combined catchment types that are statistically significantly over represented. The first is Catchment 11, which are landscapes in agricultural land with access to trade but no access to metal. The second is Catchment 7, the catchment with agricultural land, access to trade routes, and possible access to local metal sources. While there is only one site (Alba Iulia-*Recea/Monolit*) in Catchment 7, this catchment type makes up only 0.1% of the landscape of southwest Transylvania. In addition to an over-abundance of some settlements, there is a statistically significant absence of settlements in Catchment 6, which combines pastoral land with no access to trade and possible access to metal. Catchment 6 is among the most common landscape types, particularly in the uplands of the Trascău Mountains, covering 38.8% of all randomly places settlements. As a result, EBA III communities differentially positioned themselves in the southwest Transylvanian landscape to prioritize access to agricultural land and trade routes, but did not prioritize direct access to metal sources.

Formative Wietenberg: Catchment Analysis

The 14 Formative Wietenberg (2000-1875 BC) settlements were positioned in a variety of catchments (Tables 8.29 and 8.30; Figure 8.49). A majority of settlements (71.4%) were located in agricultural land. Five settlements (35.7%) were located with direct access to trade along the Mureș corridor. Six settlements (42.8%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangements were Catchment 6 (28.6% of sites), Catchment 9 (21.4% of sites), and Catchment 11 (21.4% of sites).

Table 8.29 - Formative Wietenberg settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
6	Alba Iulia-*Recea/Monolit*	Agricultural	Yes	Possible	7
51	Capud-*Măgura Capudului*	Pastoral	No	No	10
68	Cicău-*Săliște*	Agricultural	No	No	9
97	Geoagiu de Sus-*Fântâna Mare*	Agricultural	No	Possible	5
136	Lancrăm-*Glod*	Agricultural	No	No	9
139	Livezile-*Dealul Sârbului*	Pastoral	No	Possible	6
143	Livezile-*Obirsie/Obursi*	Pastoral	No	Possible	6
169	Obreja-*Cânepi*	Agricultural	Yes	No	11
228	Sebeș-*Podul Pripocului*	Agricultural	No	No	9
230	Sântimbru-*La Tarmure/La Ieruga*	Agricultural	Yes	No	11
241	Stremț-*Fabrica de Alcool*	Agricultural	No	No	9
260	Vălișoara-*Pleasa Cornii*	Pastoral	No	Possible	6
265	Vințu de Jos-*Deasupră Satului*	Agricultural	Yes	Possible	7
278	Pețelca-*Cascadă*	Agricultural	Yes	No	11

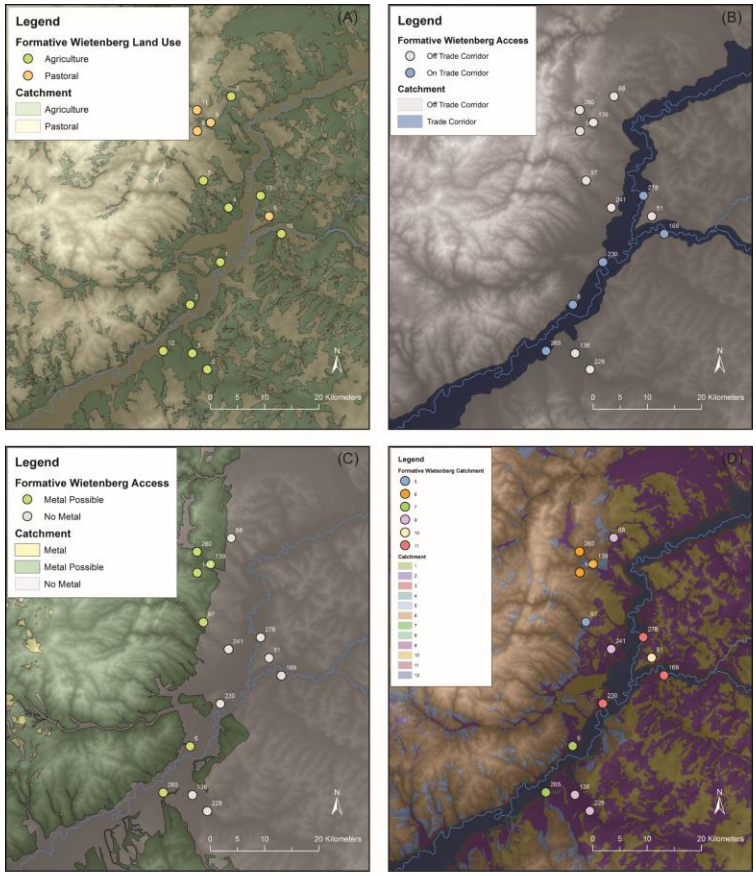

Figure 8.49 – Formative Wietenberg catchment analysis maps: (a) subsistence land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Table 8.30 - Distribution of catchments for Formative Wietenberg settlements.

	Count	Percent	Fisher's Exact Test
Land Use			Reject H_0 (p=.0032)
Agricultural	10	71.4%	*More sites in agricultural land than*
Pastoral	4	28.6%	*expected*
Trade Access			Reject H_0 (p=.0185)
Yes	5	35.7%	*More sites near trade routes than*
No	9	64.3%	*expected*
Metal Access			Cannot reject H_0 (p=1.0000)
Yes	0	0.0%	
Possible	6	42.8%	
No	8	57.1%	
Combined			
5	1	7.1%	5: Cannot reject H_0 (p=.5060)
6	3	21.4%	6: Cannot reject H_0 (p=.0956)
7	2	14.3%	7: Reject H_0 (p=.0003)
9	4	28.6%	9: Cannot reject H_0 (p=.7564)
10	1	7.1%	10: Cannot reject H_0 (p=.4940)
11	3	21.4%	11: Reject H_0 (p=.0062)
12	0	0.0%	12: Cannot reject H_0 (p=.6273)

There are statistically significantly more Formative Wietenberg settlements in agricultural land and with direct access to interregional trade routes than expected (see Table 8.30). There is no statistically significant difference in the relative access to metal between settlement locations and the random site distribution. There are two combined catchment types that are statistically significantly over represented. The first is Catchment 11, which are landscapes in agricultural land with access to trade but no access to metal. The second is Catchment 7, the catchment with agricultural land, access to trade routes, and possible access to local metal sources. The two sites in Catchment 7 (14.3% of sites) represents a highly significant difference from the random distribution of sites in which only 7 of 5000 randomly-placed sites (0.1%) were located in Catchment 7. Together, Formative Wietenberg communities differentially positioned themselves in the southwest Transylvanian landscape to prioritize access to agricultural land and trade routes, but did not prioritize direct access to metal sources.

Classical Wietenberg: Catchment Analysis

The 44 Classical Wietenberg (1875-1500 BC) settlements were positioned in a variety of catchments (Tables 8.31 and 8.32; Figure 8.50). A majority of settlements (63.6%) were located in agricultural land. Twelve settlements (27.3%) were located with direct access to trade along the Mureș corridor. Seventeen settlements (38.6%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangements were Catchment 9 (31.8% of sites) and Catchment 6 (25.0% of sites).

Table 8.31 - Classical Wietenberg settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
3	Aiud-*Cetățuie*	Agricultural	Yes	No	11
4	Aiud-*Tinod*	Agricultural	No	No	9
6	Alba Iulia-*Recea/Monolit*	Agricultural	Yes	Possible	7
41	Bărăbanț-*(no name)*	Agricultural	No	No	9
53	Cetea-*La Bai/La Pietri/Petriș/La Picuiata*	Pastoral	No	Possible	6
68	Cicău-*Săliște*	Agricultural	No	No	9
69	Cisteiu de Mureș-*Valea Poietii*	Pastoral	No	No	10
71	Craiva-*Piatra Craivii*	Pastoral	No	Possible	6
78	Dumitra-*(no name)*	Pastoral	No	No	10
97	Geoagiu de Sus-*Fântâna Mare*	Agricultural	No	Possible	5
104	Geoagiu de Sus-*Viile Satului*	Agricultural	No	No	9
136	Lancrăm-*Glod*	Agricultural	No	No	9
139	Livezile-*Dealul Sârbului*	Pastoral	No	Possible	6
143	Livezile-*Obirsie/Obursi*	Pastoral	No	Possible	6
150	Lopadea Veche-*Jidovină/Râpa Alba*	Agricultural	No	Possible	5
151	Lopadea Veche-*Pahui*	Agricultural	No	Possible	5
157	Meteș-*Vârful Baii*	Agricultural	No	No	9
161	Micești-*Cigaș*	Agricultural	No	No	9
163	Mirăslău-*CAP*	Pastoral	No	No	10
166	Oarda de Jos-*Cutina*	Agricultural	Yes	No	11
169	Obreja-*Cânepi*	Agricultural	Yes	No	11
176	Ormeniş-*Cânepiște/Cânepi/La Pod*	Agricultural	No	No	9
177	Ormeniş-*Gruiul cu Mazăre*	Pastoral	No	No	10
178	Pâclișa-*Podei*	Pastoral	No	Possible	6
189	Presaca Ampoiului-*Peștera Șura de Piatră*	Pastoral	No	Possible	6
224	Șard-*Bilag 2*	Agricultural	No	No	9
228	Sebeș-*Podul Pripocului*	Agricultural	No	No	9
230	Sântimbru-*La Tarmure/La Ieruga*	Agricultural	Yes	No	11
231	Sântimbru-*Obreje/La Tabaci*	Agricultural	Yes	No	11
241	Stremț-*Fabrica de Alcool*	Agricultural	No	No	9
247	Țelna-*Gugu*	Pastoral	No	Possible	6
252	Uioara de Jos-*La Grui/Gruiul lui Sip*	Agricultural	No	No	9
254	Unirea-*Dealul Camarii*	Agricultural	Yes	No	11
255	Vălişoara-*Peștera Bogsuta*	Pastoral	No	Possible	6
260	Vălişoara-*Pleasa Cornii*	Pastoral	No	Possible	6
262	Vălişoara-*Peștera Pucula*	Pastoral	No	Possible	6
265	Vințu de Jos-*Deasupră Satului*	Agricultural	Yes	Possible	7
278	Pețelca-*Cascadă*	Agricultural	Yes	No	11
280	Oiejdea-*Bilag 1*	Agricultural	No	No	9
286	Acmariu-*Școală*	Agricultural	Yes	Possible	7
287	Acmariu-*Valea Feneșului*	Pastoral	No	Possible	6
288	Șpring-*Cătun Carpen*	Agricultural	No	No	9
289	Gâmbaș-*(no name)*	Agricultural	Yes	No	11
291	Aiud-*Groapa de Gunoi*	Pastoral	Yes	No	12

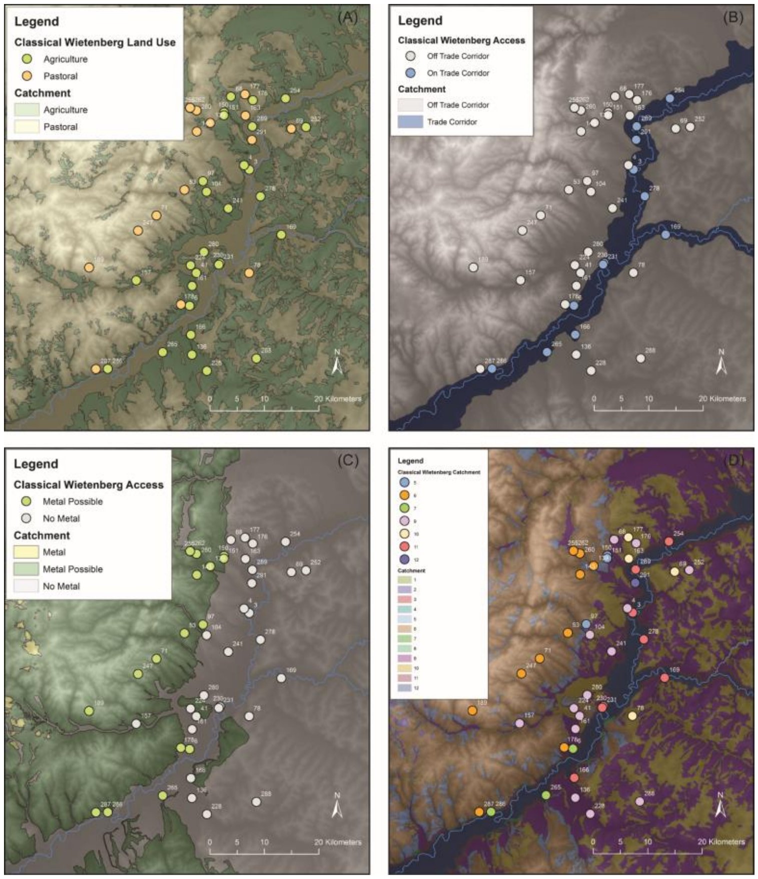

Figure 8.50 – Classical Wietenberg catchment analysis maps: (a) subsistence land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Table 8.32 - Distribution of catchments for Classical Wietenberg settlements.

	Count	Percent	Fisher's Exact Test
Land Use			Reject H_0 ($p<.0001$)
Agricultural	28	63.6%	*More sites in agricultural land than*
Pastoral	16	36.4%	*expected*
Trade Access			Reject H_0 ($p=.0043$)
Yes	12	27.3%	*More sites near trade routes than*
No	32	72.7%	*expected*
Metal Access			Cannot reject H_0 ($p=.5427$)
Yes	0	0.0%	
Possible	17	38.6%	
No	27	61.4%	
Combined			
5	3	6.8%	5: Cannot reject H_0 ($p=.4764$)
6	11	25.0%	6: Cannot reject H_0 ($p=.0636$)
7	3	6.8%	7: Reject H_0 ($p<.0001$)
9	14	31.8%	9: Cannot reject H_0 ($p=.2902$)
10	4	9.1%	10: Cannot reject H_0 ($p=.1218$)
11	8	18.2%	11: Reject H_0 ($p=.0001$)
12	1	2.3%	12: Cannot reject H_0 ($p=.1770$)

There are statistically significantly more Classical Wietenberg settlements in agricultural land and with direct access to interregional trade routes than expected (see Table 8.32). There is no statistically significant difference in the relative access to metal between settlement locations and the random site distribution. There are two combined catchment types that are statistically significantly over represented. The first is Catchment 11, which are landscapes in agricultural land with access to trade but no access to metal. The second is Catchment 7, the catchment with agricultural land, access to trade routes, and possible access to local metal sources. The three sites in Catchment 7 (6.8% of sites) represents a highly significant difference from the random distribution of sites in which only 0.1% of sites were located in Catchment 7. Together, Classical Wietenberg communities differentially positioned themselves in the southwest Transylvanian landscape to prioritize access to agricultural land and trade routes, but did not prioritize direct access to metal sources.

Terminal Wietenberg: Catchment Analysis

The catchment analysis for the Terminal Wietenberg (1500-1320 BC) is limited to the four Bronze Age settlements in the Geoagiu Valley directly dated through radiocarbon dates and artifact analysis to this period[7] (Tables 8.33 and 8.34). Three of the settlements (75.0%) were located in agricultural land. Two settlements (50.0%) were located with direct access to trade along the Mureș corridor. Two settlements (50.0%) were positioned in landscapes with possible access to metal through hydrothermal vents. The most common catchment arrangement was Catchment 11 (50.0% of sites).

Table 8.33 - Terminal Wietenberg settlements and their catchments.

ID	Site	Land Use	Trade Access	Metal Access	Combined
97	Geoagiu de Sus-*Fântâna Mare*	Agricultural	No	Possible	5
191	Rameț-*Curmatura*	Pastoral	No	Possible	6
275	Teiuș-*Fântâna Viilor*	Agricultural	Yes	No	11
278	Pețelca-*Cascadă*	Agricultural	Yes	No	11

[7] Teiuș-*Fântâna Viilor* is included due to the presence of Wietenberg ceramics, even though the community is primarily associated with the Noua Culture.

Table 8.34 - Distribution of catchments for Terminal Wietenberg settlements in the Geoagiu Valley.

	Count	Percent	Fisher's Exact Test
Land Use			Cannot reject H_0 (p=.1030)
Agricultural	3	75.0%	
Pastoral	1	25.0%	
Trade Access			Cannot reject H_0 (p=.0712)
Yes	2	50.0%	
No	2	50.0%	
Metal Access			Cannot reject H_0 (p=1.0000)
Yes	0	0.0%	
Possible	2	50.0%	
No	2	50.0%	
Combined			
5	1	25.0%	5: Cannot reject H_0 (p=.1827)
6	1	25.0%	6: Cannot reject H_0 (p=1.0000)
7	0	0.0%	7: Cannot reject H_0 (p=1.0000)
9	0	0.0%	9: Cannot reject H_0 (p=.5781)
10	0	0.0%	10: Cannot reject H_0 (p=1.0000)
11	2	50.0%	11: Reject H_0 (p=.0044)
12	0	0.0%	12: Cannot reject H_0 (p=1.0000)

With a sample of only four settlements, the patterns are mostly not statistically significant. The only statistically significant difference from the random site distribution is that two of the four sites are located in Catchment 11, which are landscapes in agricultural land with access to trade but no access to metal. It appears that, similar to the Formative and Classical, the Terminal Wietenberg communities differentially positioned themselves in the southwest Transylvanian landscape to prioritize access to agricultural land and trade routes.

Dynamics of Catchment Analysis in the Bronze Age

The long-term dynamics of catchment preference by communities in southwest Transylvania reveal change and stasis in the relationship between social and economic organization during the Bronze Age. Starting with individual aspects of the economy – land use (Figure 8.51), access to trade routes (Figure 8.52), and access to metal sources (Figure 8.53) – there was no preference for any particular resource during the EBA I. This may mean that EBA I communities were prioritizing other, non-economic, factors, such as social distance, when placing their settlements. By the EBA II Bronze Age communities began to preference certain catchments. Starting in the EBA II, and lasting through the Classical Wietenberg, there were more sites in agricultural land and near trade routes than expected. Bronze Age peoples from the EBA I through Classical Wietenberg did not prioritize access to metal. The catchment pattern for the Terminal Wietenberg is similar to that of the Formative and Classical Wietenberg, though it is not statistically significant due to small sample sizes.

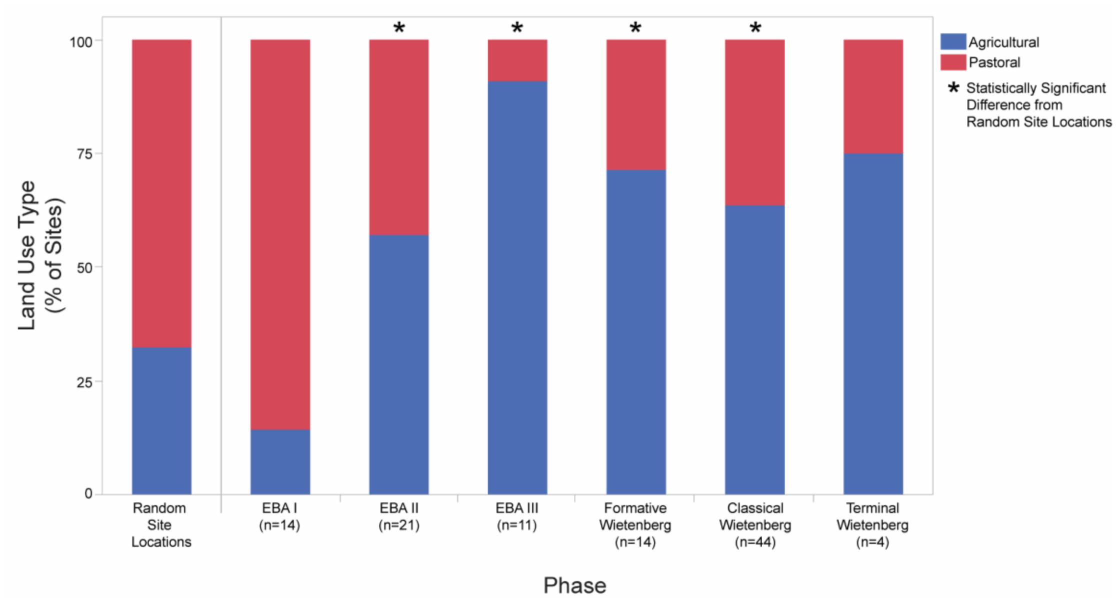

Figure 8.51 – Distribution of land use types. Communities preferred agricultural land during the EBA II, EBA III, Formative Wietenberg, and Classical Wietenberg. Distributions are not statistically different from a random distribution of sites during the EBA I and Terminal Wietenberg (Terminal Wietenberg effected by small sample).

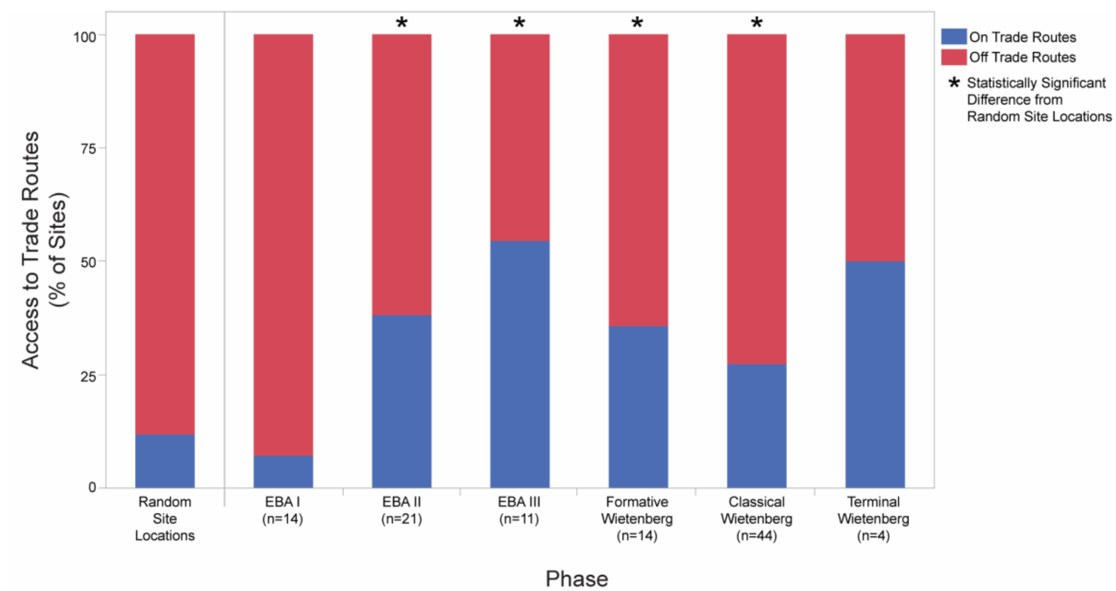

Figure 8.52 – Distribution of access to trade routes. More communities were positioned along trade routes than expected during the EBA II, EBA III, Formative Wietenberg, and Classical Wietenberg. Distributions are not statistically different from a random distribution of sites during the EBA I and Terminal Wietenberg (Terminal Wietenberg effected by small sample).

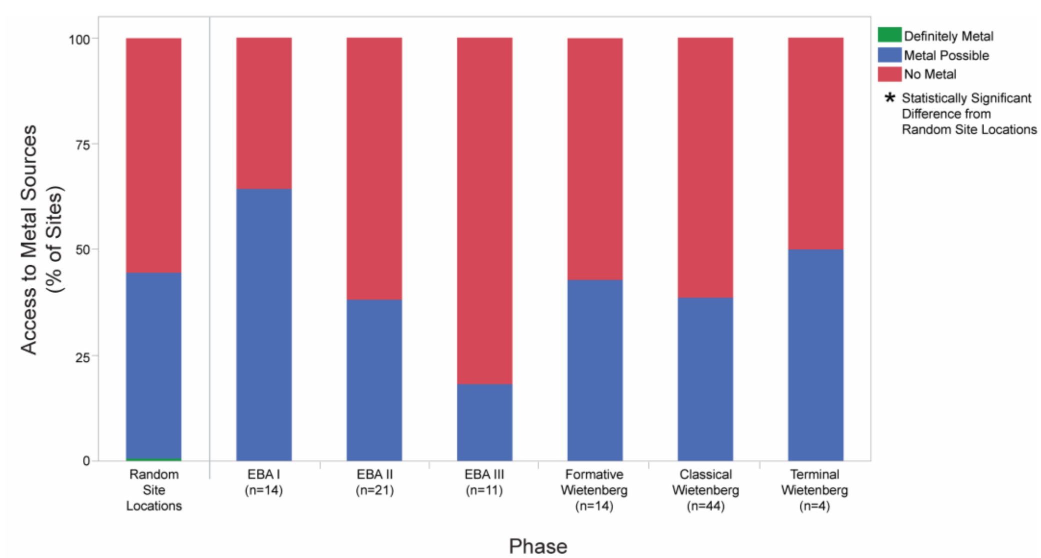

Figure 8.53 – Distribution of access to metal sources. Distributions are not statistically different from a random distribution of sites during any phase of the Bronze Age.

There are also changes in preferences for particular catchment constellations across the Bronze Age phases (Figure 8.54, Table 8.35). There are statistically significantly fewer sites in Catchment 6 (pastoral land, no trade access, metal possible) than expected during the EBA III. This may represent deliberate avoidance of upland areas, or the persistence of EBA II communities until the end of the EBA (see Chapter 11 for more discussion). There are statistically significantly more sites in Catchment 7 (agricultural land, trade access, metal possible) than expected during the EBA III, Formative Wietenberg, and Classical Wietenberg. There are statistically significantly more sites in Catchment 11 (agricultural land, trade access, no metal) than expected during the EBAII, EBA III, Formative Wietenberg and Classical Wietenberg. Though not statistically significant (due to small sample sizes) the Terminal Wietenberg also appears to have more sites than expected in Catchment 11. There is no statistical deviation from a random distribution for the other seven observed catchment combinations (Catchments 1, 2, 5, 8, 9, 10, and 12).

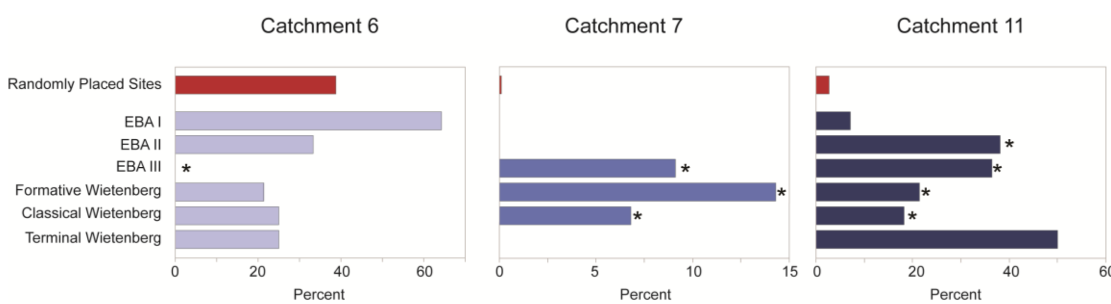

Figure 8.54 – Distribution of sites in catchments that are statistically different than a sample of randomly placed settlements (marked with asterisk). Statistically significantly more sites than expected in Catchment 7 (Agricultural, Trade Access, Metal Possible) during EBA III, Formative and Classical Wietenberg; and Catchment 11 (Agricultural Land, Trade Access, No Metal) during EBA II, EBA III, Formative, Classical, and Terminal Wietenberg. Statistically significantly fewer sites than expected in Catchment 6 (Pastoral Land, No Trade Access, Metal Possible) during EBA III.

Table 8.35 - Distribution of settlements by catchment. Light grey indicates statistically significantly more sites than expected, and dark grey indicates statistically significantly fewer sites than expected.

	Random	EBA I	EBA II	EBA III	Formative Wietenberg	Classical Wietenberg	Terminal Wietenberg
1	6	-	-	-	-	-	-
2	26	-	-	-	-	-	-
3	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-
5	245	-	1	1	1	3	1
6	1938	9	7	-	3	11	1
7	7	-	-	1	2	3	-
8	6	-	-	-	-	-	-
9	1224	1	3	4	4	14	-
10	971	3	2	-	1	4	-
11	137	1	8	4	3	8	2
12	440	-	-	1	-	1	-
Total	5000	14	21	11	14	44	4

Based on site locations alone, there were at least some changes across every phase (Table 8.36). From EBA I to EBA II, sites shifted away from a random distribution and became more closely associated with agricultural land, trade routes, and Catchment 11. From EBA II to EBA III, the patterned of more association with agricultural land, trade access, and Catchment 11 continued, while a new preference for Catchment 7 and avoidance of Catchment 6 were introduced. With the onset of the Formative Wietenberg, the only change from the EBA III pattern was that Catchment 6 was no longer avoided. There was no change in catchment preference between the Formative Wietenberg and the Classical Wietenberg. Of the changes, however, the only qualitative change is between EBA I and EBA II. The other changes between phases (EBA II to EBA III; EBA III to Formative Wietenberg) are more quantitative

Table 8.36 - How catchments of site locations changed over time in southwest Transylvania.

	Compared with Random Distribution	Change from Previous Phase
EBA I	No Difference.	--
EBA II	More sites in agricultural land than expected. More sites near trade routes than expected. More sites in catchment 11 (agricultural, trade, no metal) than expected.	Yes
EBA III	More sites in agricultural land than expected. More sites near trade routes than expected. More sites in catchments 7 (agricultural, trade, metal possible) and 11 (agricultural, trade, no metal) than expected. Fewer sites in catchment 6 (pastoral, no trade, metal possible) than expected	Yes
Formative Wietenberg	More sites in agricultural land than expected. More sites near trade routes than expected. More sites in catchments 7 (agricultural, trade, metal possible) and 11 (agricultural, trade, no metal) than expected.	Yes
Classical Wietenberg	More sites in agricultural land than expected. More sites near trade routes than expected. More sites in catchments 7 (agricultural, trade, metal possible) and 11 (agricultural, trade, no metal) than expected.	No

In addition to looking at site locations within the landscape, it is also possible to take into account demographic centralization. Using horizontal site extent as a proxy for site size (see above), I tracked how population size was linked to different catchments and resources. For each phase, I present the mean site size for sites in different catchments for the three main resources; land use (Figure 8.55), access to trade routes (Figure 8.56), and access to metal (Figure 8.57).

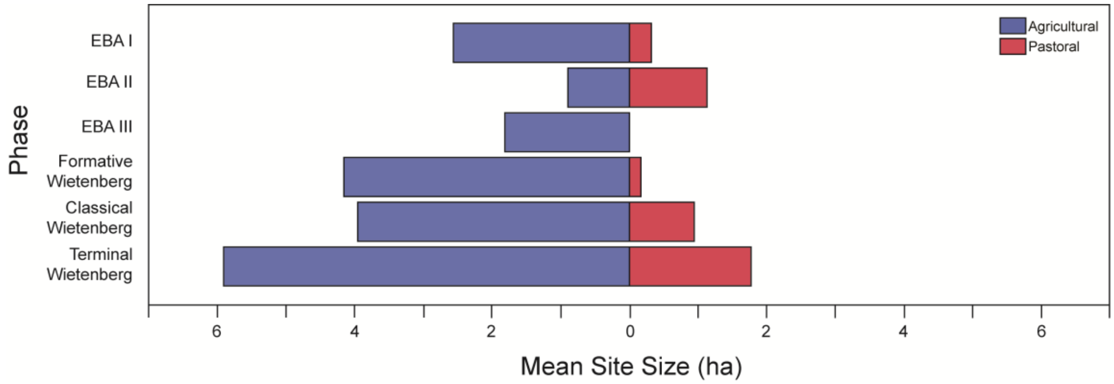

Figure 8.55 – Mean site size in agricultural and pastoral catchments by phase.

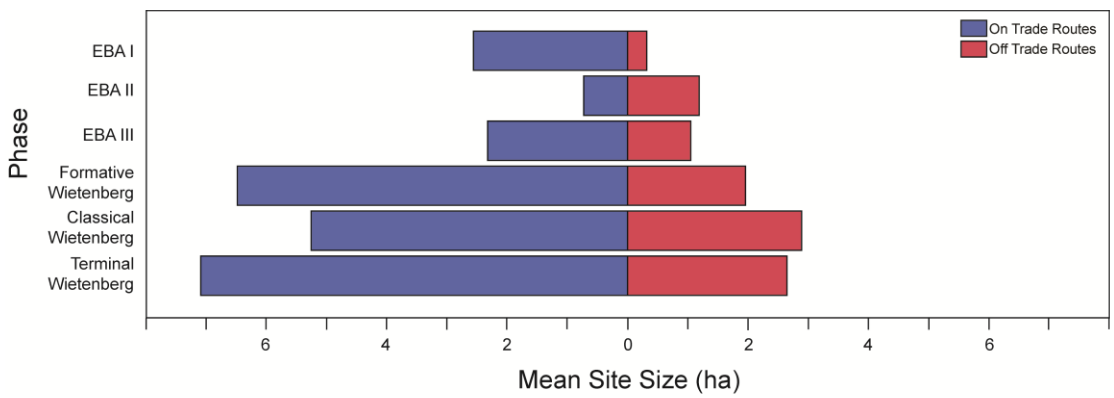

Figure 8.56 – Mean site size on trade routes and off trade routes by phase.

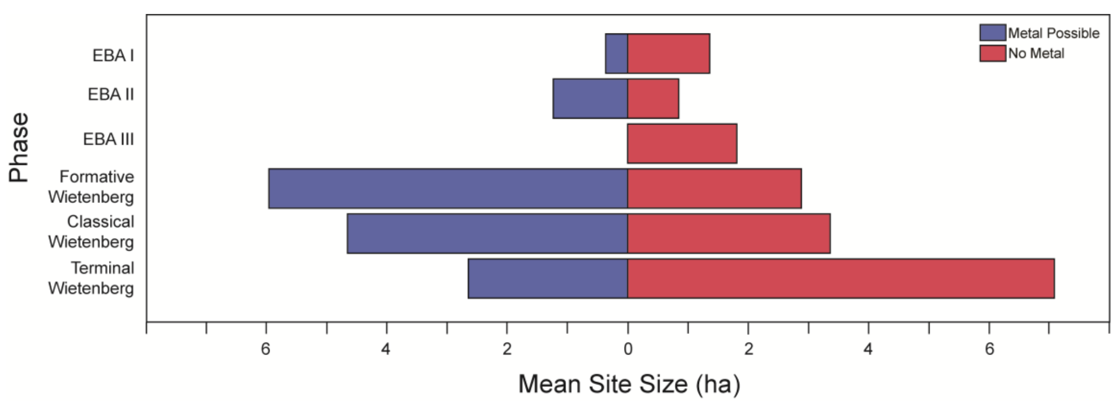

Figure 8.57 – Mean site size in catchments with possible metal access and no metal access by phase.

During the EBA I, larger sites were differentially located in agricultural land, on trade routes, with no access to metal. During the EBA II, there was very little difference in site sizes between different caches for all three resources. This was the only time where there was no clear association of site size with particular catchment types. During the EBA III, there are no sites with known site sizes in pastoral landscapes or where metal access is possible, so it is not possible to determine how catchments affected site sizes for these resources. For access to trade routes, it appears that larger sites were located within catchments where access to interregional trade was possible. During the Formative Wietenberg, sites in agricultural land, near trade routes, and with possible metal access are on average larger than sites in pastoral land, off trade routes, and with no access to metal. The same pattern holds for the Classical Wietenberg. For the four Terminal Wietenberg sites, the average site size is larger in agricultural land, on trade routes, and with no access to metal (influenced strongly by the large site at Pețelca-*Cascadă*).

For individual catchments, only Catchment 7 and Catchment 11 have the largest sites during the phase or have the highest mean site sizes (Table 8.37). For the entire EBA, the largest site and the largest mean site size per catchment is in Catchment 11 (agricultural land, trade access, no metal access). With the transition from the EBA to the MBA and the rise of the Wietenberg Culture, however, there was a segmentation in catchments and site sizes. During the Formative and Classical Wietenberg, the largest average site size was in Catchment 7, and the two largest sites were located in different catchments: Alba Iulia-*Recea/Monolit* was located in Catchment 7 and Pețelca-*Cascadă* was located in Catchment 11.

Table 8.37 - Mean site size (in hectares) for each catchment type. Catchments with the largest average site sizes for each period (shaded grey) and catchments with the largest sites of the period (with asterisk) are marked.

	EBA I	EBA II	EBA III	Formative Wietenberg	Classical Wietenberg	Terminal Wietenberg
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	-	-	-
5	-	1.226	n/a	3.532	3.532	3.532
6	.368	.125	-	n/a	1.644	1.770
7	-	-	n/a	8.399*	6.736*	-
8	-	-	-	-	-	-
9	n/a	.985	1.049	2.037	3.220	-
10	.165	.329	-	.165	.240	-
11	2.563*	1.550*	2.327*	5.532*	4.521*	7.095*
12	-	-	n/a	-	n/a	-
Overall Mean	.767	1.01	1.816	3.659	3.641	4.873

The presence of large sites in Catchment 7 during the MBA should not be a surprise. This catchment has the best access to the three primary resource types: agricultural land, direct access to trade routes, and possible access to metal through hydrothermal vents. Additionally, many of these sites are close to ecotones with pastoral land in close proximity. However, the presence of large sites in Catchment 11, with no nearby source of metal, has two implications for demographic centralization in the Wietenberg Culture. First, population size is not solely a product of the capacity of a particular catchment to meet all economic needs. The most productive catchments do draw in larger populations, either through increased economic opportunities available in rich catchments, or because the locally available resources were mobilized by emergent elite to create political authority that could serve to either push people into nucleated centers or pull them in through a broad range of social, political, economic, and ideological opportunities. The presence of similarly-sized sites in less productive catchments (e.g. Catchment 11, which had no access to metal), suggests that it was not related to the breadth of available of local resources. Second, the presence of large sites in two different catchments suggests that there may have been multiple political economic pathways for the development of MBA towns. The potential for control of economic resources would have been different at Alba Iulia-*Recea/Monolit* and Pețelca-

Cascadă. At Pețelca-*Cascadă*, the lack of locally available metal means that the community may have relied on metal procurement strategies that were different from those employed by the community at Alba Iulia-*Recea/Monolit*. This suggests that despite the emergence of a common shared system of social signaling (through ceramics and mortuary practices) of Wietenberg identity, there may have been political economic diversity among emerging elite populations across the landscape.

Chapter Summary

In this chapter, I have presented the results of the settlement pattern analysis for Bronze Age southwest Transylvania. The data for this analysis was collected during reconnaissance and systematic survey as part of the BATS Project. Four complementary analyses of the settlements were conducted, each contributing a regional perspective to our understanding of the long-term dynamics of social and economic organization of Bronze Age communities in southwest Transylvania. Site and rank-size analyses revealed that large settlements (>8 ha) only developed during the Middle Bronze Age, but that Wietenberg settlement systems do not match expectations for the presence of regional site size hierarchies. Examination of settlement dynamics in the Geoagiu Valley reveals fission-fusion and rapid settlement shifts among Wietenberg communities. It is only in the Late Bronze Age (Terminal Wietenberg) that three-tier site size hierarchies emerge in the Geoagiu Valley, potentially as a social and economic response to the movement of new communities (Noua Culture) into the region. Nearest-neighbor analyses suggest that EBA I communities deliberately spread themselves out on the landscape, suggesting maximizing social distance was a critical factor in settlement placement. Many EBA I sites were not situated in good agricultural land, suggesting that site placement was influenced by non-economic factors. For rest of the EBA and MBA, however, sites were located with regard to specific resources. Simply maximizing social distance was no longer the primary force determining site placement.

Network analyses suggested that during the Bronze Age, a central position within the settlement system was often linked to the organization of the regional social network. During the EBA I and EBA II, the largest settlement was strategically positioned to benefit from, or control, a central position in the flow of information, non-local resources, local resources, and labor. During the EBA III, the largest community would have been able to more strongly influence the flow of labor and local resources rather than information and non-local resources. With the start of the MBA and the genesis of the Wietenberg Culture, the network began to become segmented, with large sites benefiting not from broad centrality across multiple resources, but rather strategically placed to take advantage of only one of the economic resources, particularly the flow of information and non-local resources. One major Wietenberg site (Alba Iulia-*Recea/Monolit*) is not predicted to be important across any network measures during the Classical Wietenberg, suggesting that its growth was less based on its prominence within the regional network, and perhaps related to its potential local access to all resources (agricultural land, trade routes, and possibly metal). Catchment analyses suggested that EBA I communities were situated in the landscape with minimal consideration of accessing particular resources in local catchments. Throughout the Bronze Age, communities did not prioritize access to metal ores; perhaps surprising given their abundance and economic importance to all Bronze Age societies. Starting with the EBA II and continuing through the Terminal Wietenberg, communities prioritized access to agricultural land and international trade routes along the Mureș River corridor. With the start of the MBA, there was a diversification among the catchments in which the largest settlements were placed, suggesting that different large Wietenberg communities may have engaged in different socio-economic strategies to grow and support their populations.

In Chapter 11, I will explore how these analyses provide coherent or dissonant views of the organization of social and economic institutions and how and when they changed throughout the Bronze Age.

Chapter 9 - Cemeteries in Southwest Transylvania

Chapter Introduction

This chapter presents the results of mortuary analyses conducted at multiple scales within southwest Transylvania. Mortuary analyses provide insights into the organization of social, economic, and ideological institutions in the Bronze Age. Specifically, mortuary analyses provide insight into social identities, segmentation, and ranking in Bronze Age communities, as well as how mortuary rituals may have been used to contest access to key parts of the landscape in this rich resource procurement zone. Due to a lack of diagnostic features associated with different subphases of the Early and Middle Bronze Ages, as well as the paucity of available radiocarbon dates, the mortuary analyses in this chapter focus broadly on the divide between the Early and Middle Bronze Ages. When possible, finer-grained chronological insights are discussed.

Site descriptions for all cemeteries recorded by the BATS Project and used in this analysis can be found in Appendix A. This chapter is broken down into four subsections. First, I introduce the cemeteries documented by the BATS project and discussed in subsequent analyses. Second, I present a brief overview of the variable types of mortuary treatment that are present southwest Transylvania. Third, I present a chronological model for two Early Bronze Age cemeteries and one Middle Bronze Age cemetery that allow us to explore how the roles of mortuary practices changed between these periods. Fourth and finally, I present a catchment analysis, using the same method employed in the study of settlement catchments (see Chapters 5 and 8). Taken together, these archaeological measures present a unique perspective on the organization of political, economic, and ideological institutions of Bronze Age societies in procurement zones.

Cemeteries in Southwest Transylvania

Early Bronze Age Cemeteries

There are hundreds, if not thousands, of Early Bronze Age tombs in the Apuseni Mountains of Southwest Transylvania. The tombs in close proximity to each other can be grouped together into cemeteries. Each cemetery is made up of between one and sixteen discrete tumuli (Ciugudean 1995:28). Many cemeteries have been recorded over the past 120 years, though only a few have been excavated (see Ciugudean 1995, 1996, 1997a, 2011; Gerling and Ciugudean 2013). The BATS Project conducted reconnaissance survey to get accurate spatial data for several previously known cemeteries. New pedestrian surveys conducted by the BATS Project team identified many additional tumuli and cemeteries. In total, 60 discrete cemetery sites in Alba County with accurate site locations make up the BATS Project database (Figure 9.1 and Table 9.1). This list is only a small portion of all Early Bronze Age cemeteries in the Southwest Transylvanian landscape.

Table 9.1 - EBA cemeteries in southwest Transylvania.

ID	Site Name	Number of Tombs	ID	Site Name	Number of Tombs
292	Ampoița-*Colții Româneșii*	5	322	Livezile-*Baia*	6
293	Ampoița-*Dealul Doștiorului*	4	323	Livezile-*Cărpiniș*	1
294	Ampoița-*La Bulz*	5	324	Livezile-*Dealul Sârbului*	3
295	Ampoița-*(no name)*	3	325	Livezile- *Obirsie/Obursi*	1
296	Ampoița-*Peret*	9	326	Meteș-*La Meteșel*	9
297	Ampoița-*Vârful Marului*	2	327	Meteș-*Pleașa Înaltă*	1
298	Ampoița-*Vârful Vârtopulor*	2	328	Meteș-*Toaca*	9
299	Bărăbanț-*(no name)*	2	329	Meteș-*Zapode*	3
300	Capud-*Măgura Capudului*	2	330	Oiejdea-*Bilag 1*	2
301	Cetea-*La Bai/La Pietri*	5	331	Poiana Aiudului-*Tacul Mare*	1
302	Cheile Aiudului-*Dealul Velii*	16	332	Ponor-*(no name)*	4
303	Craiva-*Piatra Craivii 1*	1	333	Rameț-*Gugului*	7
304	Craiva-*Piatra Craivii 2*	2	334	Rameț-*La Cruce*	2
305	Cricău-*(no name)*	1	335	Rameț-*(no name) 1*	2
306	Gârbova de Sus-*(no name)*	4	336	Rameț-*(no name) 2*	3
307	Gârbova de Sus-*Piatră Danii*	1	337	Rameț-*Dealul Vârfului*	7
308	Geoagiu de Sus-*Cuciu*	11	338	Rameț-*(no name) 3*	3
309	Geoagiu de Sus-*Geoagiu-Cetea 1*	1	339	Rameț-*(no name) 4*	1
310	Geoagiu de Sus-*Geoagiu-Cetea 2*	1	340	Rameț-*Ticera*	5
311	Geoagiu de Sus-*(no name) 1*	2	341	Roșia Montană-*Sesul Monului*	4
312	Geoagiu de Sus-*(no name) 2*	1	342	Șard-*Bilag*	1
313	Geoagiu de Sus-*(no name) 3*	1	343	Sebeș-*(no name)*	1
314	Geomal-*Măgura 1*	3	344	Straja-*Măgura*	1
315	Geomal-*Măgura 2*	3	345	Stremț-*(no name)*	1
316	Geomal-*Măgura 3*	2	346	Țelna-*Dealul Chicerii*	2
317	Hăpria-*Capu Dosului*	2	347	Țelna-*Rupturii*	9
318	Hăpria-*(no name)*	4	348	Țelna-*Sălășele*	4
319	Izvoarele-*Gruiul Roșu*	5	349	Vălișoara-*Gruiu Darului*	3
320	Izvoarele-*La Cruce*	1	350	Vălișoara-*La Strunga*	1
321	Izvoarele-*La Furci*	7	351	Vințu de Jos-*Viile Lacranjenilor*	1

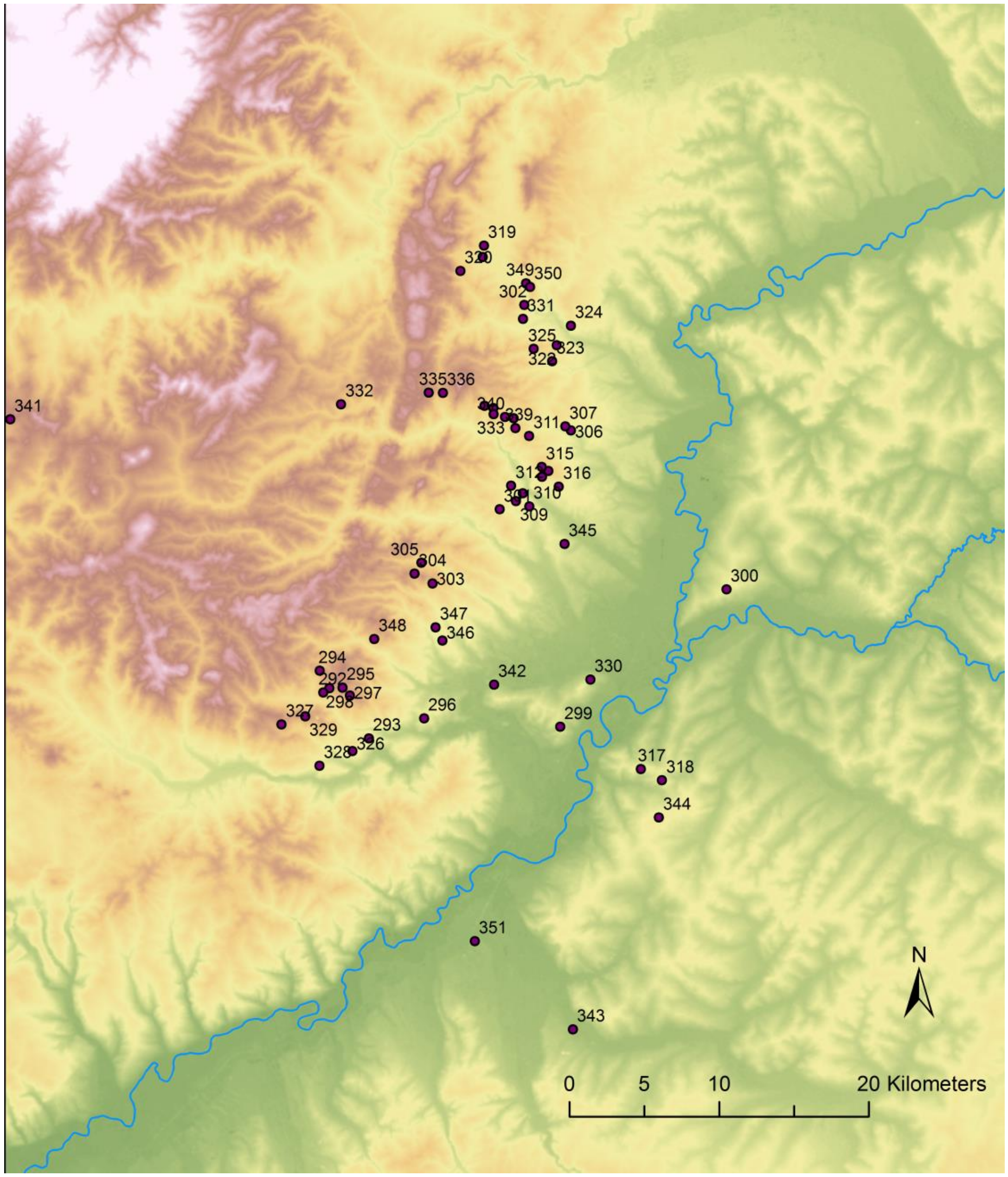

Figure 9.1 – Map of EBA cemeteries in southwest Transylvania.

Wietenberg Cemeteries and Other Mortuary Contexts

There are far fewer cemeteries known for the Wietenberg Culture. The paucity of Wietenberg cemeteries is likely due to (1) the lack of visible marking of cemeteries on the landscape (unlike the EBA tombs), (2) the abundance of cremation, which makes remains more difficult to identify as human, and (3) an overall lack of large-scale systematic archaeological research into the Wietenberg Culture (which is currently being addressed in part by highway and other large construction projects – see Fântâneanu et al. 2013; Palincaș 2014). It is unclear if there was an actual decrease in number of mortuary sites from the EBA to the MBA. Unlike the EBA, Wietenberg bodies have been found in a variety of contexts across the landscape, including in settlements, reused EBA tombs, as well as formal cemeteries (Bălan 2014b; Boroffka 1994a; Ciugudean 1989). Cemeteries range in size from 3 to 61 discrete burials (Palincaș 2014). No new Wietenberg cemeteries were recorded during the BATS Project, though the project did include contributions to the dating of burials from several Wietenberg mortuary sites (see Bălan and Quinn 2016). A total of nine previously recorded mortuary loci in Alba County make up the BATS Project database (Figure 9.2; Table 9.2).

Table 9.2 – Wietenberg mortuary sites in southwest Transylvania.

ID	Site Name	Site Type	Number of Burials
161	Micești-*Cigaș*	Settlement	2
170	Obreja-*Cânepi*	Settlement	1
251	Uioara de Jos-*Îtardeau/La Parloage*	Settlement	1
266	Sibișeni-*Deaspura Satului*	Cemetery	43
273	Sebeș-*Între Răstoace*	Cemetery	61
280	Oiejdea-*Bilag 1*	Cemetery	3
293	Ampoița-*Dealul Doștiorului*	Reused Tomb	1
301	Cetea-*La Bai/La Pietri*	Reused Tomb	1
302	Cheile Aiudului-*Dealul Velii*	Reused Tomb	1

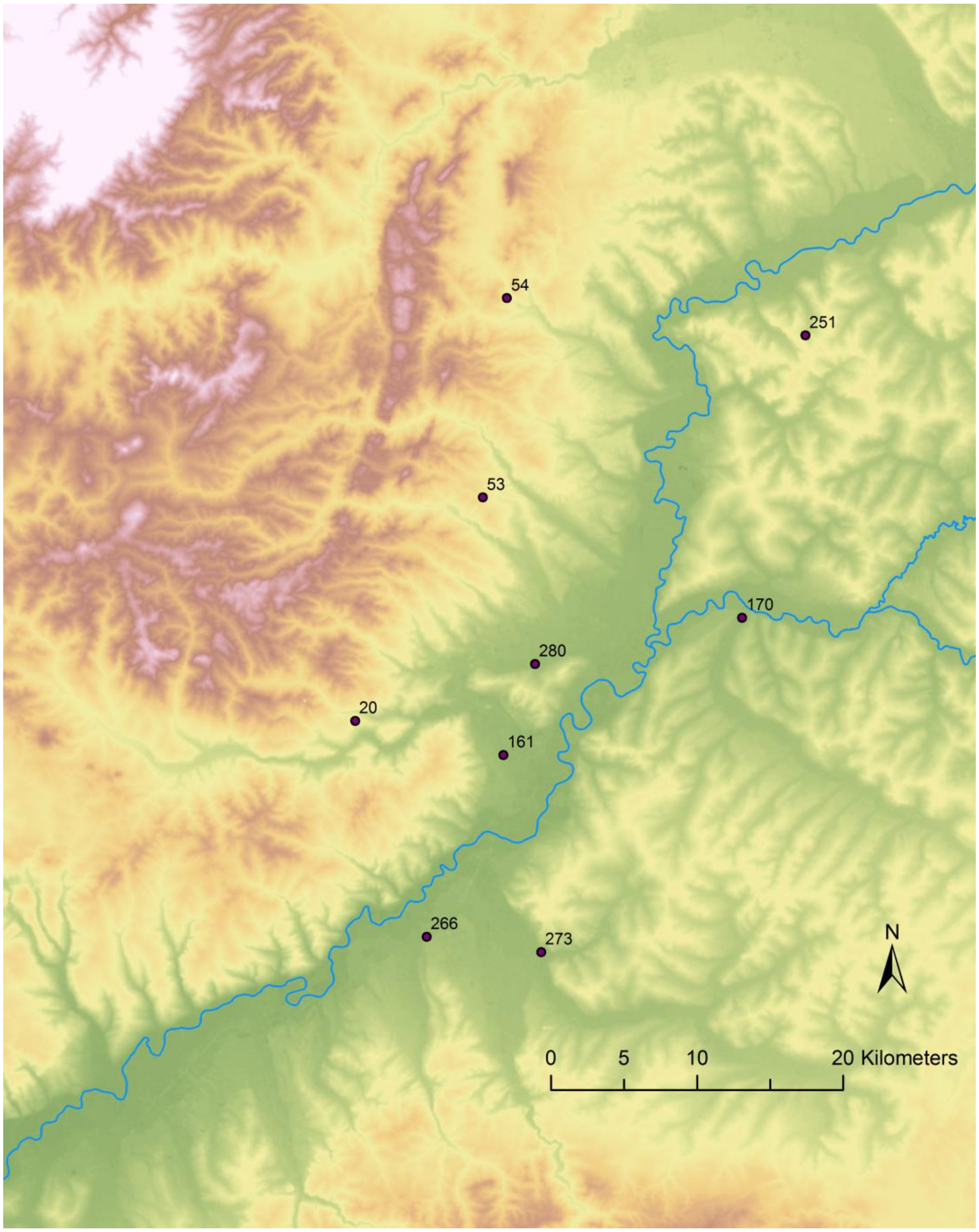

Figure 9.2 – Map of Wietenberg mortuary sites in southwest Transylvania.

Patterned Variability in Mortuary Practices

As described in Chapter 4, there were significant differences in the mortuary practices of Early and Middle Bronze Age communities in southwest Transylvania. More extensive discussions of mortuary variability for Transylvanian Bronze Age communities can be found in work by Ciugudean (1995, 1996, 1997a) and Palincaș (2014).

EBA Mortuary Practices

Early Bronze Age communities buried their dead in above ground tomb cemeteries. The tombs were primarily situated in upland locations, along intra- and inter-valley ridges (Figure 9.3). In the Apuseni uplands, individuals were placed on the original ground surface, then covered with a limestone cairn likely capped with an earthen cairn. Along the Mureș Valley, tombs were not covered with limestone, only an earthen cairn. Tomb cemeteries varied in size, from one isolated tomb to at least 16 separate tombs (Cheile Aiudului-*Dealul Velii*). Isolated tombs make up 18 (34.6%) of the 52 EBA cemeteries with size information. Each tomb contains the remains of a few individuals, with most tombs having between 1 and 9 individuals (Ciugudean 1996).

Figure 9.3 – The EBA cemetery at Rameț-*Gugului*: (a) the setting of the cemetery on an intra-valley ridge in the Geoagiu Valley with the Mureș Valley in the background; (b) the largest intact tomb in the cemetery.

There are some slight differences in the size of cemeteries and tombs based on position in the landscape. There are two landscape contexts where EBA cemeteries are found: those that are positioned on ridges that separate drainages of streams that feed into the Mureș River (inter-valley cemeteries), and those that are positioned along spurs within valleys (intra-valley cemeteries) (Table 9.3). In general, intra-valley cemeteries have more and larger tombs than inter-valley cemeteries. It is possible that different tomb cemeteries served different social, economic, political, or ideological roles. For example, inter-valley tombs may be used as territorial boundaries for communities in each valley, while intra-valley cemeteries may serve as the primary long-term burial ground for communities. For now, the temporal relationship, as well as any demographic, identity, or status differences, between inter- and intra-valley cemeteries remain unclear.

Table 9.3 – Variation in EBA cemetery and tomb sizes based on landscape setting.

	Cemetery sizes		Tomb Sizes			
	Average # of Tombs	% of Cemeteries that are Isolated	# of Small (up to 11 m) diameter	# of Medium (11-20 m diameter)	# of Large (over 20 m diameter)	Average Tomb Size
Intra-Valley Ridges	3.34 (n=26)	42.3% (11 of 26)	8	5	1	10.7 m (n=49)
Inter-Valley Ridges	2.69 (n=26)	26.9% (7 of 26)	11	6	1	9.5 m (n=46)

Early Bronze Age communities buried their dead as either primary or secondary inhumations (Ciugudean 2011:23-25; Gerling and Ciugudean 2013:186). At Ampoița-*Peret*, one of the eight tombs was a cairn (Tomb IV) covering a stone platform with secondary remains on top (Figure 9.4). This platform may have been used to excarnate the dead, who were subsequently transported elsewhere – including being deposited as secondary inhumations in other tombs in the cemetery – prior to being covered at the end of its uselife (see Ciugudean 1991:91, 1996:132-133; Gerling and Ciugudean 2013:186). The majority of the dead are adults, though there are some juvenile and infant burials (see Ciugudean 1996). The limited excavation and bioarchaeological analyses of EBA tombs makes it difficult to estimate who was eligible for burial. However, the limited number of bodies in tombs, combined with the 700-year time period, suggests that a large proportion of the population did not receive burial in tomb cemeteries. This is similar to the mortuary pattern at the Early Bronze Age Mound of the Hostages tomb at Tara, Ireland (see Quinn 2015). With no material signature, archaeologists do not know who was not buried in tomb cemeteries, or where their bodies were disposed.

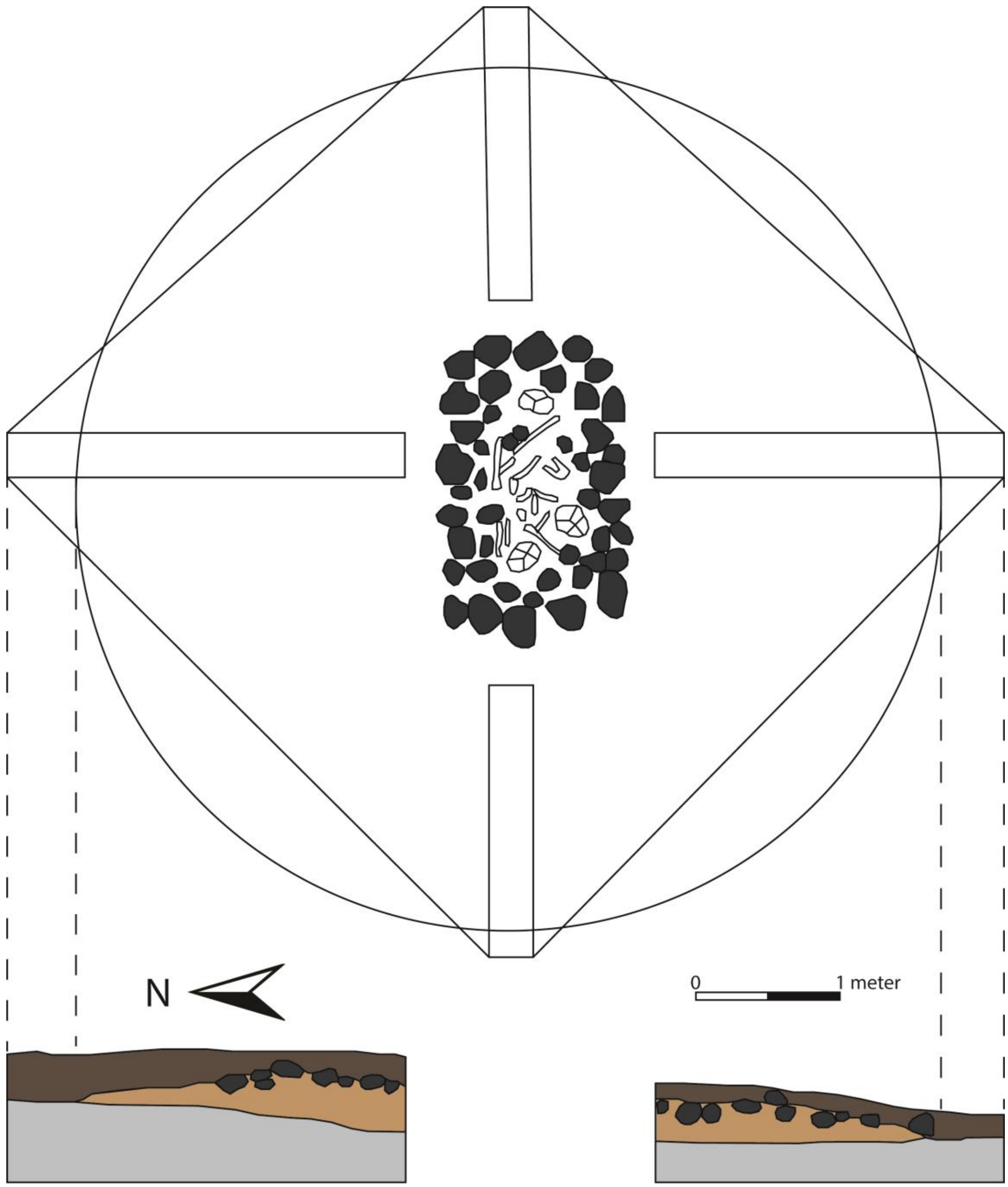

Figure 9.4 – Tomb IV at Ampoița-*Peret* (after Ciugudean 1996:225, Fig. 29).

Early Bronze Age individuals were buried with a range of grave goods, including ceramics and metal objects. At Ampoița-*Peret*, an individual (M.1) in Tomb III was buried with a ceramic vase, two gold earrings, two copper beads, a copper razor, and a copper spectacle-shaped pendant (Ciugudean 1996:Fig.31). Other burials in the same cemetery contained no grave goods.

Wietenberg Mortuary Practices

Mortuary practices became more diverse with the start of the Middle Bronze Age and the emergence of the Wietenberg Culture (Bălan 2014b; Palincaș 2014). The primary burial mode was cremation and burial in flat cemeteries. At the largest Wietenberg cemetery, Sebeș-*Între Răstoace* (n=61 graves), only cremations have been recovered (Fântâneau et al. 2013). Inhumation are also found within formal cemeteries, such as in the second largest Wietenberg cemetery in southwest Transylvania is Sibișeni-*Deaspura Satului* (n=43 graves) (Andrițoiu et al. 2004; Palincaș 2014; Paul 1995). Within cemeteries, there is evidence of spatial clustering of cremations. At Sebeș-*Între Răstoace*, there were three separate spatial clusters of burials. Some cremations show evidence of crushing after burning (e.g., at Sebeș-*Între Răstoace*), while others show no evidence of post-burning modification (e.g., at Sibișeni-*Deaspura Satului*. Bodies, however, received a range of other treatments and were buried in a wider variety of contexts.

Several burials have been found within settlements. Two primary inhumation burials were recovered in pits (Complex 7 and Complex 12) in the settlement at Micești-*Cigaș* (Bălan 2014a, 2014b; Bălan and Ota 2012). Wietenberg bodies have also been found placed in abandoned EBA tombs. The first example is from Ampoița-*Dealul Doștiorului*, where a secondary burial consisting of one skull and long bones was placed with several Wietenberg sherds from a ceramic bowl in the layer of stones in an EBA cairn (Andrițoiu 1992:33; Ciugudean 1996:38, Fig. 18-19; Palincaș 2014). The second example comes from Cheile Aiudului-*Bogza Poienarilor*, where a human skull and a few Wietenberg sherds were found in a pit dug into an EBA cairn (Boroffka 1994a:67; Palincaș 2014). Wietenberg burials have also been found at an alleged "sanctuary" site situated on a hilltop at Oarța de Sus-*Ghiile Botii*. The site is known only from subsurface pits, and a potential circular enclosure wall (Boroffka 1994a; Palincaș 2014; Kacsó 2011, 2013). Wietenberg Type B ceramics were found in association with the human remains, and features with Wietenberg Type C ceramics are characterized by the absence of human remains (Palincaş 2014). Across several pits (Pit 1, 3, 4, 12, 19, 29), researchers recorded at least 14 secondary inhumation burials and a quantity of cremated bone (Palincaş 2014; Kacsó 2011). One bioarchaeologist has interpreted the presence of inhumed bone in a secondary position with evidence of fire marking (though not complete cremation) to be evidence of human sacrifice and consumption of human flesh (Haimovici 2003:57-64), though no cut marks or other evidence of human manipulation were found (Palincaş 2014). There are parallels between Pit 4 and Complex 7 at the settlement site of Micești-*Cigaș*, with a hearth located in a pit with human remains.

Wietenberg burials have surprisingly little variation in the presence of grave goods and funerary architecture. The most common Wietenberg grave goods are ceramics. The vast majority of cremated remains are buried in urns with covering lids (Figure 9.5). There is a surprising paucity of metal in Wietenberg burials (see Bălan et al. 2017a; Boroffka 1994a; Palincaş 2014). The few non-ceramic grave goods that are present include small trade items, such as faience in sub-adult graves at Sebeș-*Între Răstoace* (Bălan et al. 2017a). Some cremations are placed within stone-lined cists (e.g., M. 44 at Sebeș-*Între Răstoace*), while others are placed on top of or below single large stones (e.g., M. 32, M. 13, M. 15 at *Sebeș-Între Răstoace*) (Fântâneau et al. 2013). Most inhumation and cremation burials in Wietenberg contexts are not elaborated with stone funerary architecture.

Figure 9.5 – Wietenberg cremation burial urn and lid from Sibișeni-*Deaspura Satului*.

Using Dates to Explore Mortuary Variability

The Early Bronze Age and Wietenberg mortuary record is highly variable, as described above. However, the source of this variation – whether it is indicative of social segmentation and inequality, or changing customs over time – remains unclear. Radiocarbon dating and Bayesian analyses provide a means of documenting what variability may be the result of diachronic change. By controlling for time, contemporaneous variability could be examined to see the extent to which it represented social variation; from different identities to potential status differences performed through mortuary ritual. In this section, I present temporal analyses of some observed mortuary variation in Bronze Age Transylvania. As part of the BATS Project, samples from several EBA and Wietenberg cemeteries, particularly Meteș-*La Meteșel*, Țelna-*Rupturii*, and Sebeș-*Între Răstoace*, were collected and processed as AMS dates. These represent a pilot study that can be expanded in the future to include additional cemeteries. Chronological models for the development at EBA and Wietenberg cemeteries make it possible to control for change over time and begin to understand how mortuary rituals materialized synchronic social variation.

Early Bronze Age Mortuary Variability

There are two Early Bronze Age cemeteries in southwest Transylvania that have been subjected to radiocarbon dating with multiple dates from the same tumuli: Meteș-*La Meteșel* and Țelna-*Rupturii*. The most complete excavation of an Early Bronze Age cemetery in the past three decades was from Ampoița-*Peret* (Ciugudean 1995:14; Ciugudean 1996:30-37), and while bone samples from Tomb 1 Burial 1 and 2 were able to produce isotopic signatures (strontium and oxygen) (see Gerling and Ciugudean 2013:188), a long bone fragment sent to the AMS laboratory at the Woods Hole Oceanographic Institute did not contain enough collagen for a radiocarbon date. While other sites have produced single dates, such as Livezile-*Baia* (Tumulus 2, Burial 2; Poz-42712; 4015 ± 35 BP; Gerling and Ciugudean 2013:184) and Ampoița-*Dealul Doștiorului* (Tumulus 1; Burial 3; OS-100961; 3850 ± 35 BP; BATS Project), it is only at Meteș-*La Meteșel* and Țelna-*Rupturii* where we can start to distinguish synchronic from diachronic variation.

Meteș-La Meteșel

The site of Meteș-*La Meteșel* is a cemetery composed of 9 tombs along a ridge spreading to the east from a local hill called “Dealul Toaca” (Ciugudean 1995:26). It was initially discovered by Horia Ciugudean during a field survey in 1993 (Ciugudean

1995:26). In 1994, Ciugudean returned to the site to excavate a single tomb, Tomb 1 (Ciugudean 1995:26). The tomb was constructed with two concentric rings of stone covered in a beaten earth mantle. This large tomb (15.5 m diameter; 1.5 m high) contained a total of 8 burials, including 6 inhumations and 2 cremations. The most centrally placed grave (Burial 7) contained the remains of three individuals – an adult male, an adult female, and an adolescent. The adult female and adolescent were buried together as crouched primary inhumations and the adult male was buried as a secondary inhumation "bundle" near their feet (Ciugudean 1996:56). Burial 3 is a female adult primary inhumation placed in a contracted position (Ciugudean 1996:56; Gerling and Ciugudean 2013:189).

As part of their isotopic study of burials from Early Bronze Age tumuli in the Apuseni Mountains, Gerling and Ciugudean (2013) ran an AMS date on the individual from Burial 3 (Poz-42714; 3660 ± 50 BP). The BATS Project ran two dates from Burial 7, one from the crouched adult female skeleton (OS-108309; 4400 ± 30 BP) and one from the disarticulated male skeleton (OS-108310; 4280 ± 25 BP). Based on these dates, it appears that the tomb was initially constructed between approximately 3083-2889 cal. BC, with the centrally placed crouched individuals in Burial 7 (Figure 9.6). A disarticulated skeleton was added to Burial 7 approximately 750 years later. Because the other individuals in the cemetery have not been dated, it is not clears exactly how often other burials were added. However, the presence of Livezile and Șoimuș pottery in association with other burials (Gerling and Ciugudean 2013) suggests the undated burials were likely all deposited before the end of the EBA II (2250 BC), and in most cases, likely well before (prior to 2500 BC). Burial 3, however, has produced a very late date (2137-1976 cal. BC), associated temporally with EBA III Iernut period, when communities with rusticated and textile-impressed ceramics established settlements in the Mureș Valley lowlands. Together, the dates demonstrate that individual tombs were not constructed in a single event – they were places communities returned to and reused (see Quinn 2015). As a result, variation between burials, such as the presence of covering stones (Burial 7), ceramic vessels (Burial 7a, Burial 8), cannot be assumed to be an index of social difference.

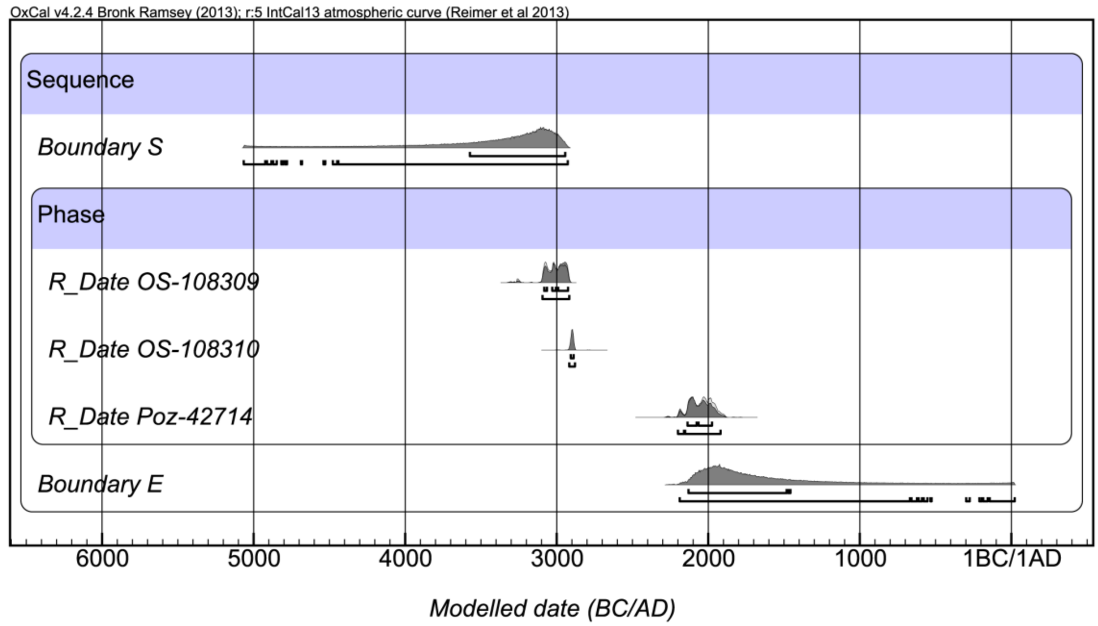

Figure 9.6 – Calibrated radiocarbon dates from Meteș-*La Meteșel* Tomb 1.

The isotopic work by Gerling and Ciugudean (2013) provides a critical line of evidence for understanding the life history of Meteș-*La Meteșel* Tomb 1. The majority of samples (Meteș-*La Meteșel* Tomb 1 Burial 7; Livezile-*Baia* Tomb 2 Burial 2; Ampoița-*Peret* Tomb 1 Burials 1 and 2; Ampoița-*Dealul Doștiorului* Tomb 1 Burial 4) cluster between $^{87}Sr/^{86}Sr$ 0.7090 and 0.7100 and $\delta^{18}O$ -10 to 8‰ (Figure 9.7) (Gerling and Ciugudean 2013:191). Only one sample is a potential outlier: from Meteș Tomb 1 Burial 3 ($^{87}Sr/^{86}Sr$ is 0.71048) (Gerling and Ciugudean 2013:188). This burial has the highest $^{87}Sr/^{86}Sr$ value of the admittedly limited dataset in combination of one of the most depleted $\delta^{18}O$ values (Gerling and Ciugudean 2013:191).

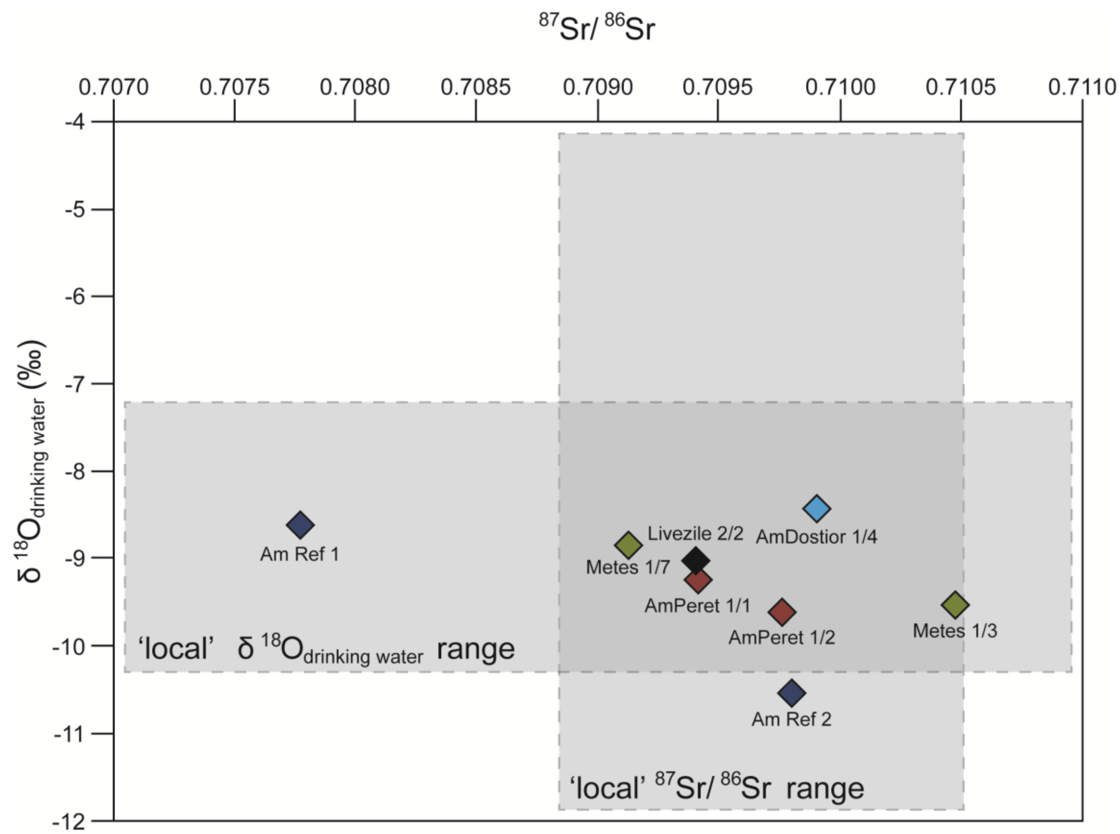

Figure 9.7 - $^{87}Sr/^{86}Sr$ and $\delta^{18}O_{drinking\ water}$ (Chenery et al. 2012) values of human burials from Ampoița-*Dealul Doștiorului* (light blue), Ampoița-*Peret* (red), Meteș-*La Meteșel* (green), and Livezile-*Baia* (black) and control samples from Coțofeni cattle (dark blue). The 'local' strontium and oxygen ranges are displayed in dashed grey frames (after Gerling and Ciugudean 2013:Fig. 8).

In their interpretation, Gerling and Ciugudean (2013:191-192) noted that it was difficult to decide if Burial 3 in Tomb 1 at Meteș-*La Meteșel* was an outlier. The values are marginal but still within the broad 'local' isotopic ranges, and there are no diagnostic artifacts that could point to a non-local origin for the individual. However, considering the new ^{14}C dates from Burial 7 that place the initial tomb construction hundreds of years prior to the death of the individual interred in Burial 3, as well as a broader contextual analysis of settlement patterns and ceramic chronologies contemporaneous with the death of the individual in Burial 3, it is now possible to make a stronger argument that Burial 3 was a non-local individual, and explore why this individual was buried in the existing tomb.

Burial 3 at Meteș-*La Meteșel* is likely an individual associated with the rusticated and textile-impressed ceramics at Iernut sites in the Mureș Valley lowlands. The use of beaten earth in this tomb is similar to the lowland tomb construction technique (see Ciugudean 2011). The isotopic signature suggests the individual is potentially not from the Apuseni uplands. The diagnostic Iernut rusticated wares are found in significant quantities in the Carpathian Basin during the Early Bronze Age and likely were brought into the region by non-local communities moving into Transylvania and establishing settlements to control exchange along the Mureș River. The response from the local Șoimuș communities, as seen at Teiuș-*Coastă*, was to reorganize themselves into larger fortified settlements. In this time of likely social tension between local and immigrant communities, the reuse of Early Bronze Age tombs was likely a political act designed to contest access to ancestors and territory (Quinn 2015). Rather than Șoimuș communities reconnecting with their own ancestors and projecting their connections to the landscape, these non-local communities may have been using burial practices to coopt and control the landscape. The location of the Meteș cemetery, along the Ampoi Valley and the easiest route to the rich copper and gold ores near Zlatna, would have been desirable for any community concerned with controlling access to metal ores.

The evidence from Meteș-*La Meteșel* hints that tomb cemeteries had a lasting impact on the social, economic, and political actions of Early Bronze Age communities. The reuse of tombs, over hundreds of years, underscores the need to be circumspect when comparing variation in body treatment, grave goods, and funerary architecture across the burials within a single tomb.

Țelna-Rupturii

The site of Țelna-*Rupturii* is a tomb cemetery located on top of a hill just north of the modern village of Țelna. The cemetery contains nine separate burial mounds (Ciugudean 1995:27). The site was initially identified in 1985 and two of the mounds were excavated in 1990 by Horia Ciugudean. Three flexed-inhumation burials were found in Tomb 1 (Figure 9.8) and seven individuals were interred in six separate graves (Burials 4 and 5 were comingled) were found in Tomb 2 (Figure 9.9). Individuals in Tomb 2 were buried both as primary and secondary inhumations (Ciugudean 1995:27).

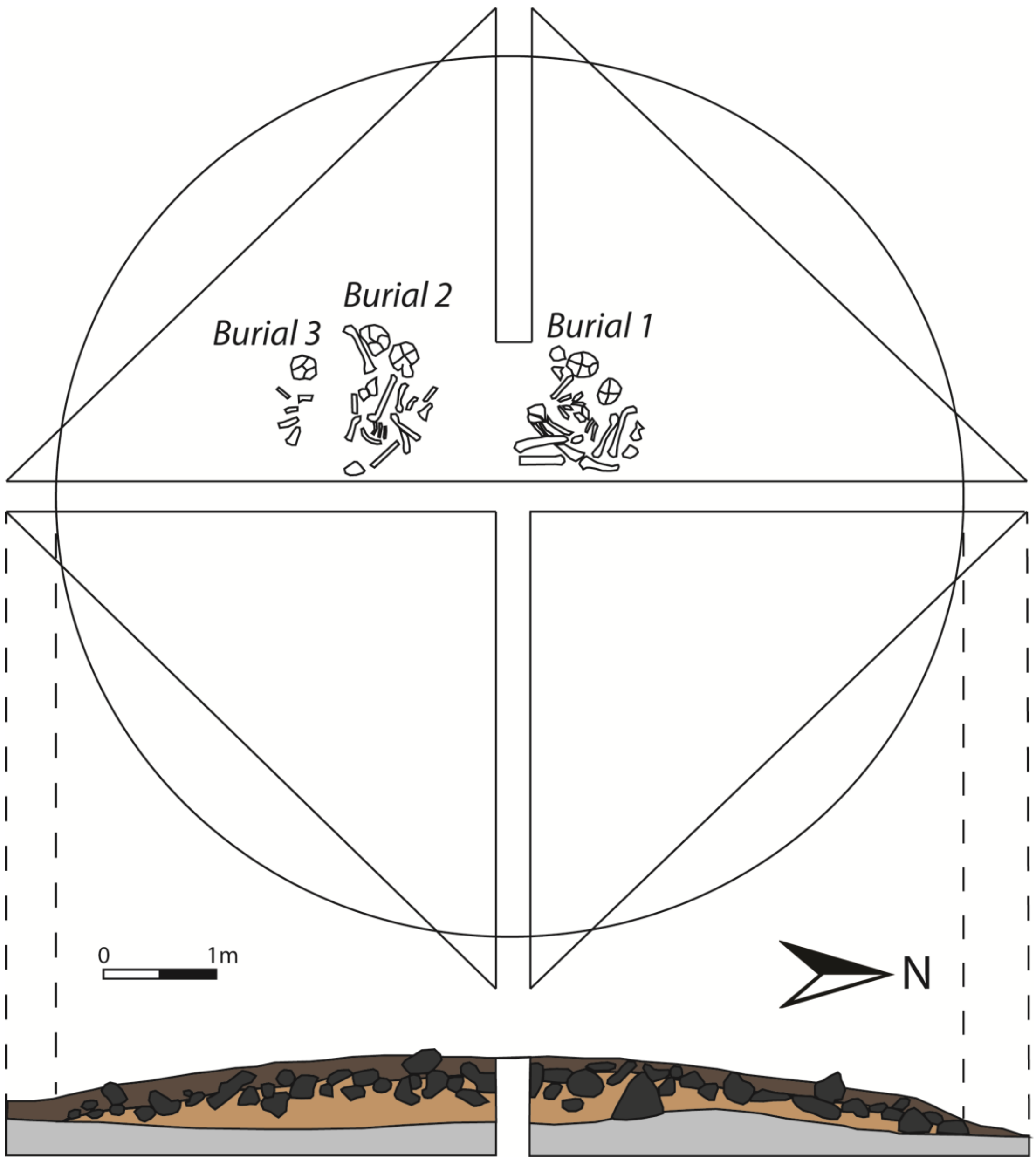

Figure 9.8 – Tomb 1 at Țelna-*Rupturii* (after Ciugudean 1996:235, Fig. 39).

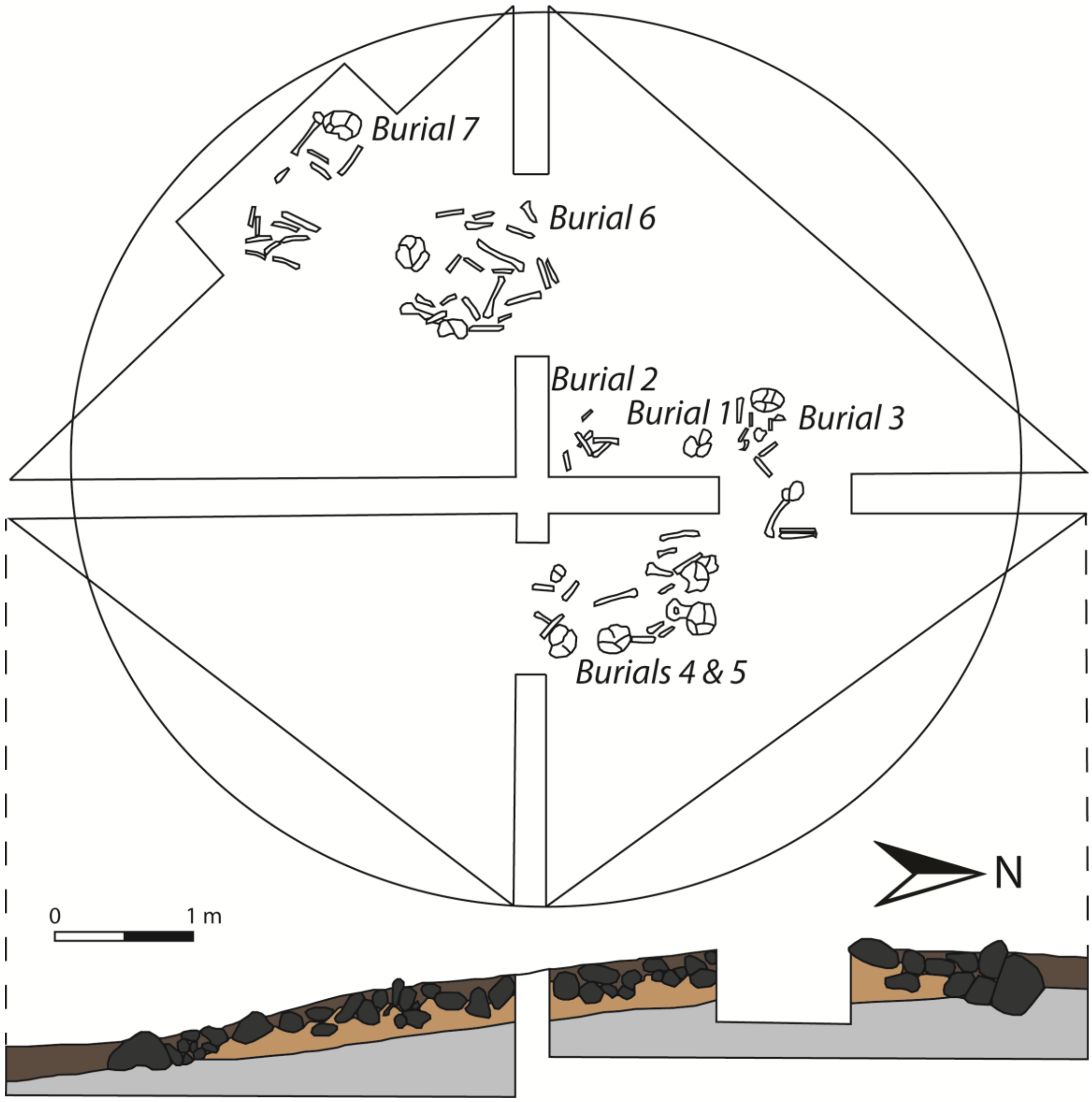

Figure 9.9 – Tomb 2 at Țelna-*Rupturii* (after Ciugudean 1996:236, Fig. 40).

As part of the BATS Project, samples of bone were taken from all three burials in Tomb 1 and three individuals in Tomb 2 for radiocarbon dating. Based on these dates, I have constructed a model of the formation of the tomb cemetery that has identified three distinct phases of burial (Figure 9.10) (see Appendix B for further discussion of model). First, two individuals were buried in Tomb 2 (2750-2650 BC). Next, Tomb 1 was constructed and two individuals were buried sequentially (rather than simultaneously)

(2650-2550). During this second phase no burial took place in Tomb 2. Finally, burials were placed – potentially simultaneously – in Tombs 1 and 2 (2530-2470 BC). These concurrent burials represent the final known interments in the Țelna cemetery. The episodes of burial are reflected in a multi-modal distribution plus a longer period of low-frequency of burial in the sum density plot (see Figure 9.10).

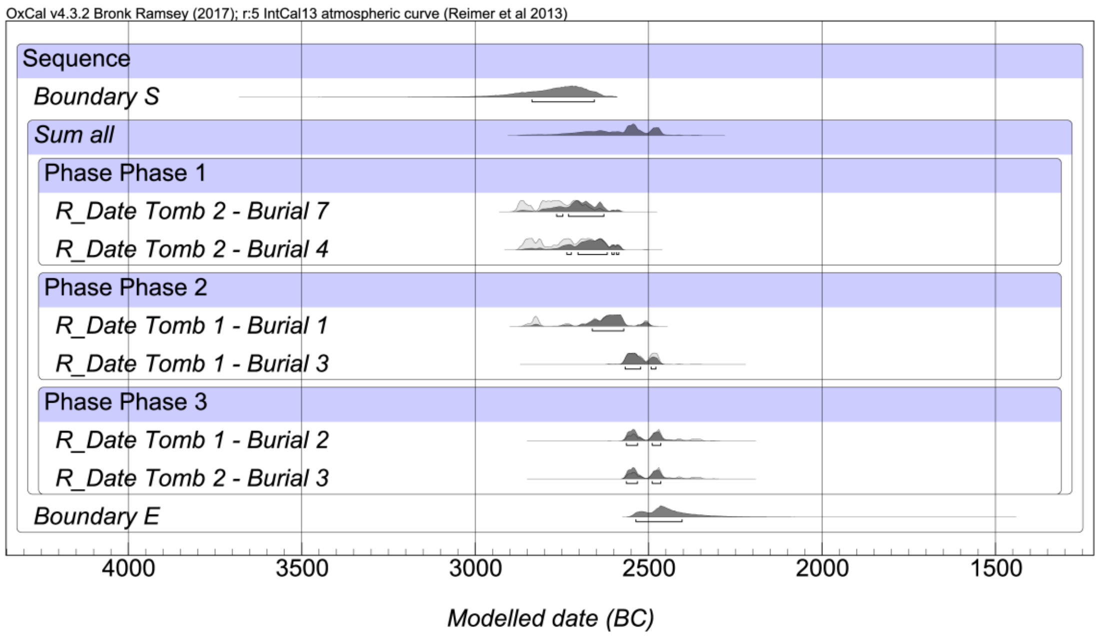

Figure 9.10 – Chronological model and calibrated radiocarbon dates from Țelna-*Rupturii* Tombs 1 and 2, following a three-phase construction.

These data suggest several key factors for the development and abandonment of Țelna-*Rupturii*. First, the tombs were not constructed simultaneously. Second, just like Tomb 1 at Meteș-*La Meteșel*, tombs are not constructed in single events. Instead, tombs grew through subsequent burial events (see Kuijt and Quinn 2013, Scarre 2010 for similar patterns from the British Isles). Third, burial was infrequent over a long period of time (six, up to 10, individuals buried within 300 years – though the modeled boundary start and end of the cemetery suggests it could have been as brief as 100 years), suggesting that only special individuals were eligible for burial. Fourth, the primary phases of tomb construction and use for each tomb do not overlap. Based on this, it is possible that the two tombs may have been constructed by a single lineage or community with burial events taking place intermittently and perhaps corresponding with important social events or deaths of important individuals (e.g., lineage heads). Fifth and finally, the apparently contemporaneous burial in both tombs may be part of a closing ritual for the cemetery. This could signal a deliberate choice to rupture the traditional link between the community who used the cemetery and the physical space itself.

Wietenberg Mortuary Variability

There is more diversity in body treatment and locations where human remains were buried in the Wietenberg Culture when compared with the preceding Early Bronze Age. As part of the BATS Project, samples of human remains from Wietenberg contexts across Alba County were selected for radiocarbon dating. Due to limited fieldwork and curation practices that have not emphasized keeping human remains until recently, samples from only three different sites were analyzed: Sebeș-*Între Răstoace* (n=9), Micești-*Cigaș* (n=2), and Sibișeni-*Deaspura Satului* (n=1). Sebeș-*Între Răstoace* is the largest cemetery in southwest Transylvania, and is discussed in more detail below.

Micești-*Cigaș* is a Wietenberg settlement, where Wietenberg types C and D ceramics were found. The two dates come from two different inhumation burials in former storage pits (Complex 7/2009 and Complex 11/2012) within the settlement (Bălan and Quinn 2014) (Figure 9.11). Dates were run on a long bone fragment from C.11/2012 (OS-108811; 3390 ±25 BP) and a rib fragment from C.7/2009 (OS-108311; 3460 ±25 BP) (Bălan and Quinn 2014:126). When calibrated, these dates extend between 1872-1645 cal. BC (1-sigma, 68.1%) (Figure 9.12).

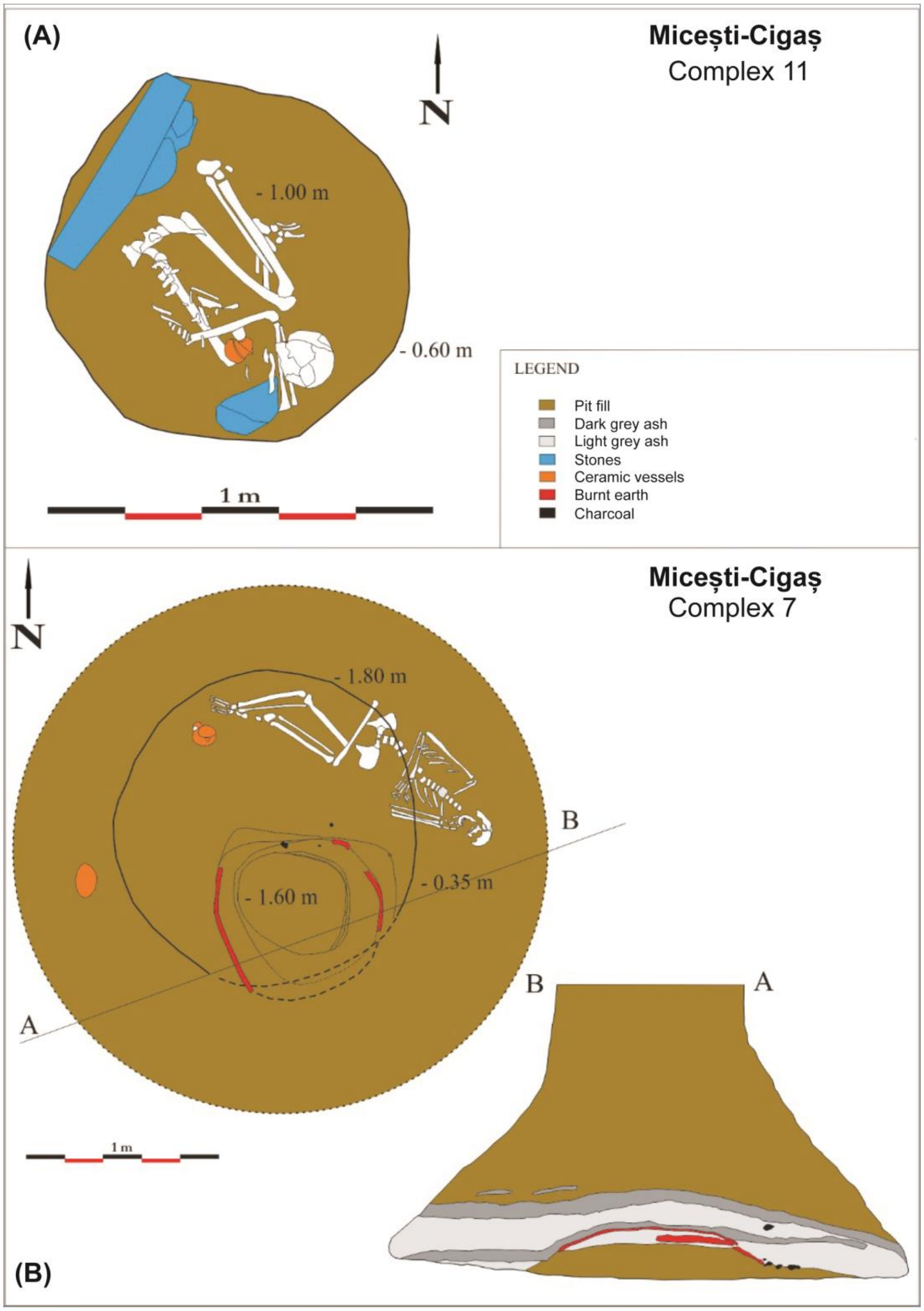

Figure 9.11 – Complexes 11 and 7 at Micești-*Cigaș* (after Bălan 2014a:Plate 3.1).

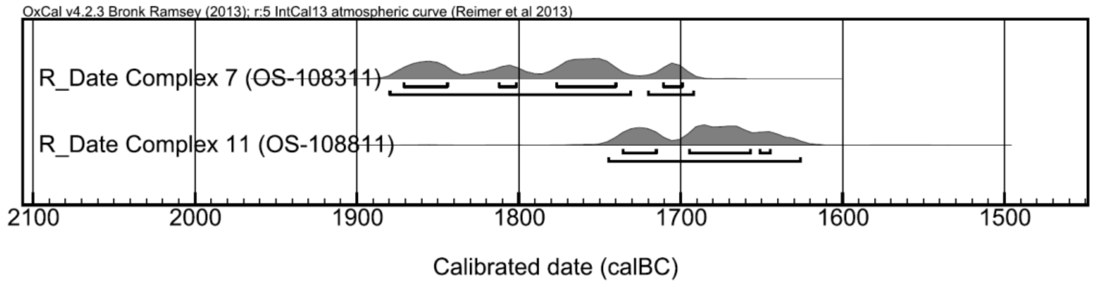

Figure 9.12 - Calibrated radiocarbon dates from Micești-*Cigaș* Complexes 7 and 11.

Sibișeni-*Deaspura Satului* is the second largest cemetery in Alba County (n=43 graves) (Paul 1995). The cemetery, which contains Wietenberg type C ceramics, contains both cremation and inhumation burials (Palincaș 2014). The remains of only one cremation burial has been curated in the Brukenthal Museum in Sibiu (Figure 9.13). According to records at the Brukenthal Museum, the remains came from the vessel pictured in Figure 9.5, which based on illustrations in the report by Paul (1995; Boroffka 1994a:Plates 120-126) appears to most likely be Burial 22 (though it is possible to be from Burials 7, 37, or 39). A fragment of calcined long bone was processed at the NSF AMS laboratory under the direction of Gregory Hodgins (AA-103610; 3454 ±46 BP). The calibrated date for this burial places it between 1877-1693 cal. BC (1-sigma, 68.1%) (Figure 9.14).

Figure 9.13 – Cremated bone from Sibișeni-*Deaspura Satului* curated at the Brukenthal Museum.

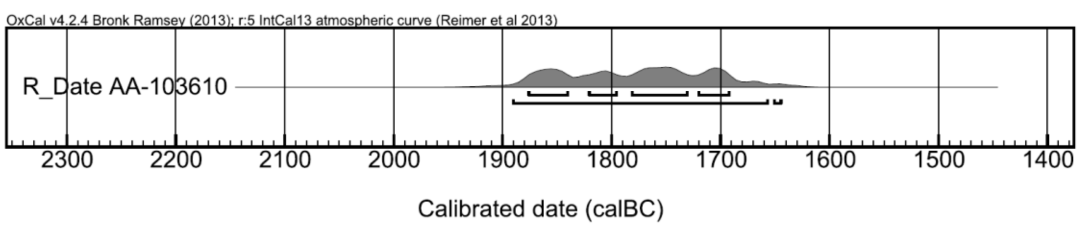

Figure 9.14 – Calibrated radiocarbon date from Sibișeni-*Deaspura Satului*.

These dates demonstrate that cremation and inhumation, and burial within formal cemeteries and within settlements, co-occurred within southwest Transylvania during the Middle Bronze Age. The co-occurrence of cremation with inhumation has been the subject of significant debate recently (see Kuijt et al. 2014). For now, it is unclear if there was a pattern to who was buried and who was cremated, or who was buried in cemeteries rather than buried in cemeteries (or other locations). The co-occurrence of different mortuary treatments suggests that much of the variation among mortuary treatments in the Wietenberg culture may reflect synchronic differences in social identities (see Bălan 2014b; Bălan et al. 2017a). In addition to broad differences across the landscape, there is a significant amount of variation in burial practices within cemeteries – and the cemetery at Sebeș-*Între Răstoace* provides the best data to determine what variation is synchronic and what variation is diachronic within Wietenberg cemeteries.

Sebeș-*Între Răstoace*

Sebeș-*Între Răstoace* is a flat cemetery located on a low terrace of the Secaș River to the northeast of the modern town of Sebeș. The cemetery was discovered during a recent highway construction project and has been subject to salvage archaeology (Fântâneanu et al. 2013:173, 2014:1). More of the cemetery, not in the path of the highway, remains unexcavated. The salvage project, conducted by the National Unification Museum in Alba Iulia, recovered 61 graves in three distinct spatial clusters (Figure 9.15). All graves contained cremated remains inside of urns. There is variability within each cluster in the presence of grave goods, stone settings and cists, and the number of individuals buried within each grave (see Bălan et al. 2017a for an extended discussion of mortuary variability).

Figure 9.15 – Sebeş-*Între Răstoace* cemetery map (after Fântâneanu et al. 2013:Fig. 2).

In collaboration with Gabriel Bălan of Muzeul Național al Unirii-Alba Iulia, nine samples were taken from across Clusters 1 and 2 for radiocarbon dating (Table 9.4). With 9 of 61 burials dated, it is possible to reconstruct the tempo of burial at the cemetery. A Bayesian model of the radiocarbon dates suggests that all of the burials were buried in a single, brief period (within 1880-1780 BC) (Figure 9.16). This single normal distribution of burials is observed in the posterior sum density estimate plot (see Figure 9.16). The normal distribution, and quantity of burials, suggests burial followed the natural death rate of the community who used the cemetery. The length of time it took to form the cemetery (under 100 years) is similar in duration to the length of occupation at most settlements in the Geoagiu Valley (see Chapter 8). The frequency of burial deposition suggests that burial was open to more members of the community than during the EBA. It is likely that the cemetery was constructed by a nearby settlement and was abandoned, with no reuse, after the site was moved. No associated settlement has been found, but no systematic survey has been conducted in the area[8].

Table 9.4 – Dates from Sebeș-*Între Răstoace*.

Lab Number	Uncalibrated Date	Context	Modelled Calibrated Date (1-sigma)
AA-103616	3562 ±42 BP	Cluster 1 – Burial 34	1898-1779 cal. BC
AA-103615	3555 ±41 BP	Cluster 1 – Burial 32	1895-1778 cal. BC
AA-103614	3533 ±41 BP	Cluster 2 – Burial 25	1886-1779 cal. BC
AA-103618	3520 ±41 BP	Cluster 1 – Burial 43	1883-1780 cal. BC
AA-103613	3517 ±41 BP	Cluster 2 – Burial 17	1881-1780 cal. BC
AA-103620	3501 ±40 BP	Cluster 1 – Burial 45	1880-1781 cal. BC
AA-103619	3495 ±40 BP	Cluster 1 – Burial 44	1878-1782 cal. BC
AA-103611	3445 ±41 BP	Cluster 2 – Burial 2	1877-1792 cal. BC
AA-103617	3425 ±41 BP	Cluster 1 – Burial 36	1877-1769 cal. BC

[8] Given the fluvial deposition from the Secaș River, any survey will likely need to incorporate sub-surface testing as flood deposits may have capped Wietenberg occupation levels and prevented these deposits from being represented significantly in the plow zone.

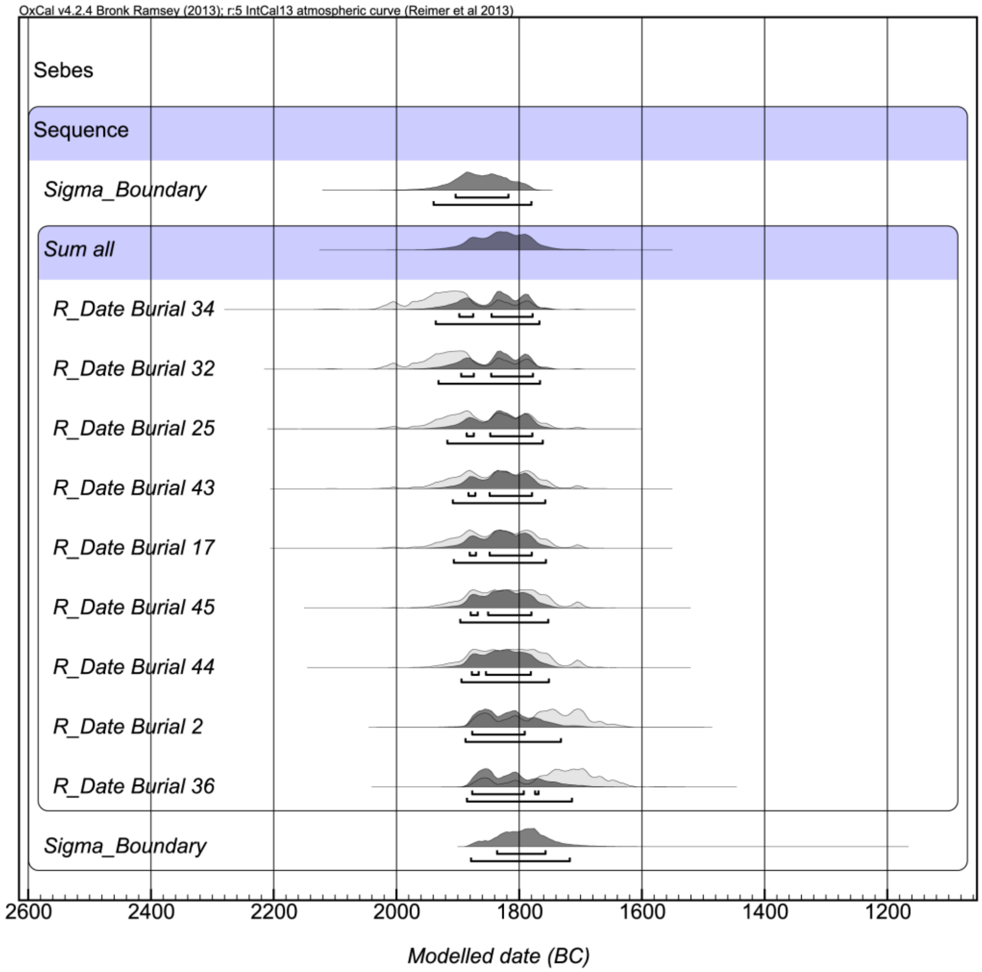

Figure 9.16 – Chronological model and calibrated dates from Sebeș-*Între Răstoace*.

The nine radiocarbon samples were selected to determine whether variation was synchronic or diachronic. The primary forms of variation in the cemetery are: (1) the spatial location within a burial cluster, (2) the presence of stone funerary architecture, and (3) the presence of grave goods beyond the urns containing the cremated remains (Figure 9.17). The three spatial clusters contain 44 (Cluster 1), 13 (Cluster 2), and 4 (Cluster 3) burials respectively. There are stone-lined cists in Cluster 1 (Burials 38 and 44). There are also large stones that were also placed below or above the urns in four burials (Burials 12, 13, 15, and 32). The remainder of the graves lacked any recognizable funerary furniture elaboration. There are 27 burials where urns are covered with lids and 33 urns that lack lids. Faience beads were buried in six burials (Burials 3, 4, 24, 25, 29, and 42), all of which except Burial 29 (adult female) were associated with the cremains of infants (Bălan et al. 2017a). There was no metal found as grave goods at Sebeș.

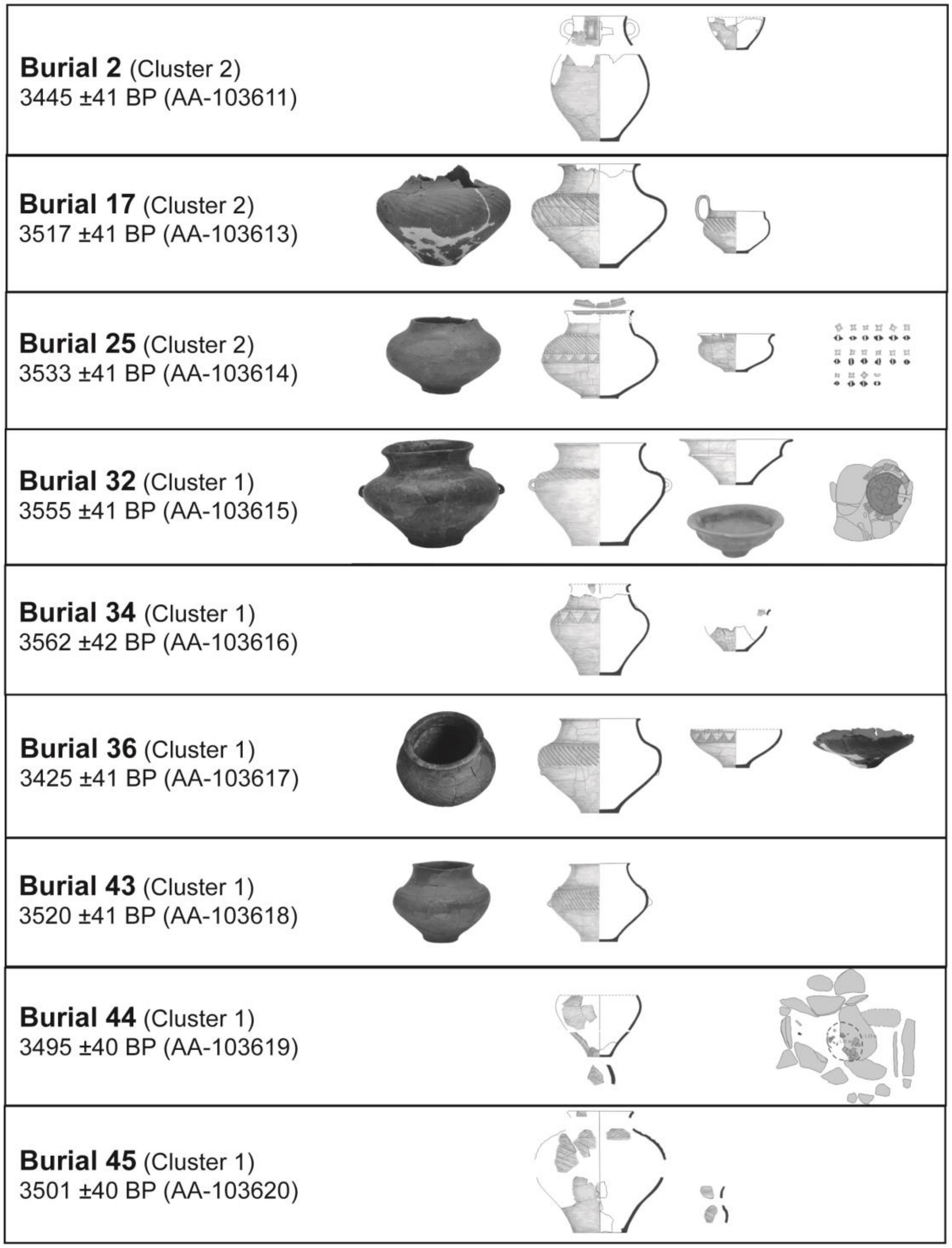

Figure 9.17 – Grave goods and stone settings for dated burials at Sebeș-*Între Răstoace* (after Bălan et al. 2017a:Plate 10).

Based on the overlapping distribution of dates between different clusters, with different constellations of grave goods, and different elaborations of graves with stones, we can for now eliminate change over time as the cause of most mortuary variability in the Sebeș-*Între Răstoace*. The temporal overlap between burial practices at Sebeș, and other body treatments and site types (e.g., inhumation in the settlement at Micești-*Cigaș*) suggests that there are many different pathways for Wietenberg bodies. While the factors that led some individuals to be cremated and buried in flat cemeteries, rather than receiving a different burial practice (e.g., being buried as primary inhumations in flat cemeteries or settlements; cremation and burial in the mantle of EBA tombs), remain unclear, some variation may be attributed to different scales of identity.

Summary of Mortuary Variability in Southwest Transylvanian Bronze Age

The burial practices of communities in southwest Transylvania shifted significantly between the Early and Middle Bronze Ages. Changes in the mortuary record indicate shifts in the roles of mortuary rituals within society.

There are several implications for understanding EBA mortuary practices from the chronological models at both Meteș-*La Meteșel* and Țelna-*Rupturii*. First, it is clear that at least some variability among tombs (including size, grave goods, number of burials, and costliness of construction) in EBA tomb cemeteries that is normally attributed to social differentiation in prehistoric societies may instead be chronological. As a result, differences in grave goods, funerary architecture, and the size of tombs and tomb cemeteries cannot be assumed to reflect inequalities in the social lives of EBA communities in southwest Transylvania. Instead, more chronological data from many more sites are needed to begin to unpack these differences.

Second, however, very few people were buried in EBA tomb cemeteries. Restricted access to burial is often considered as an indicator of social inequalities (see Quinn 2015 for a broader discussion). It is unclear what criteria were used by EBA communities to determine whether an individual was eligible for burial in a tomb or whether their bodies were disposed of in a way that has not been materialized, or discovered, in the archaeological record. The restrictiveness of burial suggests that mortuary rituals would have served to segment society into those who were eligible for burial and those who were not.

Third, reuse of tombs during the EBA was more common than previously thought. The extended use of tomb cemeteries, including potential cross-tomb closing rituals, suggests that in some cases the same community returned to the same cemetery for centuries. The reuse of the tomb at Meteș-*La Meteșel*, however, appears to have been different. The interment of Burial 3, an individual with a potentially non-local isotopic signature, co-occurs with the introduction of a new ceramic style (rusticated/textile-impressed) into the lowlands of Transylvania (2250-2000 BC). The reuse of the previously abandoned cemetery might be the upland communities reconnecting with their ancestors in light of a threat to their way of life, or it could have been lowland communities coopting existing ancestral landscapes, taking ownership over ancestors and landscapes that were not theirs before.

The dates from Sebeș-*Între Răstoace*, Micești-*Cigaș*, and Sibișeni-*Deaspura Satului* provide insight into several aspects of Wietenberg mortuary practices. First, there are many more different pathways from death to burial in Wietenberg communities than in the preceding period. Primary and secondary inhumation co-occur with cremation as body treatments for Wietenberg communities. In addition to burial in cemeteries, some individuals were buried within settlements, and there is evidence for Wietenberg cremations and secondary inhumations being placed in EBA tombs (e.g., Ampoița-*Dealul Doștiorului* and Cheile Aiudului-*Bogza Poienarilor*). The diversity of burial treatments and locations reveal a much more segmented mortuary program, with select individuals and groups receiving different mortuary treatments.

Second, cemeteries both integrated communities, but also materialized different identities within each community. Burial within the same cemetery would have been a way to promote community integration and a shared identity at the village level. If, as Bălan et al. (2017) suggest, the different spatial clusters at Sebeș-*Între Răstoace* were based on kinship (lineages), then the cemetery integrated three distinct lineages who all buried their dead within the same site. In EBA cemeteries, different tombs were likely used by the same lineage over time. Across different cemeteries across the Transylvanian Plateau, Wietenberg communities roughly followed a template of “Wietenberg burial” which involved cremation and burial in a culturally diagnostic ceramic urn. As such, in the same cemeteries, we see communities performing a shared “Wietenberg” identity, a shared “community” identity, yet maintaining distinct “lineage” identities.

Third, costly displays associated with mortuary rituals are much reduced in the Wietenberg culture when compared with the EBA. Due to the use of wood for fuel, it is possible that cremation may have been a highly visible display of resource consumption. However, the fact that cremation is the dominant mortuary rite undermines suggestions that it was a form of conspicuous consumption. The paucity of metal in burials, including gold, copper, and bronze, suggests that conspicuous consumption of metal was not a central part of mortuary rituals. There are significant metal hoards in Bronze Age Romania (Găvan 2012; Harding and Kavruk 2013), some of which may have been deposited as a form of conspicuous consumption. The shift from metal deposition in burials in the EBA to hoards in the Wietenberg Culture may reflect a shift in what roles mortuary practices played within each cultural context.

Fourth, despite the presence of marked segmentation within Wietenberg communities based on mortuary rituals, there is a striking lack of evidence that social segments were ranked hierarchically relative to each other. Burial was much less restrictive in the MBA, as all dead appeared eligible for burial in Wietenberg cemeteries. Material wealth (e.g., metal, feasting deposits) was not deposited in graves. There are two possible explanations for this pattern: (1) there was minimal hierarchical differentiation in Wietenberg society, or (2) there was hierarchical differentiation within the larger society that was intentionally masked in funerary rituals.

Together, the evidence suggests cemeteries and other mortuary contexts represented key loci for political action, identity creation, and contesting inequality during the Early and Middle Bronze Ages in southwest Transylvania. While EBA communities performed restrictive mortuary rituals, Wietenberg communities performed much more “egalitarian” social relationships through burial practices. Beyond social relationships, mortuary rituals can be used by communities to contest land claims, property, and territory (Goldstein 1981). By monitoring how the living place the dead within the landscape, we may be able to get a better understanding of socioeconomic priorities in the past, as well as whether, and how, mortuary rituals were used to contest access to different parts of the landscape.

Cemeteries in the Landscape: Catchment Analysis

When communities placed their dead within cemeteries, they did so according to shared cultural norms. Because rituals can have political dimensions (see Inomata 2006; Quinn 2015), it is possible that Bronze Age communities used cemeteries to contest territory and access to critical economic resources. In the heterogeneous landscape of southwest Transylvania, patterned placement of cemeteries towards specific landscape types can reveal some of the social, economic, and political roles of mortuary rituals. Catchment analyses, described in more detail in Chapters 5 and 8, can provide a way to quantify the relationships between cemeteries and different socioeconomic resources embedded in the landscape. As a reminder, the southwest Transylvanian landscape can be divided into different catchments based on potential prehistoric land use (agricultural or pastoral land), access to metal (near volcanic deposits, hydrothermal vents, or in areas where metal is not located nearby), and access to trade (on or off the major interregional trade routes). We can also intersect these three different types of resources to produce 12 different combinations of catchments (referred to as combined catchments). Previously I described the methods by which the different frequencies of catchments in the landscape were calculated using 5000 randomly placed sites. In this analysis, the spatial distribution of EBA and Wietenberg cemeteries are calculated based on their locations within the landscape and are compared with the random distribution using a Fisher’s Exact Test. If the cemetery catchments deviate from the random distribution, we can interpret that communities differentially preferred certain types of landscapes for the dead. By extension, these analyses can reveal if cemeteries were preferentially placed close to certain economic resources within the landscapes. If cemetery catchments match the random site distributions, however, it is likely because communities did not target particular features of the landscape when placing their dead.

Early Bronze Age Mortuary Catchments

The majority of the 60 cemeteries in the Early Bronze Age were placed in the uplands, along ridges, of the Apuseni Mountains (Tables 9.5 and 9.6; Figure 9.18). As a result, EBA cemeteries were mostly in pastoral land (80%). None of the EBA cemeteries were along the Mureș trade corridor (within 500m of the flood plain). A significant majority of cemeteries (85%) were placed in land with potential access to metal through local hydrothermal vents.

Table 9.5 – EBA cemeteries and their catchments.

ID	Site Name	Land Use	Trade Access	Metal Access	Combined
292	Ampoița-*Colții Româneșii*	Pastoral	No	Possible	6
293	Ampoița-*Dealul Doștiorului*	Agricultural	No	Possible	5
294	Ampoița-*La Bulz*	Pastoral	No	Possible	6
295	Ampoița-*(no name)*	Pastoral	No	Possible	6
296	Ampoița-*Peret*	Pastoral	No	Possible	6
297	Ampoița-*Vârful Marului*	Pastoral	No	Possible	6
298	Ampoița-*Vârful Vârtopulor*	Pastoral	No	Possible	6
299	Bărăbanț-*(no name)*	Pastoral	No	Possible	6
300	Capud-*Măgura Capudului*	Pastoral	No	No	10
301	Cetea-*La Bai/La Pietri*	Pastoral	No	Possible	6
302	Cheile Aiudului-*Dealul Velii*	Pastoral	No	Possible	6
303	Craiva-*Piatra Craivii 1*	Pastoral	No	Possible	6
304	Craiva-*Piatra Craivii 2*	Pastoral	No	Possible	6
305	Cricău-*(no name)*	Pastoral	No	Possible	6
306	Gârbova de Sus-*(no name)*	Agricultural	No	No	9
307	Gârbova de Sus-*Piatră Danii*	Pastoral	No	Possible	6
308	Geoagiu de Sus-*Cuciu*	Pastoral	No	Possible	6
309	Geoagiu de Sus-*Geoagiu-Cetea 1*	Pastoral	No	Possible	6
310	Geoagiu de Sus-*Geoagiu-Cetea 2*	Pastoral	No	Possible	6
311	Geoagiu de Sus-*(no name) 1*	Pastoral	No	Possible	6
312	Geoagiu de Sus-*(no name) 2*	Pastoral	No	Possible	6
313	Geoagiu de Sus-*(no name) 3*	Pastoral	No	Possible	6
314	Geomal-*Măgura 1*	Pastoral	No	Possible	6
315	Geomal-*Măgura 2*	Pastoral	No	Possible	6
316	Geomal-*Măgura 3*	Agricultural	No	No	9
317	Hăpria-*Capu Dosului*	Pastoral	No	Possible	6
318	Hăpria-*(no name)*	Pastoral	No	Possible	6
319	Izvoarele-*Gruiul Roșu*	Pastoral	No	Possible	6
320	Izvoarele-*La Cruce*	Agricultural	No	Possible	5
321	Izvoarele-*La Furci*	Agricultural	No	No	9
322	Livezile-*Baia*	Pastoral	No	Possible	6
323	Livezile-*Cărpiniș*	Pastoral	No	Possible	6
324	Livezile-*Dealul Sârbului*	Pastoral	No	Possible	6
325	Livezile-*Obirsie/Obursi*	Pastoral	No	Possible	6
326	Meteș-*La Meteșel*	Pastoral	No	Possible	6

327	Meteş-*Pleaşa Înaltă*	Agricultural	No	Possible	5
328	Meteş-*Toaca*	Agricultural	No	Possible	5
329	Meteş-*Zapode*	Pastoral	No	Possible	6
330	Oiejdea-*Bilag 1*	Pastoral	No	No	10
331	Poiana Aiudului-*Tacul Mare*	Pastoral	No	Possible	6
332	Ponor-*(no name)*	Pastoral	No	Possible	6
333	Rameţ-*Gugului*	Pastoral	No	Possible	6
334	Rameţ-*La Cruce*	Pastoral	No	Possible	6
335	Rameţ-*(no name) 1*	Pastoral	No	Possible	6
336	Rameţ-*(no name) 2*	Pastoral	No	Possible	6
337	Rameţ-*(no name) 3*	Agricultural	No	Possible	5
338	Rameţ-*(no name) 4*	Pastoral	No	Possible	6
339	Rameţ-*(no name) 5*	Pastoral	No	Possible	6
340	Rameţ-*Ticera*	Pastoral	No	Possible	6
341	Roşia Montană-*Sesul Monului*	Pastoral	No	Yes	2
342	Şard-*Bilag*	Agricultural	No	Possible	5
343	Sebeş-*(no name)*	Agricultural	No	No	9
344	Straja-*Măgura*	Agricultural	No	No	9
345	Stremţ-*(no name)*	Pastoral	No	No	10
346	Ţelna-*Dealul Chicerii*	Pastoral	No	Possible	6
347	Ţelna-*Rupturii*	Pastoral	No	Possible	6
348	Ţelna-*Sălăşele*	Pastoral	No	Possible	6
349	Vălişoara-*Gruiu Darului*	Pastoral	No	Possible	6
350	Vălişoara-*La Strunga*	Pastoral	No	Possible	6
351	Vinţu de Jos-*Viile Lacranjenilor*	Agricultural	No	No	9

Table 9.6 – Distribution of catchments for EBA cemeteries in southwest Transylvania.

	Count	Percent	Fisher's Exact Test
Land Use			Cannot reject H_0 (p=.0507)
Agricultural	12	20.0%	
Pastoral	48	80.0%	
Trade Access			Reject H_0 (p=.0009)
Yes	0	0.0%	*Cemeteries further from trade routes*
No	60	100.0%	*than expected*
Metal Access			Reject H_0 (p<.0001)
Yes	1	1.6%	*More cemeteries near metal sources*
Possible	50	83.3%	*than expected*
No	9	15.0%	
Combined			
2	1	1.6%	5: Cannot reject H_0 (p=.2760)
5	6	10.0%	6: Cannot reject H_0 (p=.1216)
6	44	73.3%	7: Reject H_0 (p<.0001)
9	6	10.0%	9: Reject H_0 (p=.0092)
10	3	5.0%	10: Reject H_0 (p=.0026)
11	0	0.0%	11: Cannot reject H_0 (p=.4118)
12	0	0.0%	12: Reject H_0 (p=.0089)

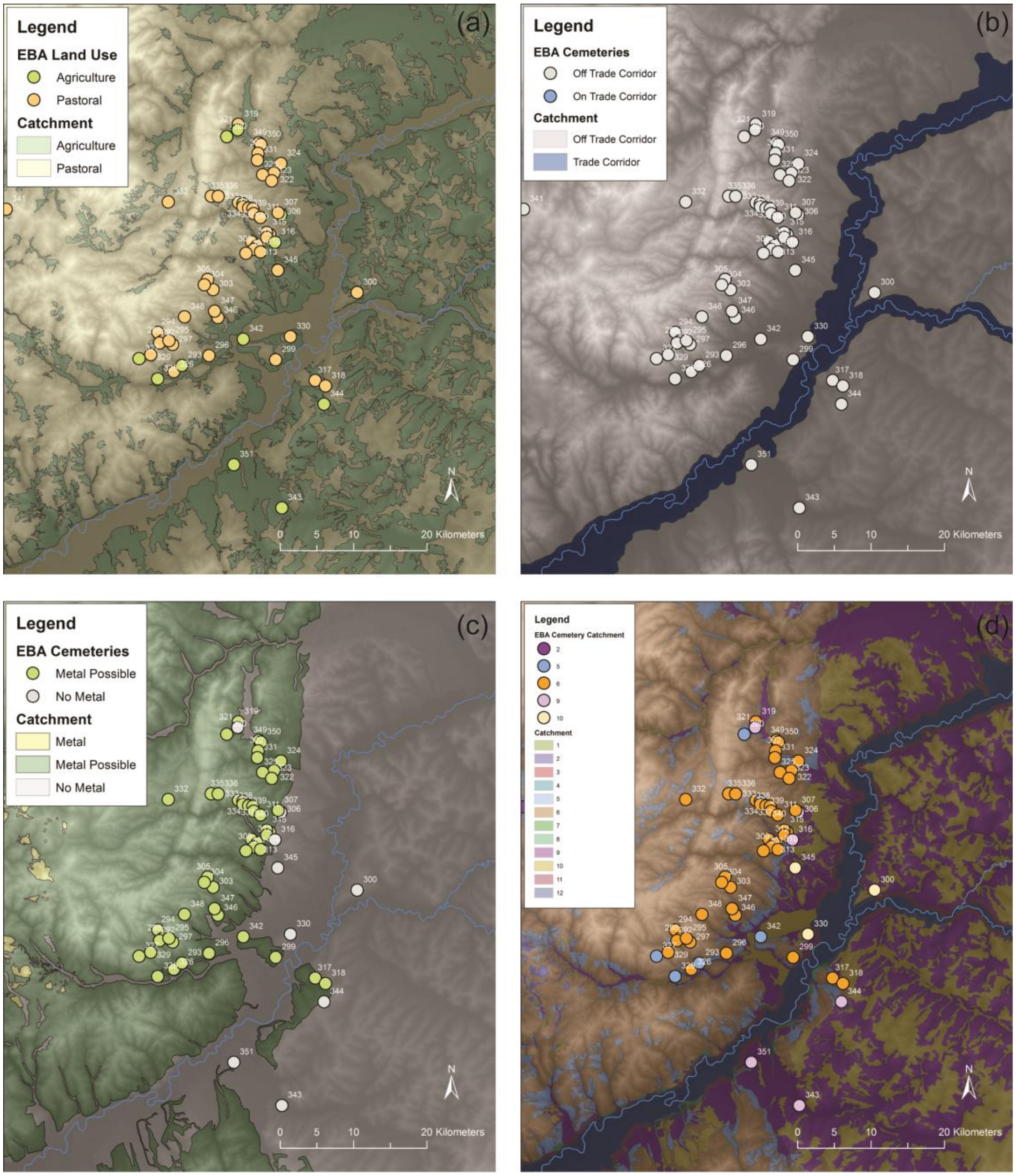

Figure 9.18 – EBA cemetery catchment analysis maps: (a) land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

EBA cemeteries were statistically significantly concentrated near metal sources and away from the Mureș trade corridor (see Table 9.6). Based on this distribution, it is likely that EBA communities used mortuary rituals and performances to contest access to metal sources. This bias towards metal-rich landscapes for burying the dead is in contrast to settlement systems, which did not preference metal-rich landscapes at any point during the EBA.

Wietenberg Mortuary Catchments

The nine loci where Wietenberg bodies have been found are in a variety of catchments (Tables 9.7 and 9.8; Figure 9.19). Unlike EBA cemeteries, the majority are in agricultural land (67%). A couple sites with Wietenberg mortuary remains (22%) are located along the Mureș trade corridor. One-third of mortuary sites (33%) were placed in land with potential access to metal through hydrothermal vents.

Table 9.7 – Wietenberg mortuary sites and their catchments.

ID	Site Name	Land Use	Trade Access	Metal Access	Combined
161	Micești-*Cigaș*	Agricultural	No	No	9
170	Obreja-*Cânepi*	Agricultural	Yes	No	11
251	Uioara de Jos-*Îtardeau/La Parloage*	Agricultural	No	No	9
266	Sibișeni-*Deaspura Satului*	Pastoral	Yes	No	12
273	Sebeș-*Între Răstoace*	Agricultural	No	No	9
280	Oiejdea-*Bilag 1*	Agricultural	No	No	9
293	Ampoița-*Dealul Doștiorului*	Agricultural	No	Possible	5
301	Cetea-*La Bai/La Pietri*	Pastoral	No	Possible	6
302	Cheile Aiudului-*Dealul Velii*	Pastoral	No	Possible	6

Table 9.8 - Distribution of catchments for Wietenberg mortuary sites in southwest Transylvania.

	Count	Percent	Fisher's Exact Test
Land Use			Cannot reject H_0 (p=.0663)
Agricultural	6	66.7%	
Pastoral	3	33.3%	
Trade Access			Cannot reject H_0 (p=.2887)
Yes	2	22.2%	
No	7	100.0%	
Metal Access			Cannot reject H_0 (p=.7396)
Yes	0	0.0%	
Possible	3	33.3%	
No	6	66.7%	
Combined			
2	0	0.0%	5: Cannot reject H_0 (p=1.0000)
5	1	11.1%	6: Cannot reject H_0 (p=.3647)
6	2	22.2%	7: Cannot reject H_0 (p=.4966)
9	4	44.4%	9: Cannot reject H_0 (p=.2360)
10	0	0.0%	10: Cannot reject H_0 (p=.2211)
11	1	11.1%	11: Cannot reject H_0 (p=.2225)

12	1	11.1%	12: Cannot reject H_0 (p=.5640)

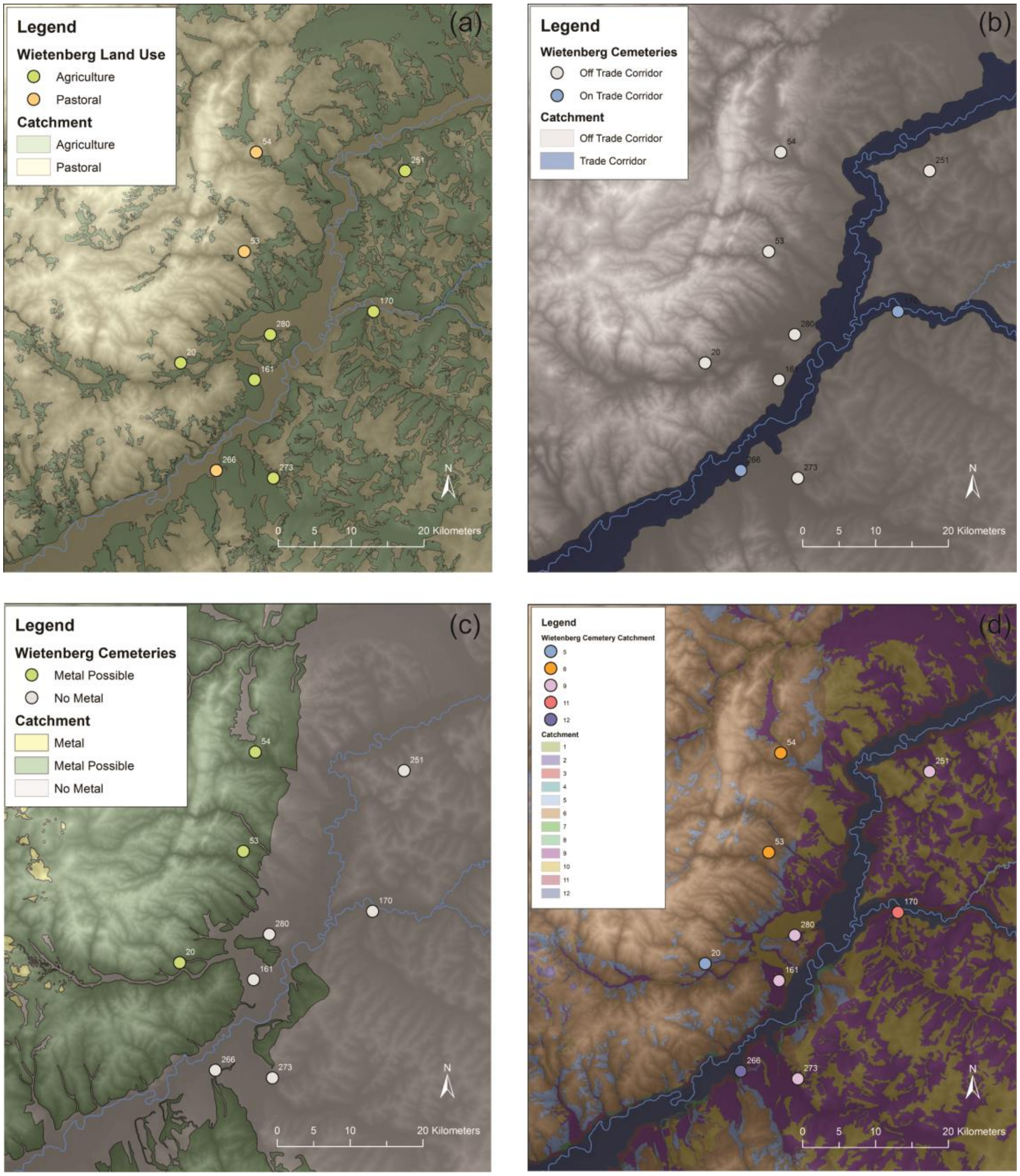

Figure 9.19 – Wietenberg mortuary site catchment analysis maps: (a) land use; (b) access to trade routes; (c) access to metal; (d) combined catchments.

Wietenberg communities did not preference particular configurations of economic resources when placing their dead in the landscape. There is a trend towards preferencing agricultural land over pastoral land, though the current distribution it is not statistically significantly different from a random distribution of site locations. As a result, it is unlikely that Wietenberg mortuary practices revolved around contesting access to resources. Instead, the patterning of cemetery catchments can be largely attributable to a practice of village-linked cemeteries placed near Wietenberg settlements. This contrasts with the practice of cemetery placement in locales with high visibility often away from settlements in the EBA. There is one potentially significant exception to the pattern of Wietenberg communities not preferencing certain landscapes and socioeconomic resources for their cemeteries: Wietenberg communities buried a few of their dead in EBA tombs. The reuse of these tombs, which were strongly associated with metal-rich landscapes, may have been a way Wietenberg communities linked mortuary performance to resource procurement.

Diachronic Change in Mortuary Catchments

It is clear that the use of the landscape for mortuary activities was very different for EBA communities and Wietenberg communities. During the EBA, communities constructed tomb cemeteries in upland, metal-rich areas away from interregional trade routes (Figure 9.20). The construction of highly visible mounds left a permanent mark on the landscape that would have been noticed long after they were built. Formal cemeteries have been suggested as a potential indicator of concern for defining territorial boundaries and ensuring that a corporate group has rights over the use and/or control of crucial but restricted resources (Brown 1995, Chapman 1995, Goldstein 1981, 1995; Saxe 1970). The strong link between EBA cemeteries and metal-rich catchments suggests that EBA communities were concerned with ensuring access to metal sources, and that they used mortuary rituals and cemeteries to establish, maintain, and contest that access.

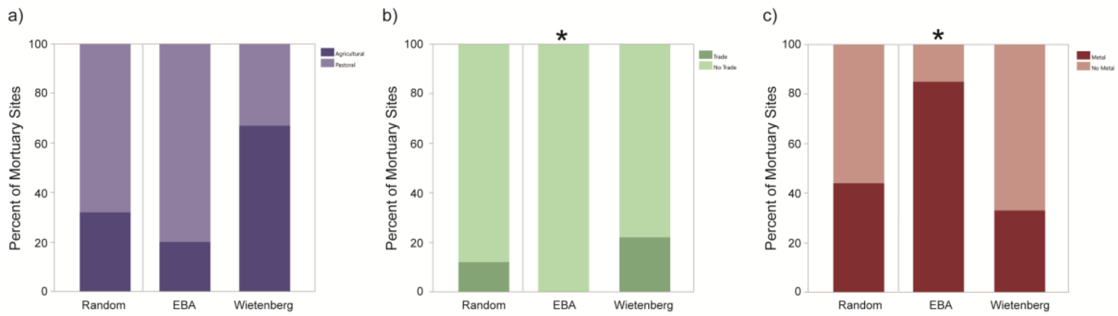

Figure 9.20 – Comparison of distribution of EBA and Wietenberg catchments with random site locations (n=5000) for: (a) land use, (b) access to trade routes, and (c) access to metal). There is a statistically significant preference (marked with *) for landscapes with potential access to metal away from interregional trade routes during the EBA. There is no landscape preference for Wietenberg mortuary contexts.

Unlike the EBA, there is no statistically significant divergence of Wietenberg mortuary sites from random site placement for land use, access to trade, or metal access. Though not statistically significant at the p=.05 level, there is a strong association of Wietenberg mortuary sites (6 of 9 sites) with catchments with good agricultural potential (see Figure 9.20a). Most Wietenberg bodies were placed with no consideration of being close to, or avoiding, interregional trade routes or metal sources. The lack of emphasis on placing Wietenberg cemeteries in metal-rich catchments does not mean that Wietenberg communities did not control metal access. It does mean, however, that Wietenberg mortuary institutions did not develop with contesting access to metal as a sole or primary driver.

While most mortuary sites were not used to contest access to metal sources (as was the case in the EBA), there are three important sites with implications for how metal procurement may have been organized in Wietenberg communities. The three key sites are reused EBA tombs at Ampoița-*Dealul Doștiorului*, Cetea-*La Bai/La Pietri*, and Cheile Aiudului-*Dealul Velii*. At each of these three EBA cemeteries, Wietenberg communities interred bodies in abandoned EBA tombs (one cremation at Cetea-*La Bai/La Pietri*; one secondary inhumation each at Ampoița-*Dealul Doștiorului* and Cheile Aiudului-*Dealul Velii*). There are many reasons why people may reuse monuments and cemeteries (see Quinn 2015), the most important of which are related to ancestors and legitimization. The reuse of EBA tombs by Wietenberg communities may reflect an attempt to connect themselves to earlier inhabitants of the region, as well as offer a way of linking themselves to the landscapes in which these ancestors dwelled. With the strong association between EBA tomb cemeteries and metal-rich landscapes, connecting to EBA cemeteries may have been a way for Wietenberg communities to connect themselves to metal sources. It is important to note that EBA tomb reuse is not the most common place for Wietenberg bodies to be interred. As a result, we see a segmentation in mortuary practices, with bodies being moved to many parts of the landscape, with the potential for different political actions to take place at each location. While contesting metal access was never the dominant driver behind Wietenberg practices, it may have been important for certain communities at specific times in the Bronze Age.

The timing of Wietenberg reuse of EBA cemeteries is still an open question. None of the burials associated with Wietenberg ceramics have been directly dated. In the future, it will be important to figure out when, during the almost 700 year extent of the Wietenberg culture, EBA tomb reuse took place. If EBA tomb reuse occurred throughout the Middle Bronze Age, these special purpose episodic events may have been a way in which institutions for metal procurement were maintained. It is possible that reuse of EBA tombs coincided with start of the LBA and the influx of Noua populations from the east into southwest Transylvania. The LBA Wietenberg settlement at Rameț-*Curmatura* suggests that Wietenberg communities were paying close attention to who was accessing metal landscapes by creating a permanent settlement near metal sources and away from good agricultural land for the first time. It is possible that the disruption of metal procurement and distributions during the Late Bronze Age spurred Wietenberg communities to find new ways of securing access to metal sources (a task that was likely achieved through shared marked identity rather than through active competition in daily life or mortuary realms).

Together, comparing EBA and Wietenberg catchments suggests that the roles of mortuary rituals changed from the EBA to the MBA. In the EBA, communities used tomb cemeteries to mark territory and contest access to metal sources. Starting in the MBA, the roles of mortuary rituals became increasingly segmented. Wietenberg communities were less concerned with using formal cemeteries to contest access to economic resources (and if they were contesting access, it was to agricultural land, not metal). In certain cases, however, bodies were used in rituals that linked Wietenberg communities to EBA ancestors and the metal resources near which they were buried. Over the course of the Bronze Age, the segmentation of the roles mortuary rituals played introduced increased complexity into mortuary practices.

Chapter Summary

In this chapter, I have presented chronological and catchment analyses of EBA and Wietenberg cemeteries in southwest Transylvania. During the EBA, mortuary rituals were restricted to only a small portion of society, who were often buried with personal items, including copper and gold objects. Within tombs and cemeteries, however, much of the variation appears to be diachronic, rather than synchronic. Tomb cemeteries were visible and enduring monuments on the landscape that were differentially situated in upland landscapes near metal ore sources and the pathways from the Trascău Mountains into the even richer ore-bearing landscapes of the Metal Mountains. Iernut communities that moved from the Carpathian Basin into Transylvania in the last two centuries of the third millennium BC buried at least some of their dead in previously constructed and abandoned tombs, revealing strategies of using mortuary rituals to contest access to ancestors, ancestral landscapes, and the nearby metal.

Wietenberg mortuary practices were much more inclusive of all members of society. The majority of individuals were cremated and buried in flat urn cemeteries. At the same time, some individuals were inhumed rather than cremated and some were buried in settlements or reused EBA tombs. Unlike the EBA, most variation in mortuary practices, including body type, spatial clustering, use of stone settings in graves, and in grave goods, are contemporaneous. The increase in different contemporaneous burial modes in the MBA suggests there was increased social segmentation materialized in mortuary contexts. At the same time, there is minimal evidence of status ranking among different burial practices, with the lack of metal and emphasis on cremation potentially obscuring significant inequalities among the living. Unlike EBA cemeteries, Wietenberg communities did not place their cemeteries in settings that contested access to a particular resource, such as metal. In Chapter 11, I will explore how these analyses complement settlement and artifactual analyses to provide coherent or dissonant views of the organization and dynamics of social, economic, and ideological institutions in the Bronze Age.

Chapter 10 - BATS Artifact Analyses

Chapter Introduction

This chapter presents the results of select analyses of artifacts collected as part of the BATS Project. The full contextual information for each lot is presented in Appendix C. The analyses presented in this chapter focus on how different socio-economic activities are distributed across space and change over time. Specifically, I present analyses of (1) ceramic quality, (2) faunal remains, and (3) metallurgical evidence. Each of these analyses provides a line of evidence on the organization and evolution of institutions that complements larger-scale regional perspectives.

The analyses presented in this chapter are limited by the nature of the design of the BATS Project. This project was primarily a regional study, focusing on identifying sites and anchoring sites in time. The test excavations that produced the artifacts presented in this chapter were designed to provide a stratigraphic profile of the site as well as organic material for radiocarbon dating. Consequently, the excavations were extremely limited in horizontal scope, often including only a few (1 to 4) 1x1 m test units across sites. With sites over 8 hectares in size, such small-scale excavations are woefully inadequate for understanding variation across settlements. Test units were also placed without the use of geophysics or other techniques (e.g., coring), so in some cases they hit distinct features and in others they only sampled general occupation fill.

The small spatial scale of excavation also resulted in small sample sizes for each artifact category. Despite collecting and recording over 10,000 objects, the quantity of artifacts from which we can draw conclusions about the socioeconomic organization for any particular occupation level at a site is very small. Additional fieldwork, including large-scale horizontal excavations, are necessary to more fully reconstruct community organization at Bronze Age settlements in southwest Transylvania.

While the BATS Project was not designed to generate sufficient material culture to fully evaluate the organization and evolution of social, economic, and ideological institutions, the artifacts at hand can provide preliminary lines of evidence to complement patterns observed in broader regional and chronological analyses (presented in Chapters 8 and 9). Any conclusions drawn from the artifact analyses presented here must be considered preliminary and will likely be subject to significant revision through future research.

Ceramic Quality: Synchronic and Diachronic Patterns

Bronze Age site assemblages are dominated by ceramics. These artifacts are a category of material that survives millennia of site formation, and they are often the only way to visibly determine a site's chronological affiliation with the Bronze Age. Ceramics are not only numerous, they are also a key line of evidence in understanding social and economic organization of Bronze Age communities. For this study, I conducted a preliminary analysis of ceramic quality on assemblages with known provenience[9] (Appendix D).

In this study, *ceramic quality* is assessed through the relative size and abundance of visible tempers in ceramic pastes. The quality of fabrics can reflect time investment and specialist production in wared. Fabrics with no visible inclusions required that potters spent time separating natural inclusions from clays in deposits. Molding and firing thin fine- and super fine-wares, which are often burnished and decorated in the Middle and Late Bronze Ages, would have been more difficult than manufacturing coarse wares. Variation in the presence and abundance of the highest quality wares may reflect the presence of elite communities that controlled their production or distribution. Fabric, however, is not solely determined by the quality of the potters. Different fabrics have different thermal properties that make them better or worse for certain tasks, particularly

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[9] Assemblages were generated through fieldwork by the BATS Project. The majority of ceramics come from intact deposits through in situ excavated contexts. In the rare case of Stremț-*Berc 1*, where the single component EBA II site was destroyed through modern plowing, ceramics from two surface collection units (10x10 m squares) were incorporated into the analysis. Surface collections at multi-phase sites were omitted because of mixing and their bias towards the latest occupation phases.

cooking. Due to the limitations of the assemblage, the function of the ceramics, such as storage, cooking, or serving, could not be evaluated in conjunction with fabric. Because of the narrow spatial coverage of the test pits, an unknown portion of the variation may be due to differences in the functional uses of the assemblages (e.g., cooking vs. dining refuse) rather than status differences.

The abundance of time-intensive decoration is also a factor affecting the quality of ceramics. Decoration, however, is not explicitly considered in this assessment for several reasons. First, the BATS assemblage was fragmentary, and identifying motifs – particularly complex motifs – was difficult. Second, regional and temporal patterns in the distribution of stylistic motifs were difficult to reconstruct with the limited quantity of decorated ceramics in the sample. In the future, a more thorough and systematic study of decoration will address this critical gap. Boroffka (1994a) conducted a detailed stylistic analysis of Wietenberg ceramics from across Transylvania, and some of his evidence will be presented in the analysis below.

I compare the relative abundance of different quality ceramics as (1) a potential archaeological measure of regional community organization (synchronically) and (2) to monitor the changing roles of ceramics as venues for performing and contesting social identities throughout the Bronze Age (diachronically). It is suggested that village autonomy would result in few differences in the distribution of different fabrics of different qualities while the presence of complex regional polities with institutionalized inequality will have significant differences in the distribution of fabrics of different qualities at contemporaneous sites of different sizes. It is also suggested that increased investment of time and energy in the production of fine-ware ceramics will reflect their importance as a medium for social signaling of different scales of identity.

Early Bronze Age and Wietenberg communities used quartz pieces of various sizes as temper in their ceramics. Quartz naturally occurs in the sandy sediment and clay sources in the region. In some cases, these communities separated the clay from any quartz inclusions, while in others they deliberately kept or added larger pieces of quartz to the clays. Through the process of manipulating temper, Bronze Age communities created ceramics that can be fit into four categories based on the presence, size, and abundance of quartz fragments (Table 10.1).

Table 10.1 - Four ceramic quality categories based on fabric.

Ceramic Quality	Description of Fabric
Coarse	Large quartz fragments and coarse sands as temper. Rarely associated with polished or burnished surface treatment.
Medium	Coarse sands as temper, few large quartz fragments possible.
Fine	Finer sands visible as temper. Can be associated with polished or burnished surface treatment.
Super Fine	No visible temper. Often associated with polished or burnished surface treatment.

Distribution of Ceramic Quality Across Space

There is very little difference in the frequency of different ceramic qualities among sites of different sizes (Table 10.2, Figure 10.1). As such, there is no qualitative difference between the distribution of fine- or super fine-ware ceramics in large sites (6-9 ha) and medium-(3-6 ha) or small-sized (0-3 ha) sites. Based on the limited sample from the Geoagiu Valley, there is no evidence that larger sites had more high quality ceramics than smaller- or medium- sized sites.

Table 10.2 - Distribution of ceramics by quality and site size (row percentages).

	Coarse		Medium		Fine		Super Fine		Total	
	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)
Small (0-3 ha)	91 (13%)	1387.9 (21%)	395 (57%)	2970.4 (45%)	126 (18%)	1049.5 (16%)	85 (12%)	1155.1 (18%)	697	6562.9
Medium (3-6 ha)	90 (7%)	1136.8 (14%)	923 (68%)	5052.9 (63%)	184 (14%)	1220.2 (15%)	157 (12%)	6083 (8%)	1354	8018.2
Large (6-9 ha)	60 (9%)	1107.3 (16%)	438 (64%)	4288.4 (61%)	126 (18%)	984.3 (14%)	58 (9%)	690.7 (10%)	682	7070.7

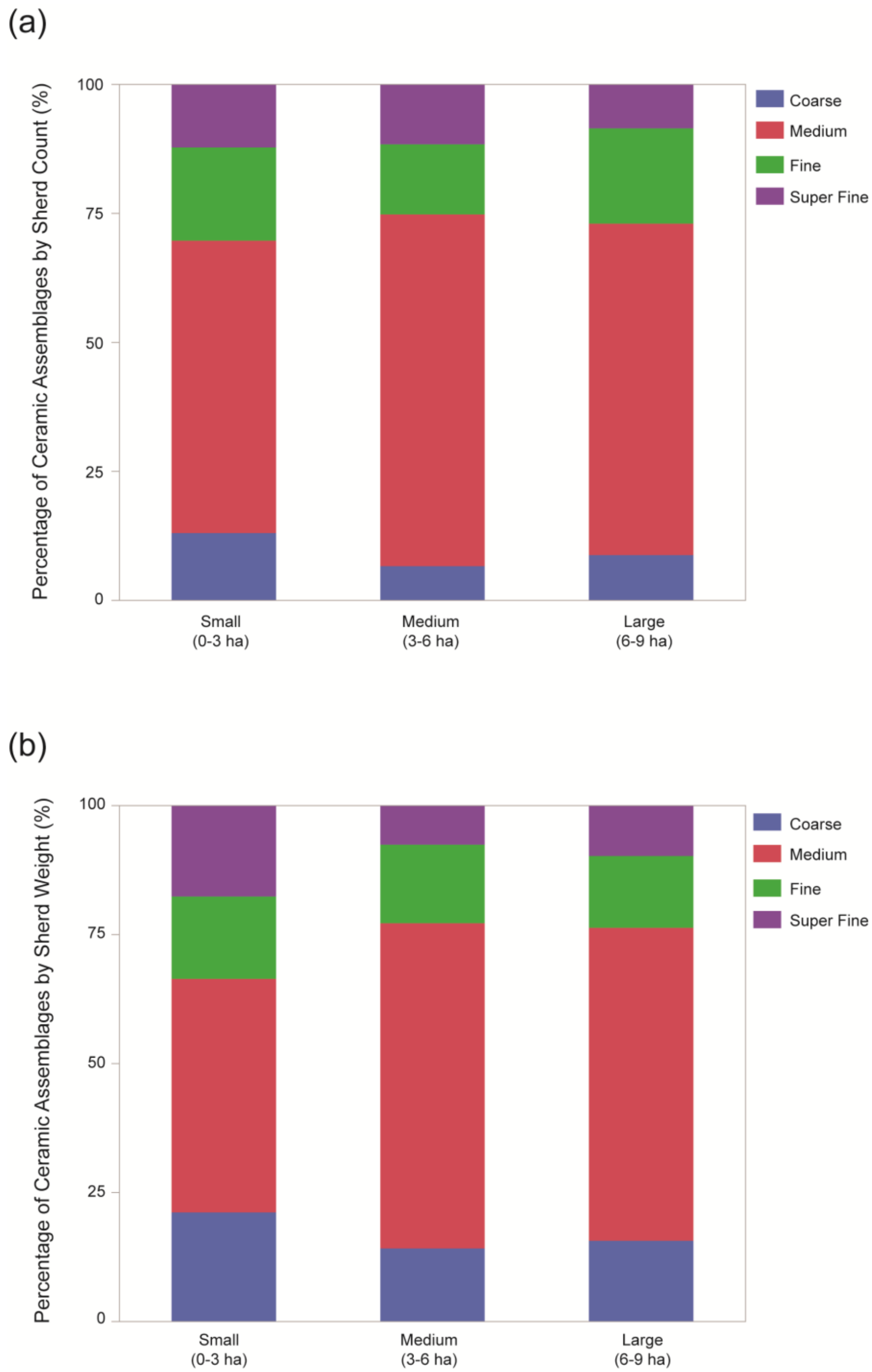


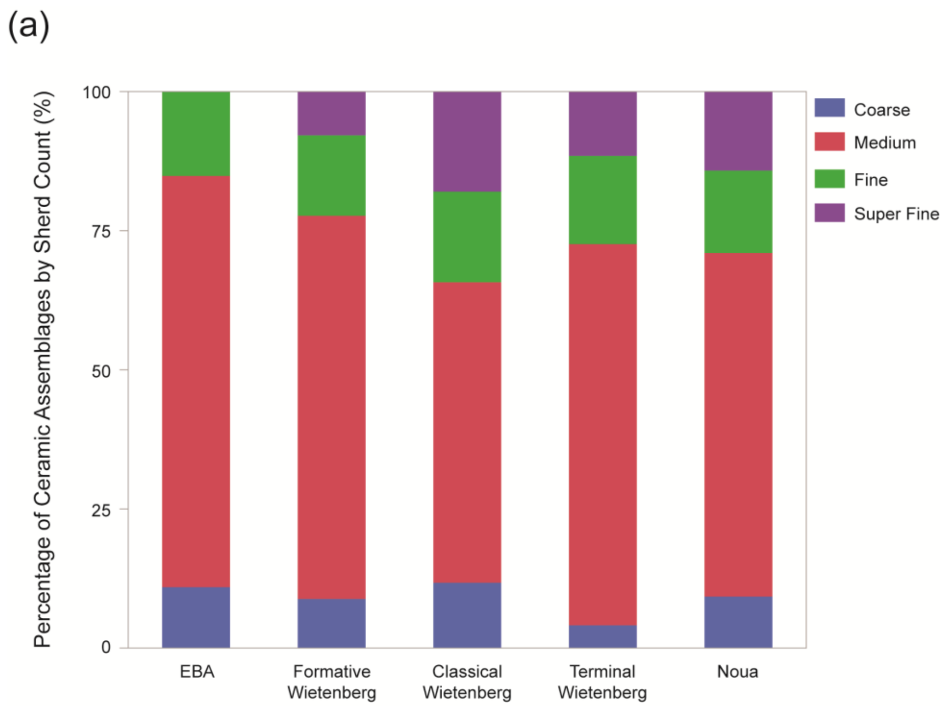
Figure 10.1 - Distribution of ceramic quality by site size for (a) sherd counts and (b) sherd weights.

Changes in Ceramic Quality Over Time

The relative frequency of different quality wares changed over the course of the Bronze Age (Table 10.3, Figure 10.2). An assessment of ceramic quality in different EBA subphases is not possible due to the limited quantity of dated assemblages associated with the EBA in the Geoagiu Valley. Grouped together, there are almost no super fine-wares from the EBA. With the start of the MBA and the Wietenberg Culture, there was an increase in the quantity of super fine-wares. The frequency of super fine-wares increased with the start of the Classical Wietenberg, a period where three different ceramic decoration techniques were employed.

Table 10.3 - Distribution of ceramics by quality and time period (row percentages).

	Coarse		**Medium**		**Fine**		**Super Fine**		**Total**	
	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)
EBA	133 (11%)	1143.0 (20%)	897 (74%)	3852.0 (67%)	183 (15%)	782.0 (14%)	1 (<1%)	4.0 (<1%)	1214	5781.0
FW	55 (9%)	687.5 (16%)	429 (69%)	2707.2 (64%)	90 (14%)	602.2 (14%)	49 (8%)	212.8 (5%)	623	4208.7
CW	83 (12%)	1694.4 (21%)	381 (54%)	3343.8 (42%)	115 (16%)	1229.4 (15%)	127 (18%)	1721.8 (22%)	706	7989.4
TW	33 (4%)	420.4 (8%)	552 (68%)	3695.9 (70%)	128 (16%)	766.1 (14%)	93 (12%)	425.2 (8%)	806	5307.6
Noua	15 (9%)	306.4 (9%)	100 (62%)	2336.2 (70%)	24 (15%)	409.1 (12%)	23 (15%)	304.3 (9%)	162	3356.0



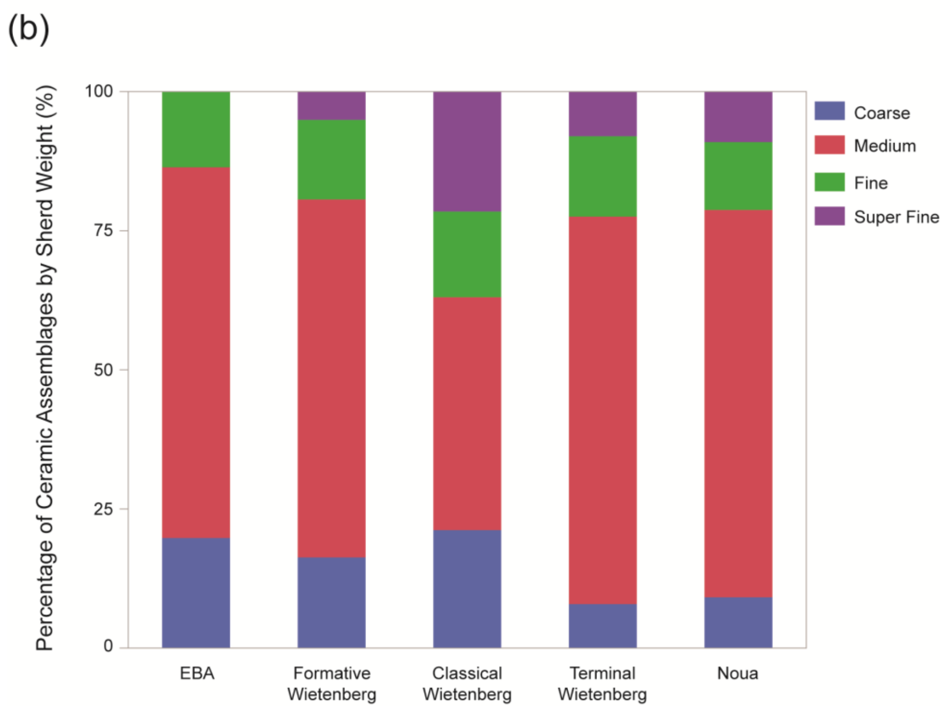


Figure 10.2 - Distribution of ceramic quality by phase and cultural affiliation by (a) sherd count and (b) sherd weight.

During the Late Bronze Age, there was little difference between Terminal Wietenberg and Noua communities in the distribution of different quality wares. Both cultural groups made ceramics with relatively fewer fine- and super fine-ware ceramics than were made during the Classical Wietenberg. This pattern, of a decrease in the quantity of the highest quality ceramics at the end of the Wietenberg sequence, is in line with the major analysis of Wietenberg ceramics by Boroffka (1994a). Boroffka documented a decrease in the quantity of decoration motifs from Wietenberg C to Wietenberg D (Figure 10.3). In the BATS sample, however, the "devolution" in the broad quality of ceramics involved Wietenberg Types B and C, not Type D. These results further problematize the remaking of the ceramic seriation sequence in light of absolute dates.

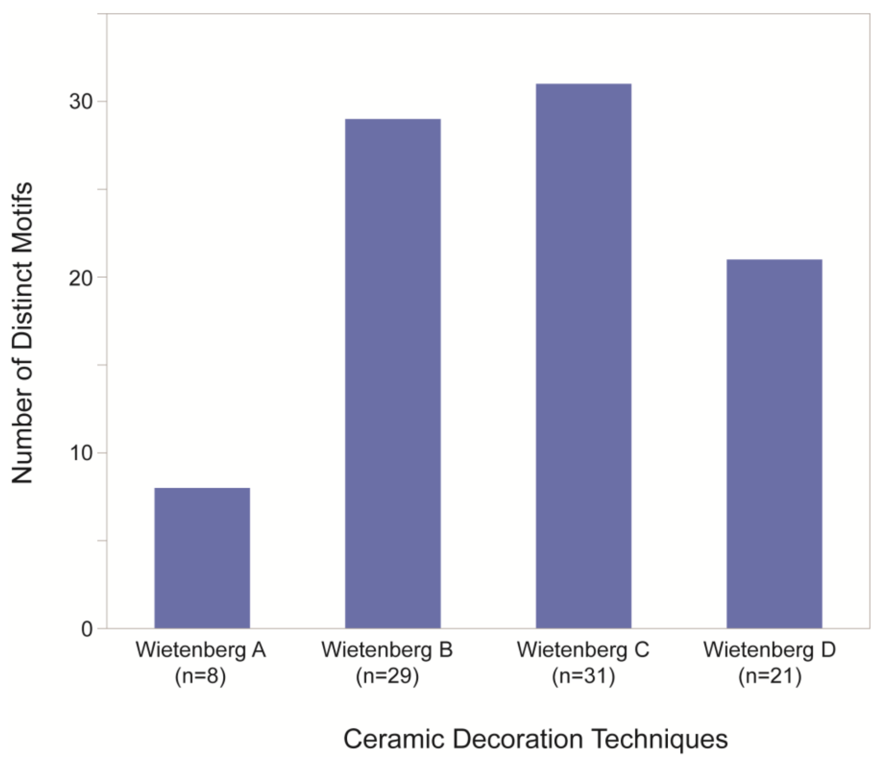


Figure 10.3 – Distribution of number of distinct decoration motifs in each Wietenberg style recorded by Boroffka (1994a: after Table 13) showing increase and subsequent "devolution" in ceramic decoration quality.

In Chapter 7, I established that Wietenberg Type A was made during the Formative Wietenberg, Type B and C began to be made during the second half of the Formative Wietenberg, Type B, C, and D ceramics were contemporaneously made during the Classical Wietenberg, and Wietenberg Types B and C continued to be produced during the Terminal Wietenberg. When we look at the distribution of different ware types by decoration technique, we see that there is minimal difference between Wietenberg Type A and B ceramics, there are slightly more super fine-wares found in association with Wietenberg Type C ceramics, and Wietenberg Type D are strongly associated with a high quantity of super fine-wares and underrepresentation of medium-wares (Table 10.4, Figure 10.4). It should be noted that the Wietenberg Type D ceramics in the BATS Project assemblage were found exclusively in the bell-shaped pit at Geoagiu de Sus-*Viile Satului*. It is possible that the high percentage of super fine ceramics associated with Type D ceramics is affected by the potential ritual significance of this pit (see Ciugudean 1999). More data are needed to test whether these results can be applied beyond the Geoagiu Valley to Wietenberg ceramics more generally.

Table 10.4 - Distribution of ceramics by quality and decoration type for the Wietenberg Culture (row percentages).

	Coarse		**Medium**		**Fine**		**Super Fine**		**Total**	
	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)
Wieten-berg A	44 (10%)	480.1 (16%)	311 (68%)	1856.4 (63%)	59 (13%)	424.0 (15%)	41 (9%)	163.7 (6%)	455	2924.2
Wieten-berg B	38 (7%)	816.8 (17%)	364 (69%)	3217.9 (66%)	89 (17%)	515.2 (11%)	40 (8%)	339.1 (7%)	531	4889.0
Wieten-berg C	89 (8%)	1504.4 (16%)	687 (60%)	4672.6 (48%)	185 (16%)	1658.5 (17%)	188 (16%)	1857.0 (19%)	1149	9692.5
Wieten-berg D	30 (11%)	662.8 (19%)	124 (44%)	1091.6 (32%)	46 (16%)	542.0 (16%)	85 (30%)	1155.1 (33%)	285	3451.5

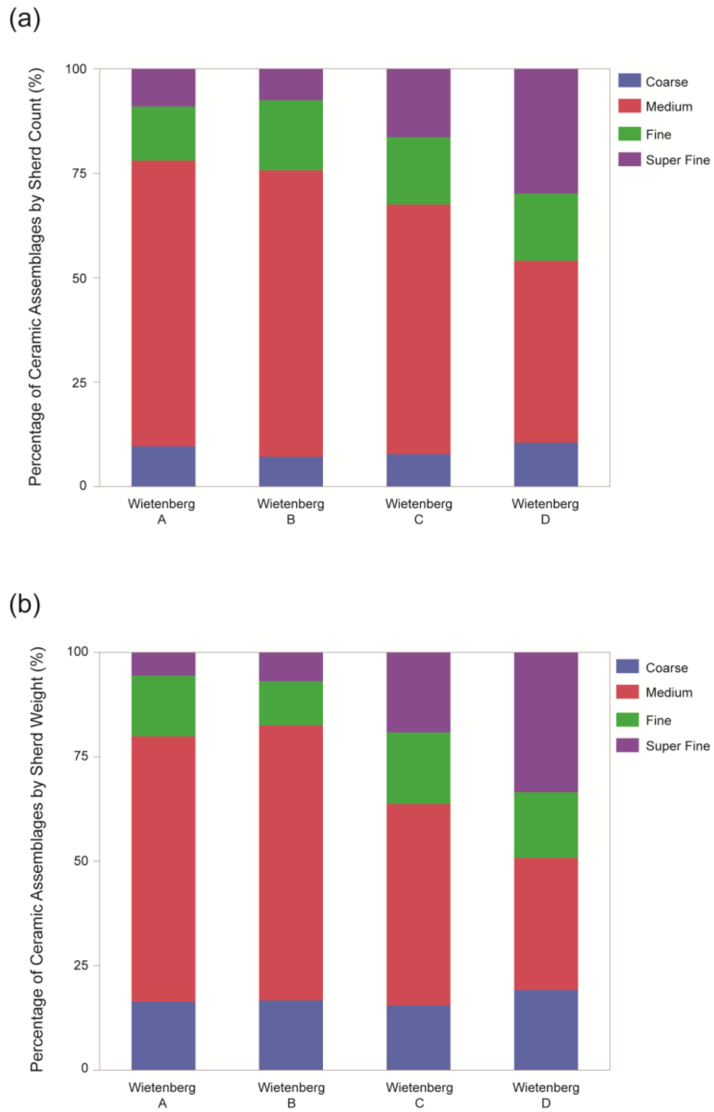


Figure 10.4 - Distribution of ceramic quality by Wietenberg decoration type by (a) sherd count and (b) sherd weight.

Discussion of Ceramic Evidence

The quality of ceramics are one potential index of the presence of socio-economic inequalities and segmented identities in Bronze Age Transylvania. Based on the limited BATS dataset, there is no distinct evidence of an 'elite' pattern of fine-ware ceramics at larger sites. There are several processes that could produce the same material outcome, including (1) elites were not exclusively located in larger regional centers, (2) ceramics were not a place where elites signaled their status, or (3) there was no institutionalized elite class in southwest Transylvania.

The increase in quality of Wietenberg ceramics starting at 1875 cal. BC matches the pattern seen in the Maros Culture ceramics at the regional center of Pecica-*Șanțul Mare* in the eastern Carpathian Basin. The emergence of 'baroque' ceramics in the Maros Culture was contemporaneous with the diversification and elaboration of Wietenberg ceramics in the Geoagiu Valley sample (see Nicodemus and O'Shea 2017). The overall synchrony of changes in ceramic production between Transylvania and the Carpathian Basin indicate the entire Carpathian Macroregion was integrated despite the marking of difference in overall ceramic styles.

The different styles among the Wietenberg ceramics represent contemporaneously different ways of decorating ceramics. These different ways of making ceramics may represent different social segments within Wietenberg society. It is currently unclear what segments of society marked identity with different production techniques, whether it was marking lineage identity, craft specialists, gender, political units, or social status. Within the BATS assemblage, Wietenberg D assemblages had a significantly higher frequency of fine and super-fine wares when compared with other contemporaneous styles (B and C). Wietenberg C assemblages also had a higher frequency of higher quality ceramics than Wietenberg B assemblages. The observed difference in ceramic quality among different Wietenberg ceramic styles provides preliminary support to the suggestion that there was some ranking between social segments marked in the ceramic craft economy.

Faunal Analysis

The faunal remains from the BATS field project were analyzed by Jordan Dalton at the University of Michigan Museum of Anthropological Archaeology (UMMAA). Amy Nicodemus (UMMAA) also assisted with identification. The fauna come from all excavated Bronze Age deposits from sites in the Geoagiu Valley, and materials collected from the surface for single component Bronze Age sites that were destroyed by plowing (e.g., Stremț-*Berc 1*). Animal bone in lots were collected in the field, and as such there is a significant underrepresentation of small animals (e.g., rabbits, rodents, fish) in the database. In the analyses below, only the animal remains that were most likely associated with subsistence are included. Among the omitted species are land snails and rodents. Future analysis of faunal remains from heavy-fraction flotation samples will be able to provide insight into what species may be missing from the field-collected samples as well as the overall proportion and density of animal remains across Bronze Age Sites.

A total of 1048 individual specimens were analyzed (Appendix E). Each specimen was analyzed to identify, when possible, its taxa, individual age, and any evidence of human manipulation (polishing/cutmarks). If it was not possible to identify specimens to specific taxa, they were grouped based on their size-class. Table 10.5 presents the nine different taxa identified at the Bronze Age sites in this sample, as well as designations of each taxa's size classification and whether it is a wild or domesticated species. The size classification and wild/domesticated split are used in the following section to monitor how pastoral, hunting, and gathering practices varied across time and space. Table 10.6 presents summary data on the number of identifiable specimens (NISP) recovered at each site in the Geoagiu Valley survey region.

Table 10.5 – Taxa identified in BATS fauna sample.

Taxon	**Size Class**	**Domesticated/Wild**	**NISP**
Horse (*Equus caballus*)	Large Mammal	Domesticated	7
Cow (*Bos taurus*)	Large Mammal	Domesticated	29
Sheep/Goat (*Ovicapridae.*)	Medium Mammal	Domesticated	48
Pig (*Sus spp.*)	Medium Mammal	Domesticated	27
Red Deer (*Cervus elaphus*)	Large Mammal	Wild	17
Roe Deer (*Capreolus capreolus*)	Medium Mammal	Wild	2
Hare (*Lepus europus*)	Small Mammal	Wild	6
River Mussel (*Unio spp.*)	Aquatic	Wild	92
Bird	Avian	Wild	1
UnID to Taxa			819
Total			*1048*

Table 10.6 - NISP of taxa found at each site in the BATS Project.

	Geoagiu de Sus-*Fântâna Mare*	**Geoagiu de Sus-*Viile Satului***	**Pețelca-*Cascadă***	**Stremț-*Berc 1***	**Stremț-*Fabrica de Alcool***	**Teiuș-*Coastă***	**Teiuș-*Fântâna Viilor***
Identified Domesticated							
Horse	0	0	3	2	0	0	2
Cow	6	1	12	1	4	0	5
Sheep/Goat	10	1	8	0	3	12	14
Pig	12	2	3	0	6	0	4
Total	*28*	*4*	*26*	*3*	*13*	*12*	*25*
Identified Wild							
Red Deer	7	2	4	0	2	0	2
Roe Deer	1	1	0	0	0	0	0
Hare	6	0	0	0	0	0	0
Total	*14*	*3*	*4*	*0*	*2*	*0*	*2*
UnID Size-Classes							
Large Mammal	148	9	100	22	23	20	101
Medium Mammal	120	9	21	2	41	14	18
Small Mammal	3	0	0	0	0	0	0
Total	*271*	*18*	*121*	*24*	*64*	*34*	*119*
Aquatic							
River mussel	1	2	86	0	0	0	3
Avian							
UnID	1	0	0	0	0	0	0
UnID	56	17	23	11	37	10	14
Total	371	44	260	38	116	56	163

In the following sections, I present the fauna data of size-class and wild/domesticated organized in six different ways. I start by presenting the data by (1) the site's position within the Geoagiu Valley (Mureș Valley; Lower Geoagiu Valley; Middle Geoagiu Valley). As I will show, the majority of – but not all – variation in faunal assemblages can be explained by the different microenvironments across the study region. To evaluate the extent to which faunal assemblages can indicate inequality across different sites and changes over time, I present the data by: (2) site size (small; medium; large); (3) by coarse-grained chronological phases (EBA-MBA-LBA), (4) by the chronological subphases used in this dissertation (EBA-Formative Wietenberg-Classical Wietenberg-Terminal Wietenberg-Noua), (5) by Wietenberg ceramic style (Wietenberg A-Wietenberg B-Wietenberg C-Wietenberg-D), and (6) by cultural affiliation (EBA Șoimuș-Wietenberg-Noua). The interpretive strength of these analyses is tempered by the potential autocorrelation with site location. Large sites are only present in the Mureș Valley, and upland sites are normally smaller. The differences in changes over time in faunal assemblages are likely influenced in part by the changing settlement systems (seen in Chapter 8) rather than changing institutions of subsistence production. The small portion of identifiable specimens due to the limited amount of excavation also limits the conclusions we can draw from this sample. Each analysis, however, presents an important perspective on the organization of subsistence, resource procurement, social segmentation and inequality, and social change in Bronze Age Transylvania.

Fauna by Valley Position

The Bronze Age sites tested during the BATS Project are distributed across different ecotones in the Geoagiu Valley. The lowest-elevation sites (Pețelca-*Cascadă*; Teiuș-*Coastă*; Teiuș-*Fântâna Viilor*) are found on the terraces along the Mureș River. These sites are located on relatively flat terraces that were good for agriculture, with a nearby flood-plain, which would have provided seasonal pasture for livestock, and riverine resources. Moving up the Geoagiu Valley to the northwest, there are two sites located in the Lower Geoagiu Valley (Stremț-*Berc 1*; Stremț-*Fabrica de Alcool*). These sites have access to some aquatic resources (though the species of mussels are likely different than those in the Mureș River), but primarily have access to agricultural land. The sites in the Middle Geoagiu Valley (Geoagiu de Sus-*Fântâna Mare*; Geoagiu de Sus-*Viile Satului*) are located at the ecotone between lower valley agricultural land and upper valley pasture and forests. These sites would have more direct access to forest and edge-of-forest resources (e.g., red deer; hares) than other sites down valley. As expected, faunal assemblages varied across valley positions (Table 10.7; Figure 10.5).

Table 10.7 - NISP for each size-class by valley position.

Valley Position	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Mureș Valley	250	93	0	89	0	47	479
Lower Geoagiu Valley	54	52	0	0	0	48	154
Middle Geoagiu Valley	173	156	9	3	1	73	415

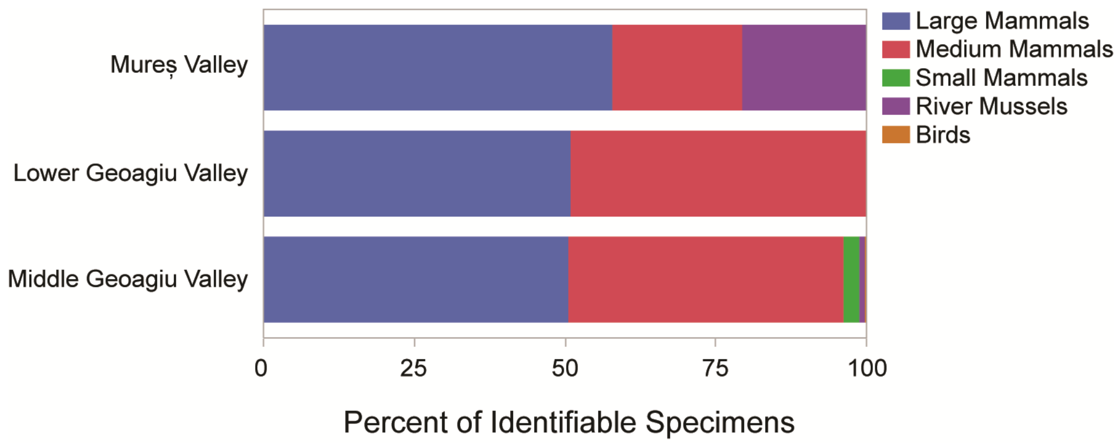


Figure 10.5 - Distribution of identifiable faunal specimens by size-class for sites in each valley position.

As expected, sites in the Mureș Valley have a high quantity of river mussels. There is also a high abundance of large mammals relative to medium mammals. The Lower Geoagiu Valley has no evidence or river mussels, and only has large and medium mammals. Sites in the Middle Geoagiu Valley have the widest breadth of resources, which is also expected given the sites' proximity to an ecotone boundary. Interestingly, there are three specimen of river mussels at sites in the Middle Geoagiu Valley, though we do not currently know which species of mussels are located at these sites (based on the species, they may be found in the Geoagiu River or in the Mureș River). More information is needed, but there are significant interpretive implications if communities in the Middle Geoagiu Valley were procuring river mussels from the Mureș, which is 10km away from these sites.

There is an increase in the utilization of wild terrestrial resources as you move up the Geoagiu Valley (Table 10.8; Figure 10.6).

Table 10.8 - NISP for domesticated and wild resources by valley position.

Valley Position	Domesticated	Wild*	UnID	Total
Mureș Valley	63	95	321	479
Lower Geoagiu Valley	16	2	136	154
Middle Geoagiu Valley	32	21	362	415

*- Wild resources include terrestrial, avian, and riverine resources.

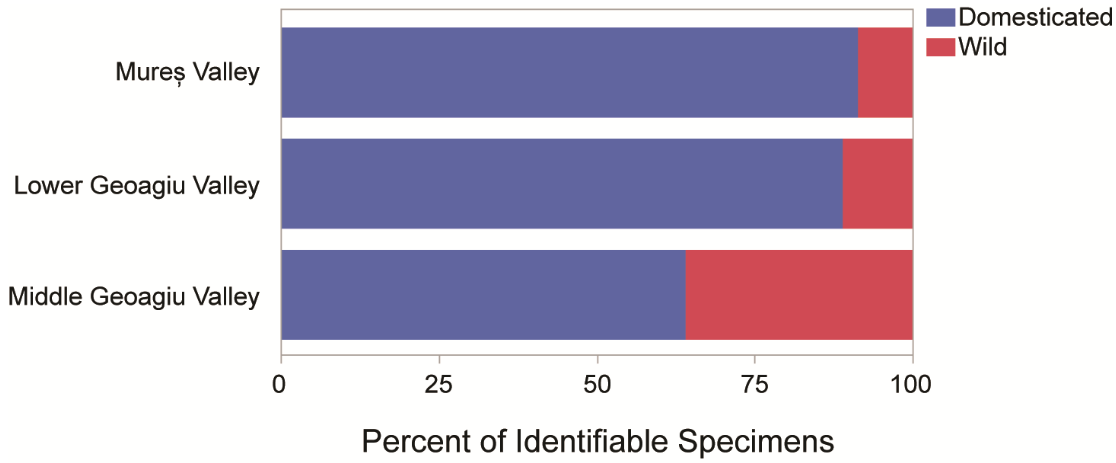


Figure 10.6 - Distribution of domesticated and wild resources for sites in each valley position. Based on identifiable specimens (river mussels omitted).

The sites in the Mureș Valley have the lowest percentage of non-river mussel wild resources (9%). The Lower Geoagiu Valley Sites located just off the Mureș Valley, have 11% of their identifiable faunal assemblages as wild resources. The Middle Geoagiu Valley, located 10km from the Mureș River and near an ecotone boundary with upland pasture and forests, has the largest percentage of non-river mussel wild resources (36%).

Together, there are patterns in the fauna assemblages that indicate that valley position – and the different ecotones available to different sites – affected subsistence practices. For the most part, faunal assemblages track the availability of different resources as you move up the Geoagiu Valley. There is a correlation between valley position and the percentage of wild specimens in the faunal assemblage (excluding river-mussels), which matches the increased availability in these resources as you go up in elevation in the Trascău Mountains. Communities on the Mureș River took advantage of their position on the river to invest in aquatic resources (river mussels). These communities on the Mureș also exploited significantly more large mammals than medium-sized mammals, which were predominately domesticated species (horse, cattle), which fits with the availability of flood plain pasture. The wild resources at Mureș River sites were exclusively red deer, which are likely not locally available in the immediate environment (though more detailed paleoenvironmental reconstructions are needed to confirm the lack of large forests along this section of the Mureș River). As a result, it is likely that the presence of red deer at lowland Mureș Valley sites suggests either trade with sites higher in the Geoagiu Valley, or more likely, hunting forays into the uplands. The uplands of the Geoagiu Valley were unoccupied during the Middle Bronze Age, and they are where the most abundant sources of metal through hydrothermal vents were located. The presence of faunal resources from the Upper Geoagiu Valley at lowland sites may indicate (1) open yet competitive access to metal sources in the same landscapes for Wietenberg Middle Bronze Age communities, (2) open access to metal sources with broad social agreement, or (3) the provisioning of elites in lowland settlements by upland communities. More work is needed to determine which of these possibilities is most likely.

Fauna by Site Size

The Bronze Age sites in the Geoagiu Valley can be divided into three different size classes: small sites (0-3 ha), medium sites (3-6 ha), and large sites (6-9 ha). Faunal assemblages varied across site-size class (Table 10.9; Figure 10.7). Documenting how faunal assemblages varied between sites of different sizes can reveal if there is a correlation between site size and particular resources or subsistence profiles, which can be critical in identifying the presence of different subsistence practices between any emerging regional elites (presumably located in large centers) and non-elite communities (presumably located in small and medium sized sites).

Table 10.9 - NISP for each size-class by site size.

Site Size	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Small (0-3 ha)	57	41	0	2	0	38	138
Medium (3-6 ha)	190	193	9	1	1	93	487
Large (6-9 ha)	230	67	0	89	0	37	423

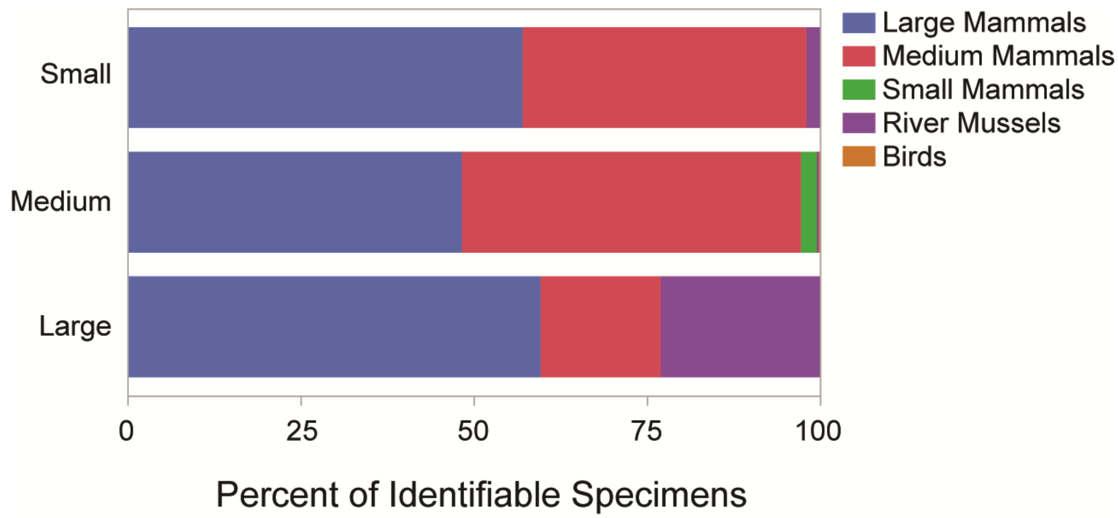


Figure 10.7 - Distribution of Identifiable Faunal Specimens by Size-Class for each site size

Faunal assemblages at small Bronze Age sites in southwest Transylvania primarily have large and medium-sized mammals. Medium-sized settlements also are dominated by large and medium-sized mammals, but also have the broadest range of species, including small quantities small mammals, river mussels, and birds. Large sites have a large quantities of river mussels along with large and medium-sized mammals. The ratio of large to medium mammals is highest at large sites (3.43), which is much higher than the ratio at small (1.39) and medium-sized (0.98) sites.

There is non-linear variation in the abundance of domesticated and wild resources across different site-size categories (Table 10.10; Figure 10.8).

Table 10.10 - NISP for domesticated and wild resources by site size.

Site Size	Domesticated	Wild*	UnID	Total
Small (0-3 ha)	19	5	114	138
Medium (3-6 ha)	41	18	428	487
Large (6-9 ha)	51	95	277	423

*- Wild resources include terrestrial, avian, and riverine resources.

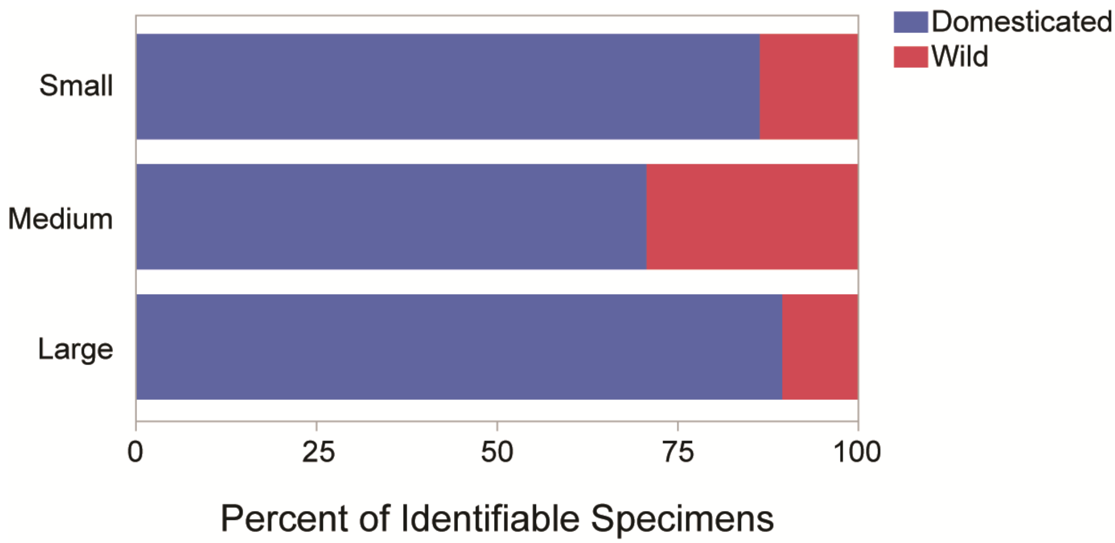


Figure 10.8 - Distribution of domesticated and wild resources for each site size category. Based on identifiable specimens (river mussels omitted).

Excluding river mussels, small and large sites had similar proportions of wild resources (14% and 11%, respectively). Medium-sized sites had a much larger proportion of wild resources, at 29% of the specimens identifiable to taxa. As such, there is no correlation between site-size and the abundance of wild resources. It should be noted that all wild specimens from the large sites were from red deer (n=6), while small and medium-sized sites had a wider range of wild resources including roe deer (n=2), hares (n=6), bird (n=1) and red deer (n=11).

Together, large sites are more strongly associated with large over medium-sized mammals, as well river mussels. The patterns in this analysis are likely strongly affected by the position of settlements relative to the Mureș River. For example, because both large sites in this analysis (Pețelca-*Cascadă*; Teiuș-*Fântâna Viilor*) are located along the Mureș River, it is unsurprising that large sites have a significantly higher proportion of river mussels than small and medium-sized sites (only 1 of 5 of these smaller sites is located on the terraces of the Mureș River Valley). As such, it is not clear to what extent the fauna profile at different site-size categories is due to their size, and what is due to their valley position. The next analysis, which explores the fauna profile by each site's valley position, provides a much more convincing case for patterned variation. While site-size may be linked to patterns (e.g., strong association at large sites with large mammals over medium-sized mammals), some aspects of the faunal profile (e.g., abundance of river mussels) are likely the product of different processes (e.g., valley position, change through time, cultural affiliation).

Fauna by Temporal Period

Grouping the faunal remains by the broad phases of the Bronze Age – Early, Middle, and Late – makes it possible to track coarse-grained changes through time in subsistence practices (Table 10.11; Figure 10.9).

Table 10.11 - NISP for each size-class by temporal period.

Time Period	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Early Bronze Age	45	28	0	0	0	21	94
Middle Bronze Age	142	94	2	69	1	60	368
Late Bronze Age	290	179	7	23	0	87	586

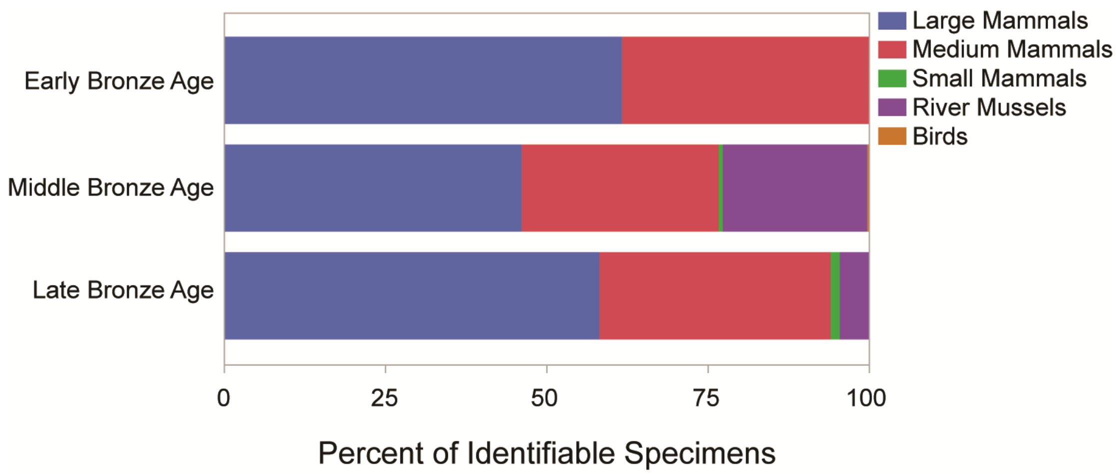


Figure 10.9 - Distribution of identifiable faunal specimens by size-class for each time period.

The EBA assemblages are dominated by large and medium mammals, with no small mammals, aquatic, or avian resources identified. The MBA has a broader range of resource types and mammal size-classes, including small mammals (hares), river mussels, and a single bird bone. The LBA shows a marked decrease in the use of river mussels. The ratio of large to medium mammals is relatively even across the different periods. There are 1.61 large mammal specimens for each medium mammal specimen in the EBA; a ratio similar to the MBA (1.51) and LBA (1.61).

Over the course of the Bronze Age, the use of wild resources varied (Table 10.12; Figure 10.10).

Table 10.12 - NISP for domesticated and wild resources by temporal period.

Time Period	Domesticated	Wild*	UnID	Total
Early Bronze Age	15	0	79	94
Middle Bronze Age	35	79	254	368
Late Bronze Age	61	39	486	586

*- Wild resources include terrestrial, avian, and riverine resources.

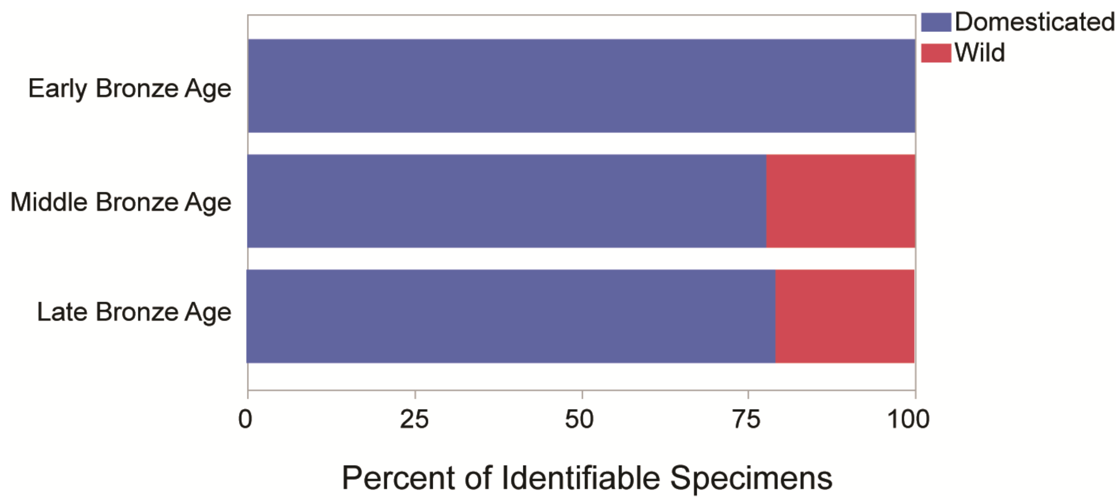


Figure 10.10 - Distribution of domesticated and wild resources for each time period. Based on identifiable specimens (river mussels omitted).

Based on available evidence, it appears that EBA communities relied on domesticated animal resources exclusively. In the MBA, however, there was a marked increase in the incorporation of wild resources. Even excluding river mussels, 22% of identifiable specimens in MBA assemblages were from wild species. At LBA sites, the exploitation of terrestrial wild resources continued at a similar frequency as in the MBA (21%).

Together, this suggests that EBA communities relied heavily on pastoral resources, primarily cattle and sheep/goat. In the MBA, communities exploited a wider range of resources, incorporating a significant quantity of wild resources into their diet. There was minimal change between the MBA and LBA, as LBA communities continued to rely on wild as well as pastoral resources.

Fauna by Temporal Sub-Phase

Thanks to radiocarbon dates, it is possible to monitor change over time in faunal assemblages at the more chronologically-refined scale of sub-phases than used above. In this analysis, the limited amount of EBA material requires lumping this together into a single phase, which was followed by the Formative Wietenberg, then the Classical Wietenberg (both part of the MBA), and finally the Terminal Wietenberg and Noua (and other unknown LBA) assemblages were contemporaneously formed during the LBA (Table 10.13; Figure 10.11). Separating the Terminal Wietenberg from the Noua assemblages makes it possible to monitor changes within the Wietenberg culture through the three sub-phases as well as identify differences between contemporaneous Wietenberg and Noua communities.

Table 10.13 - NISP for each size-class by temporal sub-phase.

Temporal Sub-Phase	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Early Bronze Age (II/III)	45	28	0	0	0	21	94
Formative Wietenberg	110	64	2	54	1	32	263
Classical Wietenberg	32	30	0	15	0	28	105
Terminal Wietenberg	173	125	7	20	0	55	380
Noua	111	35	0	3	0	14	163
LBA Unknown	6	19	0	0	0	18	43

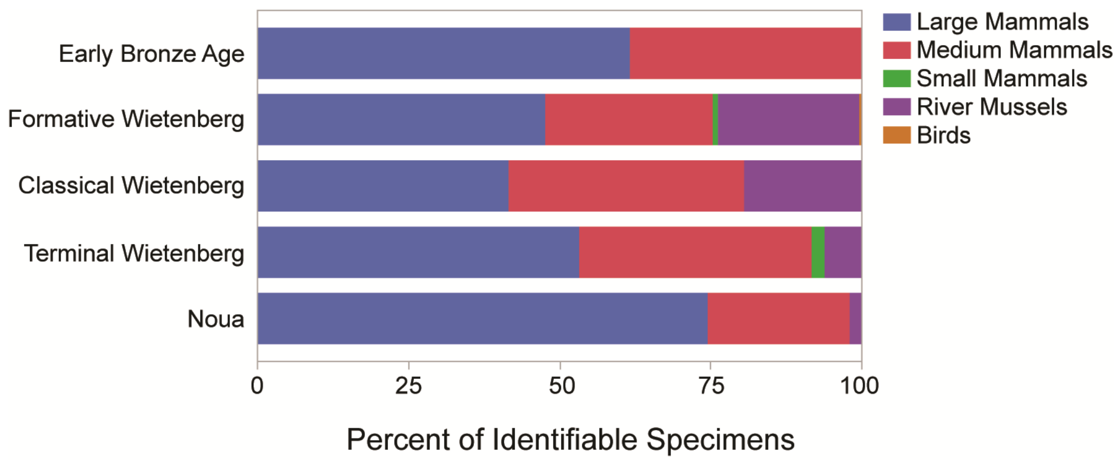


Figure 10.11 - Distribution of identifiable faunal specimens by size-class for each temporal sub-phase.

EBA assemblages were dominated by large and medium-sized terrestrial mammals. With the start of the Wietenberg Culture, assemblages reflect a broadening of the subsistence base to include small mammals and river mussels. There is slight variation between Wietenberg sub-phases in the relative frequency of different resources, but the general pattern of resource type and size-class is similar throughout. Assemblages associated with the Noua Culture have significantly more large mammals, and less medium-sized mammals and river mussels, than both earlier Classical Wietenberg communities and contemporaneous Terminal Wietenberg communities.

Over the course of the Bronze Age, there was more variation in the abundance of domesticated and wild resources between cultural groups than between sub-phases associated with the same archaeological culture (Table 10.14; Figure 10.12).

Table 10.14 - NISP for domesticated and wild resources by temporal sub-phase.

Temporal Sub-Phase	Domesticated	Wild*	UnID	Total
Early Bronze Age (II/III)	15	0	79	94
Formative Wietenberg	19	61	183	263
Classical Wietenberg	16	18	18	52
Terminal Wietenberg	34	34	312	380
Noua	25	5	133	163
LBA Unknown	2	0	41	43

*- Wild resources include terrestrial, avian, and riverine resources.

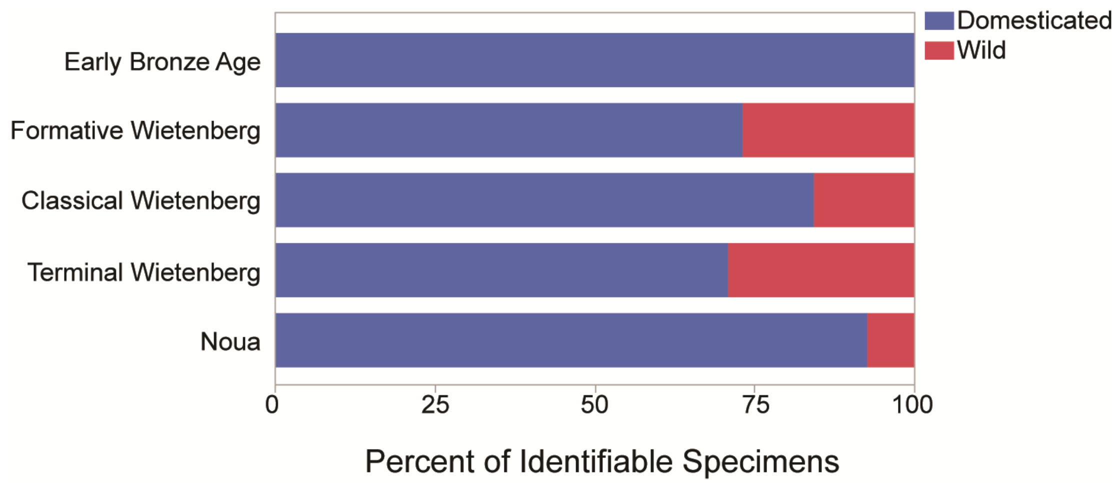


Figure 10.12 - Distribution of domesticated and wild resources for each temporal sub-phase. Based on identifiable specimens (river mussels omitted).

Based on available evidence, it appears that EBA communities almost exclusively relied on domesticated animal resources. With the start of the MBA and the Formative Wietenberg, there was a marked increase in wild resources. Even excluding river mussels, 27% of identifiable specimens in Formative Wietenberg assemblages were from wild species. In the Classical Wietenberg, there was a slight decline in non-river mussel wild resources (16%), though if river-mussels are included, the ratio of domesticated to wild specimens is nearly 50:50. With the start of the LBA, Wietenberg communities (Terminal Wietenberg) continued to exploit a significant quantity of wild resources. Terminal Wietenberg assemblages contained 29% wild resources, similar to MBA Wietenberg faunal profiles. Unlike the contemporaneous Terminal Wietenberg communities, Noua communities relied more extensively on domesticated resources. Excluding river mussels, only 7% of the Noua identifiable faunal specimens are wild resources.

Together, the results of the finer-resolution analysis are similar to the coarser phases described above. However, there are two additional insights gained by this more detailed analysis. First, there was minimal change in faunal profiles over the nearly 700 years of the Wietenberg Culture. This suggests that there was a culturally-shared subsistence institution (e.g., what to eat, how much to hunt, etc.) that was maintained over many generations. Second, this pattern was maintained across the MBA-LBA transition, as Terminal Wietenberg faunal assemblages were more similar to Formative and Classical Wietenberg sites than to contemporaneous Noua communities. This suggests that the differences between Terminal Wietenberg and Noua communities, first identified in the production and decoration of ceramics, extend to subsistence practices as well.

Fauna by Wietenberg Ceramic Style

The faunal assemblages from the BATS Project were found in association with ceramic assemblages. For deposits with Wietenberg ceramics, assessment of the ceramic style is possible. As discussed in Chapter 7, these ceramic styles are not limited to separate and sequential chronological phases as previously assumed. Instead, these ceramic styles, to varying degrees, were manufactured at the same time across Transylvania. By looking at how faunal assemblages co-vary, or not, with different ceramic styles, it is possible to assess whether any particular ceramic style may have been associated with hierarchical social identities. The fauna associated with each ceramic style, Wietenberg A, B, C, and D, are grouped in this analysis (Table 10.15; Figure 10.13).

Table 10.15 - NISP for each size-class by Wietenberg ceramic type.

Ceramic Style	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Wietenberg A	48	39	2	0	1	15	105
Wietenberg B	107	31	0	66	0	23	227
Wietenberg C	160	149	7	16	0	77	409
Wietenberg D	12	13	0	2	0	17	44

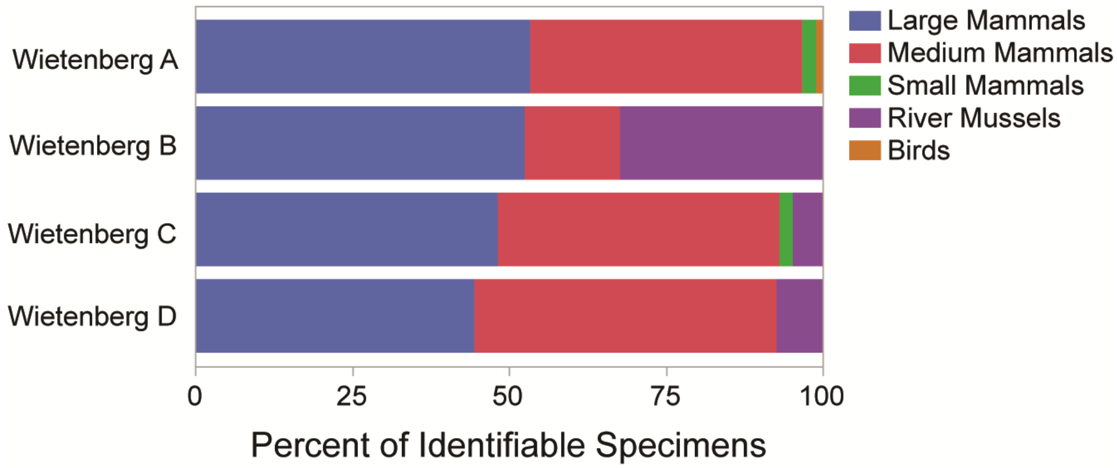


Figure 10.13 - Distribution of identifiable faunal specimens by size-class for deposits associated with each Wietenberg ceramic type.

There is minimal difference in the species and size-classes associated with Wietenberg A, C, and D ceramics. With Wietenberg B ceramics, however, medium mammals are underrepresented and river mussels are overrepresented. The reason for this pattern may be that there is only one site with Wietenberg B ceramics in the study region, Pețelca-*Cascadă*, and it is located in the Mureș Valley where a high quantity of river mussels is not surprising.

There is minimal variation in the utilization of wild terrestrial resources between Wietenberg ceramic styles, when riverine resources are taken into account. (Table 10.16; Figure 10.14).

Table 10.16 - NISP for domesticated and wild resources by Wietenberg ceramic type.

Ceramic Style	Domesticated	Wild*	UnID	Total
Wietenberg A	8	5	92	105
Wietenberg B	23	70	134	227
Wietenberg C	38	31	340	409
Wietenberg D	4	5	35	44

*- Wild resources include terrestrial, avian, and riverine resources.

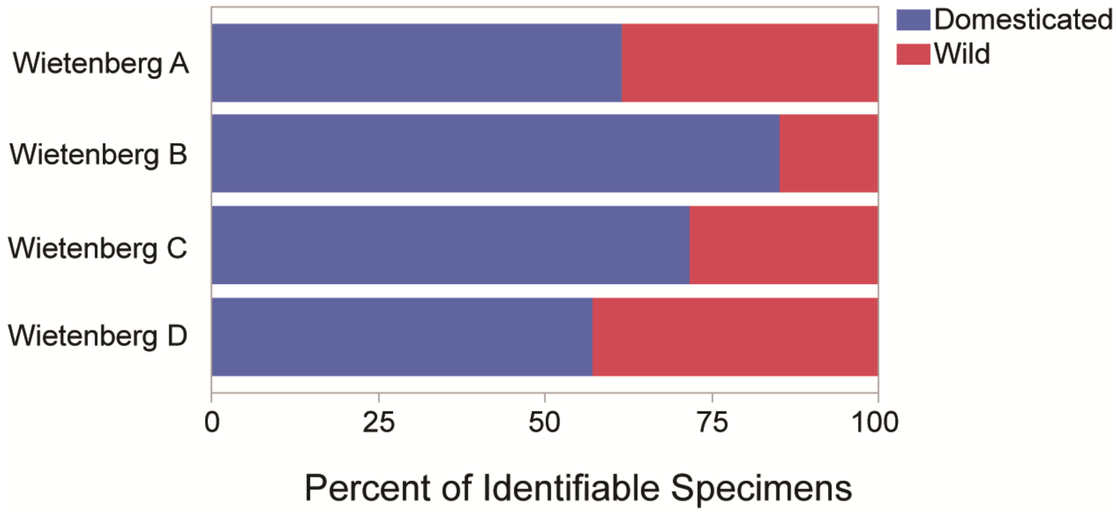


Figure 10.14 - Distribution of domesticated and wild resources for deposits associated with each Wietenberg ceramic type. Based on identifiable specimens (river mussels omitted).

Wietenberg A (38%) and Wietenberg D (43%) assemblages, which do not overlap in time, have higher percentages of wild resources than Wietenberg B (15%) and Wietenberg C (28%) assemblages. The low percentage of terrestrial wild resources associated with Wietenberg B ceramics is offset by the high quantity of river mussels.

Together, the data are too limited to make any conclusions about association of different ceramic types with socioeconomic rank. However, the broad similarities between assemblages associated with different ceramic styles does have wider significance. There appears to be a widely shared agreement among Wietenberg communities about how subsistence procurement is organized. Even through groups within the Wietenberg Culture marked themselves as different through ceramic decoration, they procured the same types of animal resources in similar abundances. As such, Wietenberg identity extended beyond shared ceramic production techniques and mortuary practices to include shared subsistence institutions.

Fauna by Cultural Affiliation

The faunal assemblages from the BATS Project can also be grouped by cultural affiliation. Cultural affiliation is determined by the associated ceramics and radiocarbon dates with each assemblage. In the BATS Project, three distinct cultural groups were prominent in the excavated deposits: (1) Șoimuș, an Early Bronze Age groups spatially and temporally linked to Transylvania in the second half of the 3rd Millennium BC; (2) Wietenberg, a group that spans the entirety of the Middle Bronze Age across Transylvania and the Late Bronze Age in southwest Transylvania; and (3) Noua, a cultural group that is proposed to have moved from the Eurasian Steppe into Transylvania during the Late Bronze Age. This analysis is designed to assess how cultural affiliation may explain any variation in the BATS faunal assemblages. The different cultural groups are primarily temporally sequential. However, there is a critical period, from 1500 to 1315 BC when Wietenberg and Noua communities lived together in the Geoagiu Valley. Comparing faunal assemblages by cultural affiliation, can be examined with temporal examinations presented above to provide a more complete picture of the relationship between subsistence practices and cultural affiliations primarily determined by ceramics and mortuary practices. In the BATS sample, faunal assemblages varied significantly between different cultural affiliations (Table 10.17; Figure 10.15).

Table 10.17 - NISP for each size-class by cultural affiliation.

Culture	Large Mammal	Medium Mammal	Small Mammal	River	Bird	UnID	Total
Șoimuș	45	28	0	0	0	21	94
Wietenberg	315	219	9	89	1	115	748
Noua	111	35	0	3	0	14	163

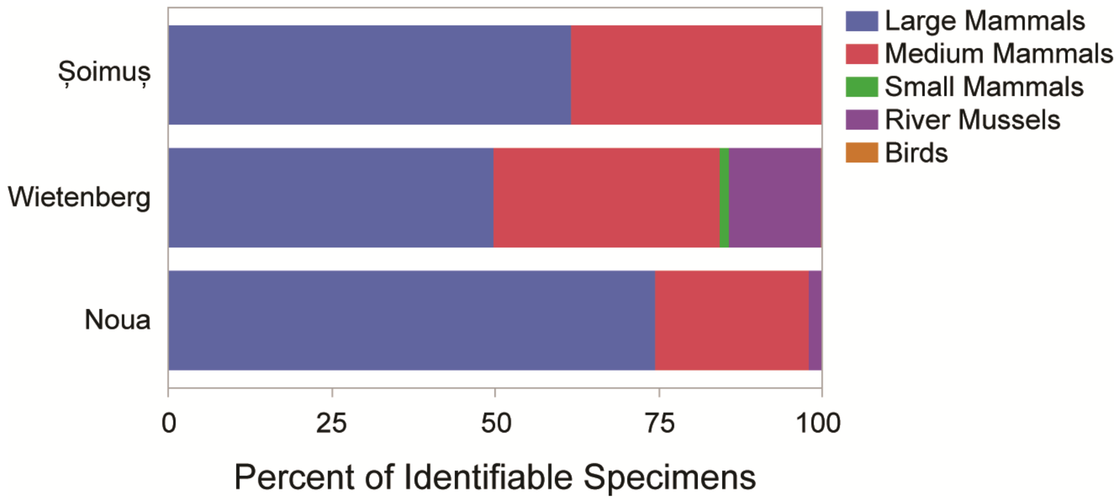


Figure 10.15 - Distribution of identifiable faunal specimens by size-class for deposits associated with each cultural group.

The identifiable specimens in Șoimuș assemblages are exclusively large (62%) and medium (38%) mammals. Wietenberg assemblages are notable for the increased diet breadth when compared with Șoimuș and Noua assemblages, though this may be a product of the larger sample size of Wietenberg faunal assemblages. The ratio of large to medium mammals for the Wietenberg assemblages (1.44 large mammal specimens for every one medium mammal) is slightly smaller than Șoimuș (1.61) and significantly smaller than Noua (3.17) assemblages.

There are also significant differences in the utilization of wild resources between cultural groups (Table 10.18; Figure 10.16).

Table 10.18 - NISP for domesticated and wild resources by cultural affiliation.

Culture	Domesticated	Wild*	UnID	Total
Șoimuș	15	0	79	94
Wietenberg	69	113	566	748
Noua	25	5	133	163

*- Wild resources include terrestrial, avian, and riverine resources.

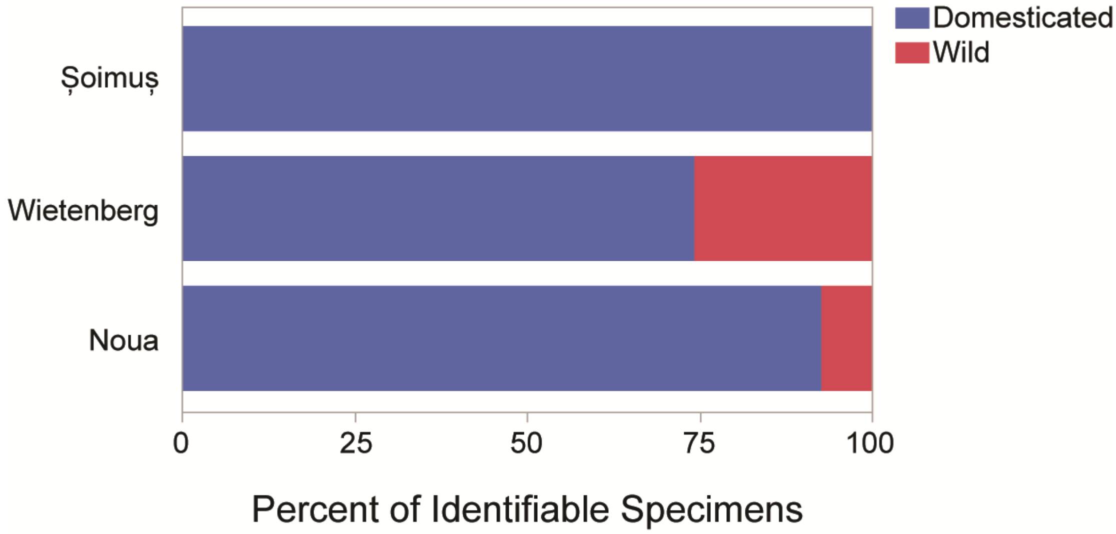


Figure 10.16 - Distribution of domesticated and wild resources for deposits associated with each cultural group. Based on identifiable specimens (river mussels omitted).

Șoimuș faunal assemblages are made up of only domesticated species, including horse, cow, and sheep/goat. Wietenberg assemblages, however, are made up of 74% domesticated species, such as horse, cow, sheep/goat, and pig, and 26% wild resources (not including river mussels) such as red deer, roe deer, hare, and birds. Noua assemblages, in contrast, are almost completely domesticated species (93%), including horse, cow, sheep/goat, and pig. The only wild terrestrial species associated with the Noua Culture is red deer.

Together, the faunal evidence shows a clear difference in animal economies between different cultural groups. The Șoimuș groups relied exclusively on pastoral resources. The communities of the Wietenberg Culture had a much broader diet, complementing pastoral resources with a large quantity of wild resources. The use of wild resources, many from upland forests, co-occurs with the movement of settlements out of the uplands and towards the more fertile agricultural land of the Mureș Valley and Lower and Middle Geoagiu Valleys. With communities further from these resources, it is likely that Wietenberg communities organized specific hunting forays into the uplands. The Noua communities, like the EBA Șoimuș, relied heavily on domesticated species. However, Noua communities focused more heavily on larger-bodied species (e.g., horse, cow, red deer). Despite overlapping in time, Noua and Terminal Wietenberg communities had very different faunal assemblages. This suggests that cultural affiliation, primarily marked in ceramics and mortuary practices, also came with distinct pastoral and hunting practices.

Discussion of Faunal Evidence

The faunal evidence from the BATS Project provides opportunities to draw preliminary conclusions about subsistence economies, integration, and inequality in the Geoagiu Valley during the Bronze Age. There is a strong link between the location of the settlement in the Geoagiu Valley and the frequency and type of wild resources. This fits with expectations that Bronze Age communities were provisioning themselves with locally available resources. Sites near the Mureș River had more river mussels than those up the Geoagiu Valley, and sites in the Apuseni uplands had more wild mammal resources, such as roe deer, red deer, and rabbits, than those in the lowlands. While this pattern holds for the EBA and MBA, there are some unexpected patterns found in Terminal Wietenberg (LBA) deposits. During this period, red deer is found at Pețelca-*Cascadă* in the Mureș lowlands and river mussels are found at Geoagiu de Sus-*Fântâna Mare* in the uplands of the middle Geoagiu Valley. This appears to be evidence of inter-settlement movement of subsistence products, potentially as the result of increased interaction or provisioning. The potential implications of changing movement of subsistence products for understanding Terminal Wietenberg social, economic, and political institutions will be explored in Chapter 11.

Wietenberg communities had a strong focus on wild resources. While wild terrestrial resources made up less than 10% of EBA and Noua assemblages, they made up over 25% of Wietenberg assemblages. The emphasis on wild resources was similar across different valley positions, even though the species that made up the wild species varied by landscape position (e.g., more river mussels in sites near the Mureș). It is likely that the Wietenberg emphasis on wild resources was part of a broader cultural cuisine rather than simply due to available resources. During the LBA, Terminal Wietenberg and Noua communities both occupied the research area, but Terminal Wietenberg faunal assemblages look much similar to Formative and Classical Wietenberg assemblages than they do to the neighboring Noua. Consequently, there appears to be a shared subsistence economy template for the Wietenberg communities that remained relatively stable for the almost 700 year time period this cultural group occupied the area.

As with ceramic quality, there is no strong pattern between site size and the frequency of wild resources. As a result, it is not clear whether there were elite communities at the large site of Pețelca-*Cascadă*, or if there were, there is minimal evidence that they were consuming significantly different foods than communities at smaller surrounding sites. There are more red deer at Pețelca-*Cascadă* than would be expected based on its site location, which may be indicative of hunting forays by elites or the movement of food from upland to lowland communities. However, at this point there does not appear to be a qualitatively different subsistence profile between communities in large and small sites.

There is no distinct pattern between the faunal assemblages associated with different Wietenberg ceramic decoration techniques. While ceramic quality appears to vary between styles, there is no link between higher quality ceramic assemblages and certain faunal profiles. Instead, faunal assemblages more strongly conform to a shared Wietenberg template rather than differ between style. This suggests that the degree of inequality seen in these different lines of evidence lack coherence. If increased ceramic quality is associated with elite status, then there is no strong link between elite status and animal-based subsistence.

The high amount of wild animal resources in all Wietenberg assemblages reflects the settlement pattern that indicate there was open access to the uplands during the MBA. Wild resources were likely more abundant in the uplands, and the presence of wild resources across all sites indicates that all MBA communities had direct access to upland landscapes. This has implications for metal procurement, which may have also been conducted by all communities in the unoccupied uplands. If all MBA Wietenberg communities had uncontested access to the uplands to hunt, they may have also been able to directly procure metal from upland sources. It is also possible that metal procurement was embedded within hunting forays or pastoral exploitation of upland landscapes (see Gerling et al. 2012).

Metallurgical Evidence

Due to the small scale of excavation as part of the BATS Project, this study uncovered only a limited quantity of evidence for metallurgical production at Bronze Age sites in the Geoagiu Valley. Consequently, it is currently impossible to fully reconstruct the organization of metal procurement, production, and consumption through metallurgical evidence alone. The material that was recovered, however, does provide important insights into how metal systems were organized (and perhaps even more information on how they were *not* organized, as will be discussed below). Much more work needs to be done on the BATS samples that have been collected, particularly chemical analyses of ores, slags, and finished items through XRF and lead isotopes.

The BATS Samples were primarily collected through visual recognition and collection in lots during test excavations. Flotation samples, some of which have not been fully processed, also revealed evidence of metallurgy that was unrecognized in the field. An initial sort of collected materials was conducted by Christopher Papalas, which is presented in this section. The evidence of metalworking will be presented by site, and due to the limited number of artifacts, it is not possible to present larger comparative synchronic and diachronic analyses as was possible with the ceramic and fauna material.

Geoagiu de Sus-Fântâna Mare

Geoagiu de Sus-*Fântâna Mare* is located near a potential gold mine at Măgura Geomal in the middle Geoagiu Valley (see Chapter 3 for further discussion). As part of fieldwalking and initial surface survey of the site, a Wietenberg ceramic was found with the interior surface covered with a byproduct (sulfide) of melted copper ore (Lot 12-077). This piece is likely a crucible fragment, suggesting secondary processing of ores and metals took place within the settlement. A potential piece of copper or bronze was found (Lot 12-099) in the Formative Wietenberg deposits in Unit 3.

Geoagiu de Sus-Viile Satului

In the portion of the large bell-shaped pit excavated at Geoagiu de Sus-*Viile Satului*, a rolled cylindrical copper or bronze bead (Lot 13-095) and two segments of furnace lining (Lots 13-073-092) were recovered (Figure 10.17). The deposits in which these metals were found have been dated to the Classical Wietenberg subphase of the MBA. It is unlikely that the furnace lining is in situ, and was likely deposited along with other ceramic, fauna, and metallurgical material into the pit after the end of its uselife as a storage pit. It is likely, however, that copper and/or bronze metalworking was taking place at this small settlement in the middle Geoagiu Valley during the Classical Wietenberg.

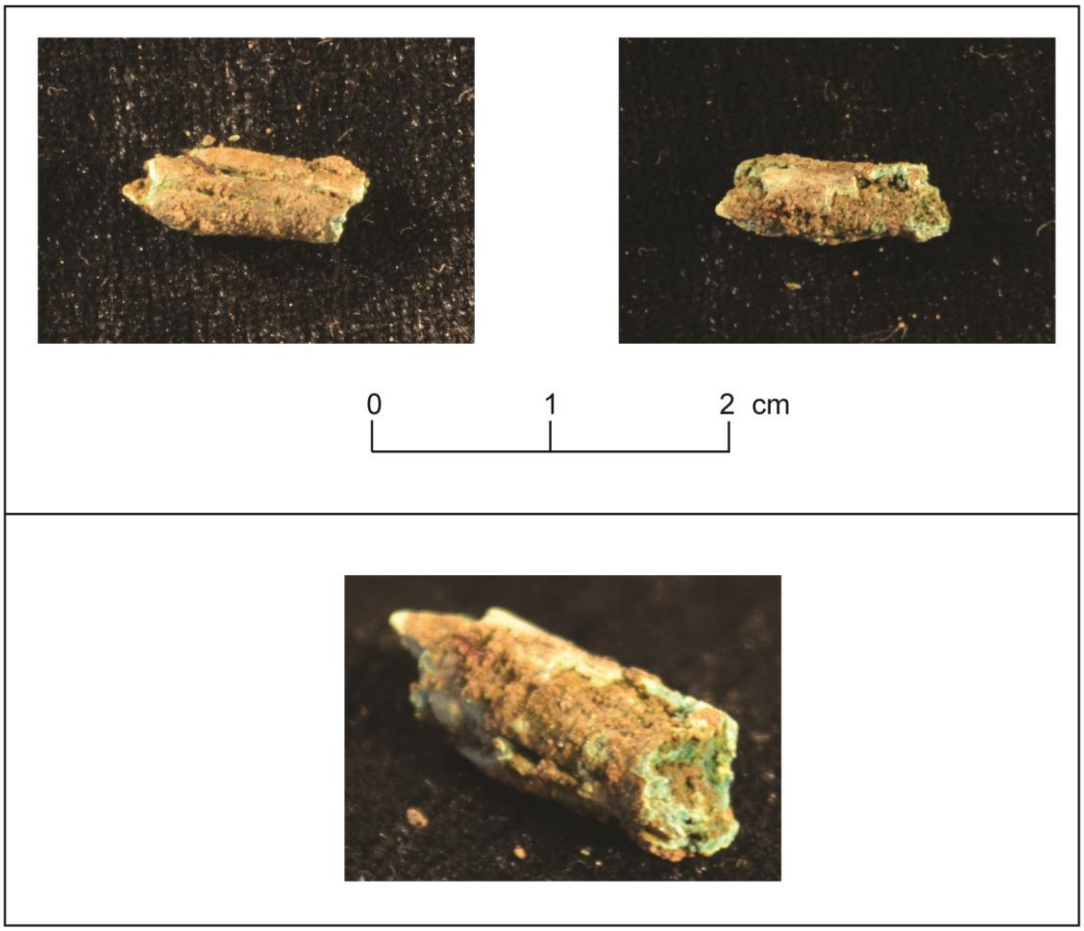


Figure 10.17 – Rolled copper or bronze bead from Geoagiu de Sus-Viile Satului.

Pețelca-Cascadă

The largest site in the BATS Project survey region contained important evidence of metal production. A sandstone mould fragment for bronze pins was found in Classical Wietenberg deposits in Unit 3 (Lot 14-046) (Figure 10.18). A flotation sample from the same context produced metallurgical slags (Flot 14-019). A piece of furnace lining was found in Terminal Wietenberg deposits in Unit 1 (Lot 14-118). The evidence suggests that metalworking was taking place in the central areas of the nearly 8 ha settlement.

Figure 10.18 – Stone mould for bronze pins from Pețelca-*Cascadă*.

Rameț-Curmatura

The test excavations at Rameț-*Curmatura* failed to identify intact and undisturbed Bronze Age deposits. However, during the course of excavation, a Late Bronze Age bronze bucket handle was recovered in Unit 1 (Figure 10.19). The handle has evidence of decoration in the form of sequential lines along the length of the handle. Similar handles have been identified by Soroceanu (2008) and dated to the Late Bronze Age. Previous field collections at the site, published by Boroffka (1994a) produced other metal objects initially linked to the Wietenberg Culture through more likely based on Late Bronze Age forms (Figure 10.20). The co-occurrence of Wietenberg Type C ceramics and Late Bronze Age metal objects, along with the lack of non-Wietenberg Late Bronze Age ceramics, suggests the site was occupied during the Terminal Wietenberg.

Figure 10.19 – Bronze vessel handle from Ramet-*Curmatura*

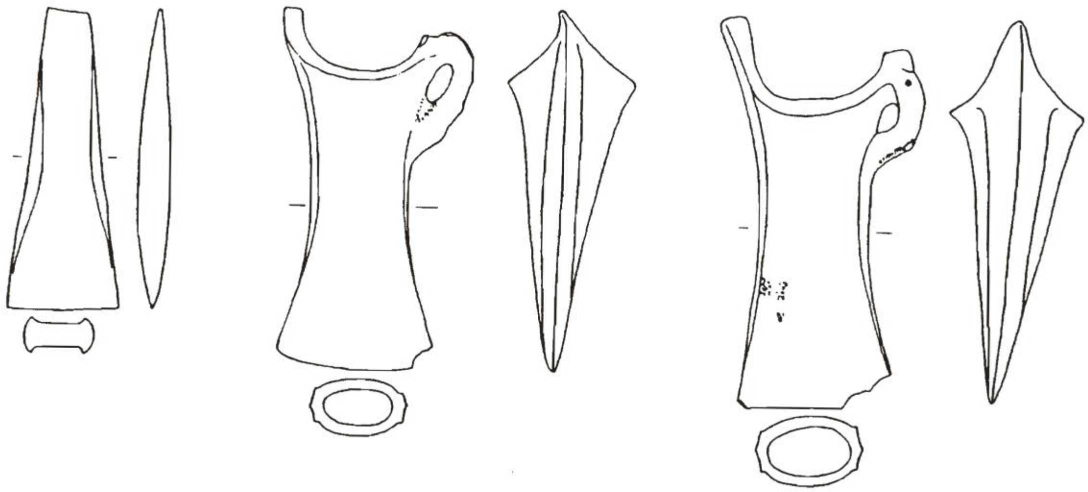


Figure 10.20 – Late Bronze Age bronze axes previously found at Rameț-*Curmatura* (after Boroffka 1994a:Plate 114).

Stremț-Fabrica de Alcool

The Formative and Classical Wietenberg deposits at Stremț-*Fabrica de Alcool* contained significant evidence of early stage metallurgy. A fragment of copper ore – quartz with visible native copper still present – was found in the Classical Wietenberg deposits in Unit 3 (Lot 13-057), and additional ore was found in the overlaying Late Bronze Age deposits (Lot 13-045). Copper slag was found in the Formative Wietenberg deposits in Unit 2 (Lots 13-033, 13-040). Copper slag was also found in the Classical Wietenberg deposits in Unit 3 (Lot 13-052). Furnace lining fragments were found in the Formative Wietenberg (Lot 13-033) and Late Bronze Age (Lot 13-046) deposits at the site. This site contains the best evidence for Bronze Age ore processing in addition to evidence of smelting in the Geoagiu Valley. The site is approximately 10 km away from the nearest presumed hydrothermal sources of copper in the area. Consequently, the material recovered demonstrates that unprocessed ore was being brought into the site, a distance of at least 10 km.

Teiuș-Coastă

Excavations at Teiuș-*Coastă* produced evidence of smelting as well as finished copper/bronze objects. A fragment of a furnace lining and slag pieces were found in the stone and ceramic-filled feature in Unit 1 (Flot 14-024). A copper/bronze pin (Lot 14-095) and a drop of copper/bronze were found in the same cultural layer (Flot 14-025). The feature contained EBA II (Șoimuș) ceramics and produced a EBA III date. Teiuș-*Coastă* is a large (for the EBA – almost 2 ha), potentially fortified, settlement along the Mureș River. No other metallurgy evidence was found in other EBA contexts excavated by the BATS Project. However, the absence of metallurgy at other, smaller, settlements during the EBA cannot be considered definitive evidence of centralized production; only a few EBA sites were subjected to subsurface testing and many lacked intact cultural deposits (e.g., Stremț-*Berc 1*; Rameț-*Gugului*).

Discussion of Metallurgical Evidence

As mentioned above, any conclusions drawn from the limited metallurgical evidence in the BATS Project must be considered preliminary and subject to significant change with future work. However, some early patterns are emerging. First, metallurgical evidence was found at a number of different sites. Metalworking is not limited to only large sites in the Geoagiu Valley (e.g., Pețelca-*Cascadă*), as there is evidence at smaller sites as well. There is evidence of metallurgy at sites closer to ore sources (e.g. Geoagiu de Sus-*Viile Satului* and Geoagiu de Sus-*Fântâna Mare*) as well as over 10 km from the nearest sources (e.g., Pețelca-*Cascadă*, Teiuș-*Coastă*, and Stremț-*Fabrica de Alcool*). The presence of metallurgy at most Early, Middle, and Late Bronze Age sites within the Geoagiu Valley matches the spatial distribution seen by Papalas (2008) at sites in the Lower Mureș Valley in the Carpathian Basin. There, small-scale metallurgy was common across households and sites, while larger-scale production may have been more intense in larger regional centers. In the Geoagiu Valley, we currently lack evidence for how the intensity of metalworking varied between sites. It is possible that instead of the presence of metallurgy, highly skilled individuals that engaged in more advanced production that may have varied across space (Kuijpers 2008, 2012).

The presence of unprocessed ores at Stremț-*Fabrica de Alcool* also hints at the organization of metal procurement and processing during the Bronze Age. Ores were not always fully processed at mining locations for transport to settlements. Combined with the lack of contemporaneous (Middle Bronze Age) settlements in the ore-rich Upper Geoagiu Valley, it may indicate that community members at Stremț-*Fabrica de Alcool* directly procured ore from the uplands. Further discussion of the organization of metal procurement is presented in Chapter 11.

Based on the current evidence, there is no discernable link between potential emerging elite communities and metallurgical production. The lack of a link between elites and metal production is bolstered by recent evidence metalworking finds recovered from the site of Aiud-*Groapa de Gunoi* (see Bălan et al. 2017b). At this small Wietenberg Type C site along the Mureș Valley just north of Aiud, researchers uncovered significant evidence for metalworking, including casting of complex axe forms, in the form of stone and clay moulds, clay crucibles, and finished bronze items (Figures 10.21 and 10.22).

Figure 10.21 – Clay mould (a) and ceramic crucibles (b-d) from Aiud-*Groapa de Gunoi* (after Bălan et al. 2017b: Plate 23).

Figure 10.22 – Stone moulds (a-b) and bronze objects (c-g) from Aiud-*Groapa de Gunoi* (after Bălan et al. 2017b: Plate 26).

Chapter Summary

In this chapter, I presented analyses and discussion of three classes of artifacts collected by the BATS Project that contribute to a better understanding of social, economic, and political institutions in southwest Transylvania during the Bronze Age. Ceramic fabrics increase in quality over time, with a significant uptick in stylistic diversity and super-fine wares in the Classical Wietenberg period. Higher quality wares make up a larger portion of assemblages associated with Wietenberg Type D ceramics than any other type, though this may be biased by the depositional context in which Type D ceramics were found. There is no strong link between ceramic quality and site size, as large sites did not have more higher quality wares than small sites.

Faunal analyses demonstrate that there were significant differences in animal hunting, rearing, and consumption practices between Early Bronze Age, Wietenberg, and Noua cultural contexts. There were similar faunal patterns, including a significant incorporation of wild resources, across all Wietenberg sites and time periods. The presence of some upland resources at lowland sites, and vice versa, suggests inter-community integration and mobility among Wietenberg communities of the MBA and LBA. There were minimal differences among faunal assemblages associated with the four different Wietenberg ceramic types, suggesting that ceramic styles may not have been linked to ranked status differences, at least in access to wild and domesticated animals. Communities focused on locally available resources and much of the variation in faunal assemblages was due to communities being located in different positions in the Geoagiu and Mureș Valleys.

The limited metallurgical evidence recovered as part of the BATS Project suggests that metallurgy was widespread across all sites. Ore, which may have been processed at mining locales, was also brought back to at least some settlements for processing. There does not appear to be evidence that an emerging elite community controlled and restricted access to basic metallurgical needs, though whether an emerging elite could control larger-scale and higher skilled work is as yet unknown. In the next chapter, I draw together the settlement, mortuary, and artifact analyses to reconstruct the organization and dynamics of southwest Transylvanian societies in the Bronze Age.

PART V: SYNTHESIS

Chapter 11 - Synthesizing Community Organization and Social Change in the Transylvanian Bronze Age

Chapter Introduction

The previous part of this study (Chapters 7-10) presented several lines of archaeological evidence necessary for evaluating the models presented in Chapter 5. In this chapter, I weave these lines of evidence together to test the organization and evolution of communities in southwest Transylvania. I begin this synthesis with a discussion of the organization of social, economic, and ideological institutions in southwest Transylvania by temporal subphase. As a reminder, this study considers seven institutions spread across three realms (Table 11.1)

Table 11.1 – Seven institutions and realms investigated in this study.

Realm	Institution
Social	How people situated themselves across the landscape (Social Institution 1). What identities were present and marked (Social Institution 2).
Econmic	How crafting was organized (Econmic Institution 1). How subsistence production was organized (Economic Institution 2). How trade and exchange was organized (Economic Institution 3).
Ideological	How in/equality was legitimized in mortuary contexts (Ideological Institution 1). How in/equality was legitimized in daily contexts (Ideological Institution 2).

In presenting these institutions, I focus on how they articulate to create coherence or dissonance in community organization. After presenting assessments of community organization in each subphase of the Bronze Age, I trace changes in institutions and inter-institutional articulations to reconstruct the trajectory of change in community organization over time. I assess whether changes best fit models of microevolutionary, macroevolutionary, and social transformative changes. I also discuss potential mechanisms that allowed quantitative change to lead to qualitative changes, as well as the broader social conditions that may have inhibited qualitative change at other times in the Bronze Age. The trajectory of southwest Transylvania is then situated within the broader Carpathian Macroregion to explore how the processes of social change compare with trajectories in neighboring regions. Comparing southwest Transylvania with other regions makes it possible to identify how the unique constellation of natural resources in southwest Transylvania may have impacted the dynamics of social change. The case study from southwest Transylvania provides a trajectory of social change in a resource procurement zone that underscores the need for holistic approaches and long-term perspectives on social processes in middle-range societies.

Community Organization in Bronze Age Transylvania

Community organization in southwest Transylvania was highly dynamic throughout the Bronze Age. Broadly, there was increased integration and connectivity between sites throughout the Early and Middle Bronze Ages. Settlements increased in size in the Middle Bronze Age, but a pattern of short use and rapid abandonment of upland communities meant that there was no settlement hierarchy associated with complex regional polities throughout the Early and Middle Bronze Ages. The importance of ceramics as a marker of identity only emerged after Iernut communities with textile-impressed and rusticated wares moved into the region. The creation of new scales of marked identity started in the Middle Bronze Age with the creation of Wietenberg identity materialized in ceramics and mortuary practices. At the same time, the Middle Bronze Age was a period of increased segmentation of identity at smaller social scales, though there is minimal evidence of hierarchical ranking prior to the Late Bronze Age. The movement of Noua communities into the region spurred a hierarchical reorganization of Wietenberg settlement systems in the Late Bronze. Economically, there was an increased focus on accessing long-distance exchange routes throughout the Early and Middle Bronze Ages. In the Late Bronze Age, with the movement of Noua communities into the region, the local Wietenberg communities reorganized themselves to exert more control on the upland metal resources than had been present throughout the Middle Bronze Age. Ideologically, Early Bronze Age communities materialized more inequality in mortuary contexts than appears in residential contexts. Conversely, Middle Bronze Age communities may have masked emerging inequalities in daily life in their funerary treatment of the dead. This broad view emerges out of a consideration of integration and interaction within and between institutions. In this section, I examine how institutions were organized to characterize southwest Transylvanian communities as autonomous villages at the local scale, asymmetric semi-autonomous regional networks, or complex hierarchical regional polities.

EBA I (2700-2500 BC)

At the inception of the Bronze Age, the social, economic, and ideological institutions of communities in southwest Transylvania were primarily organized at the local level with minimal regional asymmetries (Figure 11.1, Table 11.2)[10].

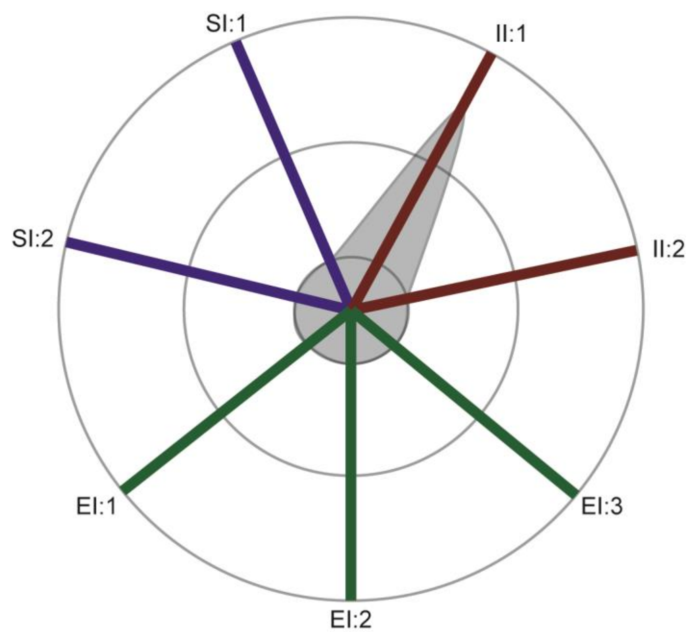


Figure 11.1 – EBA I inter-institutional articulations.

[10] The inter-institutional articulation figures in this section present a visual representation of the organization of each institution. Models for these figures are presented in Chapter 5. The inner circle represents local autonomy (Mode 1), the middle circle represents regional asymmetries (Mode 2), and the outer circle represents regional hierarchy (Mode 3).

Table 11.2 – Summary of community organization in EBA I.

Institution	Organization
Social Institution 1 (SI:1)	People situated themselves evenly across the landscape (Mode 1).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked (Mode 1).
Economic Institution 1 (EI:1)	Metal crafting was organized at or below the village level (Mode 1).
Economic Institution 2 (EI:2)	Subsistence production was organized at or below the village level (Mode 1).
Economic Institution 3 (EI:3)	Trade and exchange was organized at or below the village level (Mode 1).
Ideological Institution 1 (II:1)	Significant regional inequality was legitimized in mortuary contexts (Mode 2/3).
Ideological Institution 2 (II:2)	Little inequality was legitimized in daily contexts (Mode 1).

In the social realm, people situated themselves evenly across the landscape. Sites were generally small (most under 1 ha). There was one site that was significantly larger than the rest, Sântimbru-*Obreje/La Tabaci* (2.56 ha), which helped produce the material signatures of a site-size hierarchy associated with more complex polities. However, this site was also occupied during the EBA II and it is unclear how large the settlement was during the EBA I. Sântimbru-*Obreje/La Tabaci* was located between the confluences of the Mureș and Târnâva Rivers and Mureș and Ampoi Rivers. With the site positioned in this strategic location, we must consider the possibility that this was not a permanent year-round settlement. Instead, the site may have been a locale of interaction and exchange through episodic trade fairs (see Tache 2011). This is supported by the network analysis. Sântimbru-*Obreje/La Tabaci* had the highest betweenness centrality, but lower degree and eigenvector centrality, suggesting its size was a factor of its strategic position for controlling the flow of resources, people, and information through the regional settlement network. The identities that were materialized in EBA I communities were primarily small in scale. These communities buried their dead in clustered tomb cemeteries which may have been associated with specific lineages and villages for several centuries. Livezile ceramics were not elaborate and were not constructed or decorated following rigid cultural templates. In burials, individual identity was marked through personal adornment items. Together, the social institutions indicate communities with local autonomy and some episodic regional integration that likely produced symmetrical interactions.

There is no evidence for hierarchical economic relationships between sites during EBA I. The dispersed settlement system meant that inter-settlement interactions would have occurred less often and that each settlement would have had sufficient access to local resources, particularly subsistence resources, and would not have relied on other communities for economic needs. Communities buried their dead on ridges, which had the dual benefit of being visible from long distances and situated near metal sources and paths from the Mureș Valley into the rich Metal Mountains. There are several EBA I settlements located high in the uplands (e.g., Rameț-*Gugului*, Zlatna-*Colțul lui Blaj*, Zlatna-*Dumbrăvița*, Livezile-*Baia*, and Livezile-*Obirsie/Obursi*) that would have been well placed to mine nearby metal sources. There is evidence of fortification at these upland EBA I sites (e.g., Livezile-*Baia*; Ciugudean 1996), suggesting that communities were concerned with defense from raiding from other communities. Given the position of some of these upland sites, nearly 20 km from the Mureș interregional corridor, it is likely that their defensive features were at least in part constructed to protect sites from other local communities in southwest Transylvania. The threat of violence would have impacted how metal procurement would have been organized, with upland communities concerned with defending themselves from lowland communities engaged in direct procurement in the uplands. Settlements were placed with no preference for pastoral or agricultural land. This seeming lack of concern with the productivity of different microenvironments, combined with the small site sizes, suggests that EBA I communities were likely self-sufficient for their subsistence needs. Because EBA I communities lived in many different landscape types, this means that the subsistence profiles of each site would have been different. There was no strong link between EBA I communities and the Mureș trade corridor (as seen through catchment analyses). Together, the economic institutions in southwest Transylvania hint at communities with minimal integration, potential episodic economic aggregations, but minimal asymmetries in interactions.

In the ideological realm, alternative views of the amount of inequality materialized in mortuary and daily life contexts cooccur. At the cemeteries of Țelna-*Rupturii* and Meteș-*La Meteșel*, funerary rituals occurred infrequently and only a few members of the community were buried. Grave goods at Livezile-*Baia* and Ampoița-*Peret*, which include ceramics and gold and copper/bronze adornment items, were placed in some of the graves. EBA I mortuary practices emphasized inequality in a way that did not match the relative equality seen in daily life contexts. Due to Sântimbru-*Obreje/La Tabaci*, there is evidence for a settlement rank-size hierarchy. As mentioned previously, however, this is likely a byproduct of inaccuracies in the horizontal extent of the EBA I component on the multi-component site. There is no evidence of different house sizes (see Ciugudean 1996), control of craft or subsistence production, or exerting control on trade and exchange that would indicate institutionalized inequality in daily life of Livezile communities.

The organization of EBA I communities can be characterized as slightly dissonant, with most institutions coherently organized at the local scale through autonomous communities with minimal institutionalized inequality. The only deviation from this mode is how inequality is materialized in mortuary practices, where burial rituals are reserved for only a small segment of the population. The presentation of identities and relationships in death exaggerated inequalities that were minimal in daily life.

EBA II (2500-2250 BC)

With the shift from Livezile to Șoimuș pottery, communities in southwest Transylvania became increasingly integrated at the regional scale with minimal regional asymmetry (Figure 11.2, Table 11.3).

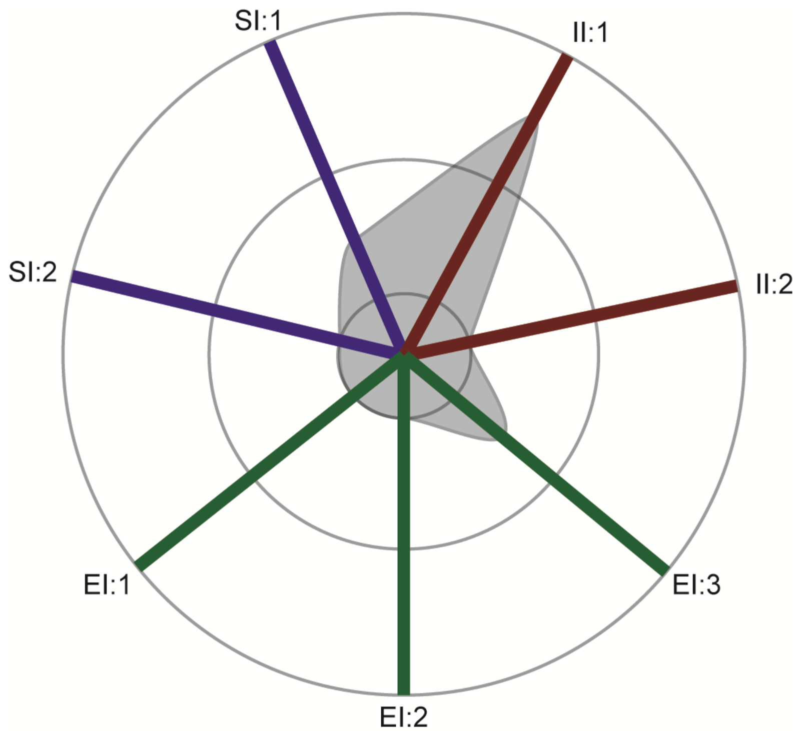


Figure 11.2 – EBA II inter-institutional articulations.

Table 11.3 – Summary of community organization in EBA II.

Institution	Organization
Social Institution 1 (SI:1)	People situated themselves evenly across the landscape with some regional integration (Mode 1/2).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked (Mode 1).
Economic Institution 1 (EI:1)	Metal crafting was organized at or below the village level (Mode 1).
Economic Institution 2 (EI:2)	Subsistence production was organized at or below the village level (Mode 1).
Economic Institution 3 (EI:3)	Some regional integration of trade and exchange but minimal asymmetries (Mode 1/2).
Ideological Institution 1 (II:1)	Significant regional inequality was legitimized in mortuary contexts (Mode 2/3).
Ideological Institution 2 (II:2)	Little inequality was legitimized in daily contexts (Mode 1).

In the social realm, people were situated more evenly across sites, with no rank-size hierarchy in the settlement system. Sites were larger on average than the EBA I, but no sites were larger than the 2.56 ha Sântimbru-*Obreje/La Tabaci*. Because of the site's key socioeconomic position among the regional settlement network – Sântimbru-*Obreje/La Tabaci* had the highest centrality across all three network measures – people were likely drawn to its broad economic opportunities. The pull of Sântimbru-*Obreje/La Tabaci* may have produced some regional asymmetry in interactions with surrounding communities. While there was increased interaction among EBA II settlements, there does not appear to be any evidence that local autonomy was transcended in any lasting way. As in the EBA I, small-scale identities were the primary identities materialized in EBA II communities. These communities continued to bury their dead in clustered tomb cemeteries which may have been associated with specific lineages and villages for several centuries. Șoimuș ceramics had some diagnostic elements, but these were primarily through manufacturing techniques (e.g., folded handles) that would have not been an overt signal of different identities. Burial practices continued to mark individual and small-scale community identities (e.g. households, lineages, villages). Primary inhumations with personal adornment items would have preserved individual identity throughout the funerary rituals, while secondary burial of defleshed bones may have provided an opportunity to obscure individual identities and promote communal identities (e.g. see Kuijt 1996; Kuijt et al. 2011). There is also a pattern of tomb cemeteries in the Mureș Valley lowlands that are covered in earth with no stone covering (e.g., Hapria, Sebeș, Oiejea), but no absolute dates have been run to situate them within this period or during the preceding or subsequent EBA subphases. If they date to the EBA II, they may indicate the presence of an upland/lowland division in identity that would become more important in the EBA III. While there may be an upland/lowland division in mortuary practices, there is no patterned difference currently observed in other material culture signals (e.g., ceramics, stone tools). Consequently, it is unlikely that there was significant differentiation among communities in increasingly integrated regional networks. Together, the social institutions indicate communities with local autonomy, some episodic regional integration that likely produced symmetrical interactions.

In the economic realm, there is no evidence of hierarchically integrated regional institutions during the EBA II. While settlements shifted towards agricultural land and interregional trade routes, there was a continued presence in the metal-rich uplands. There are many settlements located in the upper Ampoi valley towards the Metal

Mountains, and there are EBA II sites located in the upper reaches of valleys of the Trascău Mountains. Șoimuș communities continued to use upland landscapes near metal sources for ridgetop cemeteries. Access to metal was likely contested and secured through regular returning to cemeteries, even from lowland settlements, in metal-rich landscapes. There is no evidence of regional centralization in the production of metals or other crafts (e.g., groundstone axes, lithics). Subsistence production continues to appear to be organized at the local scale, with each community meeting their own subsistence needs. There is a relationship between site size and agricultural productivity; sites positioned in good agricultural land can support larger population sizes. With some communities placed in the uplands and some communities placed directly along the Mureș trade corridor, it is possible that there were significant undirected local exchange networks that moved metals to the lowlands and imports and other agricultural products back to the uplands.

In the ideological realm, inequality is more visible in mortuary contexts than in daily life contexts. The mortuary patterns first observed in the EBA I continued in the EBA II, where funerary events occurred infrequently and only a portion of the community received the treatment of burial in a cemetery. Grave goods were unevenly distributed, with some individuals being buried with metal adornment items and ceramics and others buried with no objects. The mortuary practices of EBA II communities materialized an amount of inequality that did not match daily life relationships and identities. There is not settlement size hierarchy during the EBA II. The artifact assemblages recovered show no patterned restrictions in metallurgical production, animal subsistence economies, or ceramic production and elaboration. Any inequalities among Șoimuș communities were not marked and reinforced through residential patterns or domestic activities.

The organization of EBA II communities was more dissonant than in the EBA I, with social identities, metallurgical production, and subsistence production organized at the local scale. Settlement systems and the organization of institutions of trade and exchange suggest there is increased interaction and integration across southwest Transylvania. While relationships between sites were not necessarily symmetrical, asymmetries that did exist were not controlled by elite communities. The only institution materializing relationships of inequality was in mortuary practices, where burial rituals continued to be restricted to a small segment of the population. The presentation of identities and relationships in death continued to emphasize inequalities that may have been more muted in daily life, though it was not as wide a difference as it was during the EBA I.

EBA III (2250-2000 BC)

The new radiocarbon dates in this study have introduced complexity into our understanding of community organization during the EBA III. One critical new insight based on the new dates is that when ceramics with rusticated decoration (Iernut – EBA III ceramics) arrived in Transylvania, the ceramic was not widely adopted. In fact, Șoimuș communities (EBA II ceramics) persisted until the start of the Middle Bronze Age, overlapping in time and space with the Iernut communities, who likely moved into the region from the Carpathian Basin and settled near strategic river confluences by 2200 cal. BC. The assertion that Iernut communities migrated into the region is based on the introduction of new ceramics from the Carpathian Basin, the unique settlement pattern, and isotopic evidence from Meteș-*La Meteșel* that suggests that non-local peoples were active in the EBA III landscape[11]. The new length of time during which communities making Șoimuș ceramics lived in Transylvania (now 500 years) challenges reconstructions of regional settlement systems, especially because we know that Șoimuș communities aggregated into larger fortified settlements (e.g., Teiuș-*Coastă*) concurrently with the immigration of Iernut communities. As such, this assessment of community organization will look across both Iernut and Șoimuș communities to reconstruct social, economic, and ideological institutions.

During the EBA III, social, economic, and ideological institutions were variably organized at the local level and at the regional level with asymmetries but no hierarchical relationships (Figure 11.3, Table 11.4).

[11] It is still possible that some local Transylvanian communities fully adopted the Iernut rusticated ceramics (which includes all utilitarian wares) while other local communities did not. Futher work is needed to be certain of the suggestion of migrating groups in the EBA III.

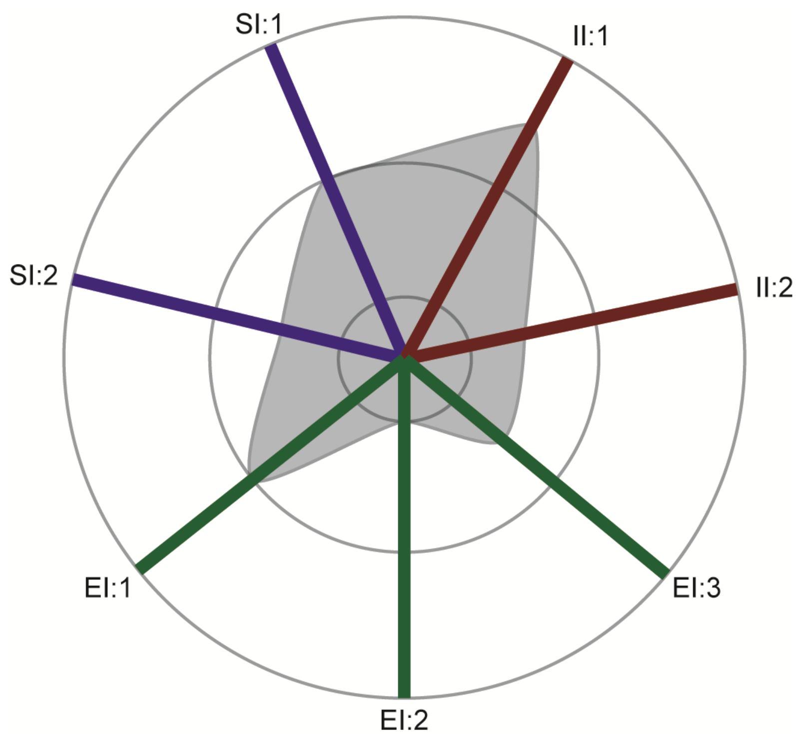


Figure 11.3 – EBA III inter-institutional articulations.

Table 11.4 – Summary of community organization in EBA III.

Institution	Organization
Social Institution 1 (SI:1)	Regional asymmetry in how people situated themselves across the landscape (Mode 2).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked; some larger regionally integrative cultural identities marked (Mode 1/2).
Economic Institution 1 (EI:1)	Metal crafting was organized with regional asymmetry (Mode 2).
Economic Institution 2 (EI:2)	Subsistence production was organized at or below the village level (Mode 1).
Economic Institution 3 (EI:3)	Some regional integration of trade and exchange but minimal asymmetries (Mode 1/2).
Ideological Institution 1 (II:1)	Significant regional inequality was legitimized in mortuary contexts (Mode 2/3).
Ideological Institution 2 (II:2)	Minimal inequality was legitimized in daily contexts (Mode 1/2).

In the social realm, the movement of Iernut communities into the region from the Carpathian Basin spurred a reorganization of settlement. Local Șoimuș communities appear to have aggregated into larger fortified sites, such as the fortified village at Teiuș-

Coastă. During this time, it is possible that communities in the uplands moved towards the lowlands. However, the paucity of radiocarbon dates from upland Șoimuș sites (only 1 has been accurately dated – Geoagiu de Sus-*Fântâna Mare*) may be partially responsible because these sites are normally attributed to the EBA II. The Iernut communities established a tight cluster of settlements at the confluence of the Ampoi and Mureș Rivers, which would have been an ideal position from which these communities could have controlled the flow of metal through the Mureș River corridor to the Carpathian Basin. No Iernut communities have been found in the uplands near the metal sources. At Meteș-*La Meteșel*, Burial 3 in Tomb 1 appears to be a non-local individual that was interred in a previously constructed and abandoned tomb. This suggests that while Iernut communities placed their settlements to control the flow of resources out of southwest Transylvania, they used their dead to contest access to upland metal-rich landscapes. The act of burying their dead in a tomb previously used by local Transylvanian communities would likely have been a form of political action to appropriate ancestors and territorial rights mediated through mortuary landscapes. There is a rank-size hierarchy, with the Iernut community at Oarda de Jos-*Sesul Orzii* occupying the largest site to date in the Bronze Age (3.77 ha).

There is a contradiction in the settlement systems, however. The sites are positioned to control trade, but network analysis reveals that the largest site (Oarda de Jos-*Sesul Orzii*) is more effectively placed to control labor and local procurement and production rather than trade and exchange. This contradiction can most likely be explained as the byproduct of an incomplete settlement network. Potentially contemporaneous upland sites cannot be attributed to this phase based on ceramics alone. By conducting network analyses with a potentially large quantity of sites unaccounted for, particularly systematically omitting sites from one area, the outcomes are potentially flawed for interpreting socioeconomic organization.

The EBA III is the first period where communities would have had a nearly daily reminder of identity differences through ceramics. The Iernut rusticated wares are visibly distinct from Șoimuș ceramics, and it would have been difficult for these communities to not take notice of the differences. At Teiuș-*Coastă*, the site was covered almost exclusively in Șoimuș ceramics, though one large piece of rusticated Iernut ceramics was found. This suggests that these communities, while maintaining marked differences in their ceramics, were interacting. Together, the social institutions suggest that EBA III communities were integrated both within the two distinct ceramic traditions, but also across these ceramic boundaries. Given the fortifications at Teiuș-*Coastă*, and the reuse of old tombs by Iernut communities, it is likely that the nature of relationships was contentious, if not outright violent. Confronting each other would have made these communities more aware of how their different cultural practices (e.g. ceramic decoration) marked different social identities at scales beyond the individual communities.

In the economic realm, there continues to be no evidence for hierarchical organization of institutions. Metal procurement, production, and distribution does appear to be subject to more regional integration and regional asymmetries. The tight clustering of Iernut communities at the confluence of the Ampoi and Mureș Rivers suggests that they may have been coordinating to control the flow of metal to surrounding areas. This represents a form of regional integration, and potential coordination, that is greater than in the EBA II. At the Șoimuș site of Teiuș-*Coastă*, slag and finished metals suggest that ore was transported into the settlement for processing, potentially an indication of concern about lingering at sources. While there is evidence of metallurgical procurement and production by the community at Teiuș-*Coastă*, and no evidence of procurement and production have been found at other upland Șoimuș sites in the Geoagiu Valley, the small scale of fieldwork makes it impossible to provide definitive conclusions on any regional asymmetry in metal systems. Subsistence production continues to appear to be organized at the household and community level, as the larger sites are located in agriculturally rich landscapes that would have been able to grow and manage enough plant and animal resources to feed themselves without inter-site provisioning. Trade and exchange systems reflect inter-settlement integration, as sites were positioned to prioritize access to the Mureș River, and particularly for the Iernut communities controlling the key riverine and overland trade routes through the Mureș corridor. While there is likely regional integration, there is not sufficient evidence of inter-site asymmetries in exchange relationships.

In ideological institutions, inequality in mortuary practices continued to be materialized to a greater degree than seen in daily contexts. Burial in lowland earthen covered tombs, which likely are associated with EBA III settlements, was restricted to only a small portion of society. There are few visible signals of inequality in lived experiences, or marked through ceramics. The presence of metal personal adornment items in settlements, such as a copper/bronze pin at Teiuș-*Coastă*, may indicate some degree of inequality was marked in daily life. The presentation of identities and relationships in death continued to overemphasize inequalities in daily life that were likely minimal but increasing towards the end of the EBA.

The organization of EBA III communities trended towards more coherence. EBA III communites were regionally integrated with asymmetrical relationships and fewer institutions were organized at the local scale. The presentation of identities and relationships in death continued to present the most hierarchically organization of all institutions. Regional asymmetries were present in how people situated themselves in space and with how metal systems were organized. Subsistence continued to be organized at the local level, while there was an increasing trend towards regional identities and inequalities in daily life contexts. Within realms, institutions were not organized coherently, producing tensions between different aspects of southwest Transylvanian social, economic, and ideological organization.

Formative Wietenberg (2000-1875 BC)

The transition to the Middle Bronze Age around 2000 BC, where widely distributed EBA cultural identities were replaced with new, regionally bounded, identities was a process that occurred across the Carpathian Macroregion. In Transylvania, there is little evidence that the co-occurrence of different identities in the preceding EBA III period had a lasting impact on Middle Bronze Age community organization. The origins of Wietenberg cultural identity were established in the Formative Wietenberg. Radiocarbon dating confirmed that Wietenberg emerged around approximately 2000 BC, and that the assemblages were primarily Wietenberg type A ceramics. During this period, there was a trend towards increasing ceramic complexity with the introductions of Wietenberg B and C type ceramics towards the end of the 20^{th} century BC. Community organization in the Formative Wietenberg was characterized by institutions exhibiting some regional integration but primarily local autonomy (Figure 11.4, Table 11.5).

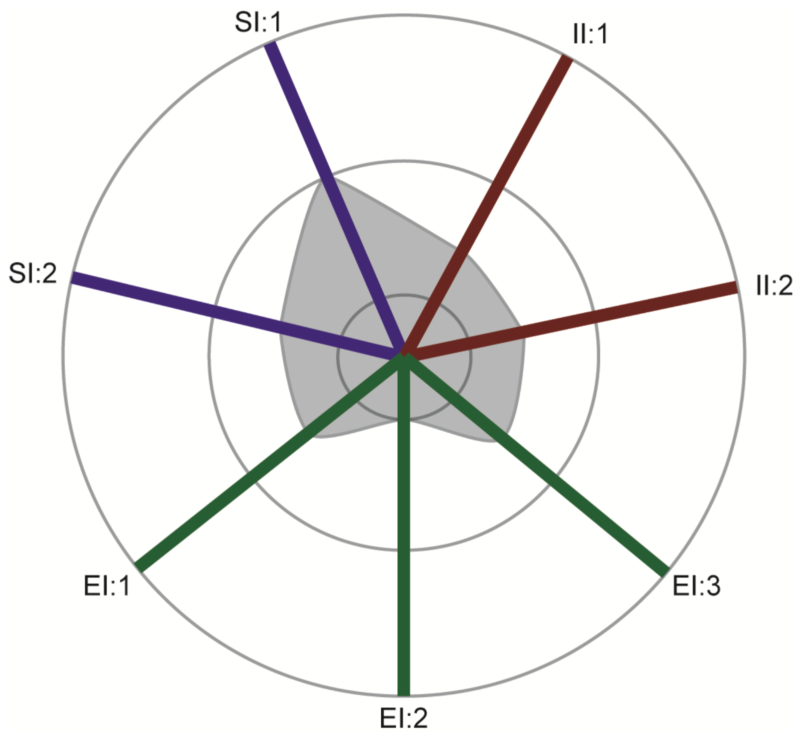


Figure 11.4 – Formative Wietenberg inter-institutional articulations.

Table 11.5 – Summary of community organization in Formative Wietenberg.

Institution	**Organization**
Social Institution 1 (SI:1)	Regional asymmetry in how people situated themselves across the landscape (Mode 2).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked; large regionally integrative cultural identities marked (Mode 1/2).
Economic Institution 1 (EI:1)	Someregionoal integration of metal crafting but minimal asymmetries (Mode 1/2).
Economic Institution 2 (EI:2)	Subsistence production was organized at or below the village level (Mode 1).
Economic Institution 3 (EI:3)	Some regional integration of trade and exchange but minimal asymmetries (Mode 1/2).
Ideological Institution 1 (II:1)	Minimal inequality was legitimized in mortuary contexts (Mode 1/2).
Ideological Institution 2 (II:2)	Minmal inequality was legitimized in daily contexts (Mode 1/2).

In the social realm, the Formative Wietenberg is the first time we see people aggregating at large sites (over 6.5 ha) during the Bronze Age. However, there is no evidence of significant settlement hierarchies at the time. Formative Wietenberg sites are more likely than EBA sites to be located out of the Apuseni uplands and towards the Mureș Valley lowlands. In the Geoagiu Valley, only one or two tiers of settlement sizes were occupied at any one time during the Formative Wietenberg. Across southwest Transylvania, the large centers of Pețelca-*Cascadă* and Alba Iulia-*Recea/Monolit* are integrated into a regional settlement network with sites that are much smaller. Across southwest Transylvania, the creation of the shared Wietenberg identity masks some segmentation in the settlement systems. It is likely that both Pețelca-*Cascadă* and Alba Iulia-*Recea/Monolit* were at the center of asymmetrical interactions with surrounding communities, with the potential of each center and network to be working independent of the other. Unlike the Early Bronze Age, communities began to place their dead in formal flat urnfield cemeteries near settlements across the landscape. During the Formative, there is as yet no evidence of the diverse mortuary practices, including inhumation in settlements and reuse of EBA tombs, that would become prevalent during the Classical Wietenberg. Formative Wietenberg communities were more active in marking regional identity than in prior periods. The Wietenberg decorative array, plus the forms and fabrics of ceramics, were substantially and visibly different from ceramic assemblages in surrounding regions. The creation of a regional-scale identity appears to be something that people buy into, and emulate, rather than something that is dictated by regional elites. The emergence of Wietenberg identity appears akin to the process of ethnogenesis that has been attributed to Middle Bronze age cultural identities elsewhere (see O'Shea 1996). In addition to emerging diagnostic ceramics, the Wietenberg identity appears to have included shared cultural norms on burial practices, subsistence practices, and other crafts. The Formative Wietenberg represents a new regional scale of intentioned identity marking, but lacks the hierarchical authority that might be associated with more complex regional polities. At smaller scales, lineage identity appears to be marked in part by maintaining distinct and contemporaneous spatial clusters of burials in cemeteries, like those seen at Sebeș-*Între Răstoace*. Some individual identities may be marked in mortuary practices (e.g., use of faience beads in Sebeș-*Între Răstoace* burials), but individual identity is mostly masked through cremation and burial in urn cemeteries. Together, the newly emerging Wietenberg identity slightly masks, but does not obliterate, segmented identities at smaller scales. Towards the end of the Formative Wietenberg, Type B and Type C ceramics are added to the Type A repertoire to provide new forms of marking segments of identity, though there is no evidence that any segmented identities below the regional scale were hierarchically organized relative to each other.

The concurrent processes of creating regionally integrated identities and segmenting communities within that region impact the organization of economic institutions. Settlement systems were increasingly oriented towards agricultural land and trade routes. Communities were mostly placed in good agricultural land, which would have decreased the need for inter-settlement provisioning. While there is autocorrelation between agricultural land and trade routes in most of the region, the abandonment of much of the upper Ampoi Valley, which had rich agricultural land but was located over 10 km from the Mureș River suggests that access to trade routes was a major factor in how people organized themselves in space. The metal rich uplands were now less densely utilized for settlements or cemeteries. With fewer permanent settlements in the uplands, access to metal sources would have been less easily monitored. The lack of cemeteries or other ritual markers of territory suggests that access to the metal in these landscapes were no longer the loci of active inter-community competition. The genesis of Wietenberg identity likely fostered cooperation among southwest Transylvanian communities that no longer saw each other as in direct competition for natural resources. This form of settlement does not require that metal procurement was organized above the household or village level. There is currently no evidence of regional asymmetries in metal procurement or production during the Formative Wietenberg. Most households and villages in southwest Transylvania would have been directly involved in procuring resources for their own needs. The emphasis on trade and exchange, however, is likely linked to how metal systems were organized – particularly how communities in surrounding regions, such as central Transylvania and the Carpathian Basin, acquired metal. It is possible that different contemporaneous systems of metal procurement, production, and exchange were emerging at this time. Controlling the flow of metal out of the region, rather than within the region, would have provided the most opportune bottleneck for any emerging elites to control.

The presence of two large settlements in different catchments and positions within the settlement network suggest that there have been multiple political economic pathways for the development of MBA centers. The potential for control of economic resources would have been different at Pețelca-*Cascadă* and Alba Iulia-*Recea/Monolit*. Pețelca-*Cascadă* rose to regional prominence despite lacking local access to metals. Instead, the site is at a critical point to control the flow of information and resources along the Mureș River trade corridor. Alba Iulia-*Recea/Monolit* does have potential access to local metal sources, and is much better positioned to control the flow of metal out of the Ampoi Valley and into the Mureș Valley. The potential access to metal at Alba Iulia-*Recea/Monolit* does not come with a sacrifice away from agricultural land or trade routes. It is in the most ideal catchment position in the region, though its position within the regional network suggests the community at the site would have been able to control labor more readily than the flow of resources throughout the network. These two sites, which were established as Wietenberg settlements during the Formative Wietenberg and went on to be major centers throughout the Classical Wietenberg, suggest that despite shared cultural identity, emerging elites in different Middle Bronze Age regional centers employed different socio-economic strategies. This pattern of contemporaneous centers that have different roles in the landscape has been documented in many contexts across the globe (Flad and Chen 2013:13; Quinn and Barrier 2014; Smith 2014:309). Together, the economic institutions show evidence of inter-settlement integration for metal and trade systems, with as yet minimal regional asymmetry. Agricultural production continued to be organized at the local scale. Within this broad inter-institutional arrangement, it is possible to see in the Formative Wietenberg that there are multiple ways Wietenberg centers emerge, suggesting segmentation in overall political economies that made it challenging to identify any single economic factor as defining community organization in southwest Transylvania.

In the ideological realm, Formative Wietenberg mortuary practices materialized minimal inequality. Formative Wietenberg mortuary also reflected increased segmentation and larger-scales of integration than seen in EBA cemeteries. At the cemetery at Sebeș-*Între Răstoace*, all individuals were cremated. Cremation can be used to obliterate the identity of an individual to promote a more communal identity (see

Quinn et al. 2014). There are several burial contemporaneous burial modes, some of which include burial with stone settings and a few with non-local grave goods (faience beads and ceramics; see Bălan et al. 2017b; Fântâneau et al. 2013; Quinn and Ciugudean, forthcoming). However, no Formative Wietenberg burials contained metal that was so important to the local and macroregional economy, and which the local communities would have had in relative abundance. There is evidence that different segments of society, likely different lineages, buried their dead together at one scale (at the Sebeș-*Între Răstoace* cemetery) and separately at another scale (in different spatial clusters). Again, there is no evidence of ranked or hierarchical relationships among the different segments. In daily life, there is evidence of regional integration but minimal evidence of inequality materialized in ceramics, metallurgy, or subsistence production. The establishment of two sites that would become regional centers throughout the Classical Wietenberg during this period suggests that there was likely some regional asymmetry in how communities at those sites interacted with surrounding communities, but there is minimal evidence that inequality fueled by an emerging elite underpinned these interactions. It is likely that mortuary rituals reflected increased segmentation within larger scales of social integration as well as reinforced an increasingly integrated but unranked society experienced through daily life.

The organization of Formative Wietenberg communities trended towards more coherence as regionally integrated communities but without asymmetrical relationships as fewer institutions were organized at the local scale. Subsistence continued to be organized at the local level. Regional asymmetries were present in how people situated themselves in space. The presentation of identities and relationships in death shifted significantly from the EBA where more inequality was presented to a situation more in line with the trend towards regional identities and low regional inequalities in daily life contexts. Metal procurement appears to have been less hierarchically organized than during the EBA III. Within realms, ideological institutions were organized coherently, while the other realms had some dissonance, with the most significant being a more asymmetrical settlement pattern with less evidence of identities marking this asymmetry.

Classical Wietenberg (1875-1500 BC)

The shift from the Formative Wietenberg to the Classical Wietenberg did not include a change in overall cultural identity. Rather than a rupture, this shift at around 1875 cal. BC was a continuation of the processes of regional integration and internal segmentation. The most visible changes in the Classical Wietenberg is the increased production of “baroque” ceramics – the increase investment in decorating, burnishing, and polishing increasingly fine wares. Assemblages of the Classical Wietenberg included Types B, C, and D ceramics, which all speak to a broad Wietenberg identity through shared motifs, but represent distinct production differences that include visibly different decoration techniques. The increase in ceramic elaboration seen in the Wietenberg culture at this time is also seen in other Middle Bronze Age cultures in the rest of the Carpathian Macroregion (see Duffy 2014; Jaeger and Kulcsár 2013; Kiss 2012; Nicodemus 2014; O’Shea and Nicodemus 2017). Throughout this period there is evidence of increasing segmentation with important dissonance between the amount of inequality in mortuary and daily life contexts. Community organization in the Classical Wietenberg was characterized by institutions exhibiting mostly regional integration with asymmetries (Figure 11.5, Table 11.6).

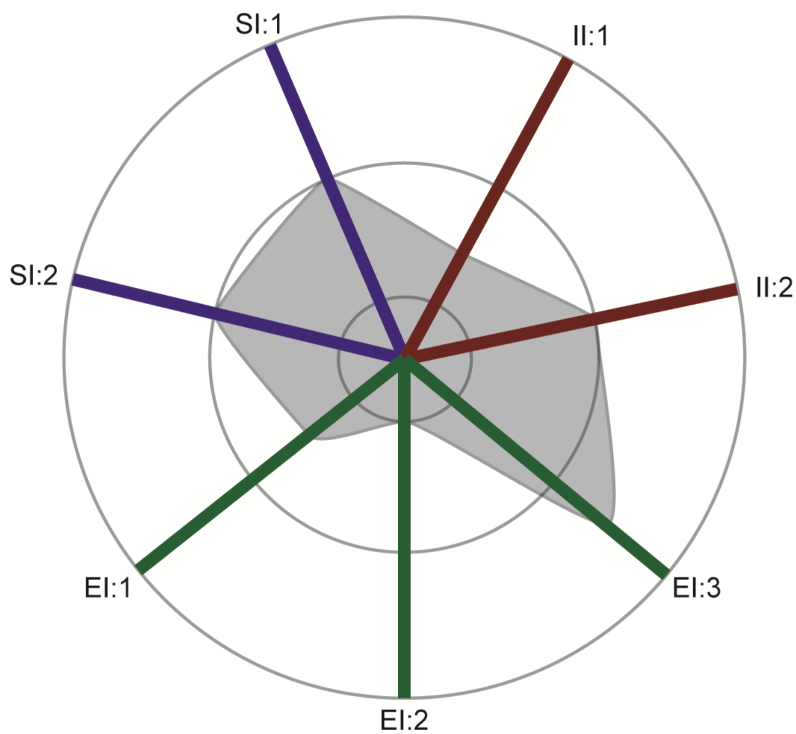


Figure 11.5 – Classical Wietenberg inter-institutional articulations.

Table 11.6 – Summary of community organization in Classical Wietenberg.

Institution	Organization
Social Institution 1 (SI:1)	Regional asymmetry in how people situated themselves across the landscape (Mode 2).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked; large regionally integrative cultural identities strongly marked (Mode 2).
Economic Institution 1 (EI:1)	Someregionoal integration of metal crafting but minimal asymmetries (Mode 1/2).
Economic Institution 2 (EI:2)	Subsistence production was organized at or below the village level (Mode 1).
Economic Institution 3 (EI:3)	Trade and exchange differentially influenced by a subset of the regional community (Mode 2/3).
Ideological Institution 1 (II:1)	Minimal inequality was legitimized in mortuary contexts (Mode 1/2).
Ideological Institution 2 (II:2)	Some inequality was legitimized in daily contexts (Mode 2).

In the social realm, people continued to situate themselves across the landscape at small and large sites. The sites of Pețelca-*Cascadă* and Alba Iulia-*Recea/Monolit* continued to dominate the settlement networks of southwest Transylvania. In the Geoagiu

Valley, the Formative and Classical Wietenberg were times where there was consistent occupation of the lowland center (Pețelca-*Cascadă*), and a smaller upland community that moved every 70-120 years between different site locations (e.g., Geoagiu de Sus-*Fântâna Mare*; Stremț-*Fabrica de Alcool*; Geoagiu de Sus-*Viile Satului*), perhaps due to the depletion of local timber resources. The resulting two-tier settlement hierarchy suggests that there was regional asymmetry, but no evidence that the community in the center exerted control over the upland community. There was a continued trend in the Classical Wietenberg for there to be few settlements placed high up the valleys. Even the settlements up the Geoagiu Valley were located within the boundaries of good agricultural land, not situated more than 10 km from the Mureș River. There is currently no evidence of fortifications in the Classical Wietenberg, though this is undoubtedly a byproduct of the limited fieldwork rather than representing a lack of concern with defense by Wietenberg communities (especially when contrasted with the significant fortifications at contemporaneous sites in the Carpathian Basin – see O'Shea and Nicodemus 2017; Szeverenyi and Kulcsár 2012). Classical Wietenberg cemeteries are located with no strong pull towards a particular landscape type. Cemetery location is more likely a byproduct of being placed near settlements than an intentioned way of marking territory as was the case in the EBA.

The identities marked in the Classical Wietenberg reflect a continued commitment to a regional Wietenberg identity. During the Classical Wietenberg segmentation of identities within the broad Wietenberg template become more visibly marked than they were in the Formative Wietenberg. At the single-component site of Geoagiu de Sus-*Viile Satului*, Wietenberg C and D ceramics were found together in a pit (Figures 11.6, 11.7). Previous excavations at the site found only Wietenberg D ceramics (Figure 11.8). At Pețelca-*Cascadă*, Wietenberg C and Wietenberg B ceramics were found in different parts of the site but these assemblages produced the same absolute dates. Different ceramic styles are potentially visible markers of social segments within the region, though current faunal, metallurgical, and ceramic evidence suggests there is no hierarchical socio-economic relationship between the three primary styles (Wietenberg Types B, C, and D) during this period. There is more evidence of segmentation in the Classical Wietenberg mortuary practices than was present in the Formative Wietenberg. In addition to cremation and burial in urn cemeteries, there are also inhumations in cemeteries (e.g., Sibișeni-*Deaspura Satului*), inhumation in pits in settlements (e.g., Micești-*Cigaș*), and cremation and burial in abandoned EBA tombs (e.g., Ampoița-*Dealul Doștiorului* and Cheile Aiudului-*Bogza Poienarilor*). There is also evidence of continued spatial clustering marking social difference within the same cemeteries (e.g., Sibișeni-*Deaspura Satului*). The demographics of the few known Wietenberg cemeteries suggests that a greater portion of society was buried during the MBA when compared with the EBA.

Figure 11.6 - A sample of Wietenberg C (5-8) and Wietenberg D (1-4) ceramics in levels D8-14 Unit 3, Geoagiu de Sus-Viile Satului (after Ciugudean and Quinn 2015:Plate 6).

Figure 11.7 - A sample of Wietenberg C (1-4, 6, 13-17) and Wietenberg D (5, 7-12) ceramics in levels D1-7 Unit 3, Geoagiu de Sus-Viile Satului (after Ciugudean and Quinn 2015:Plate 8).

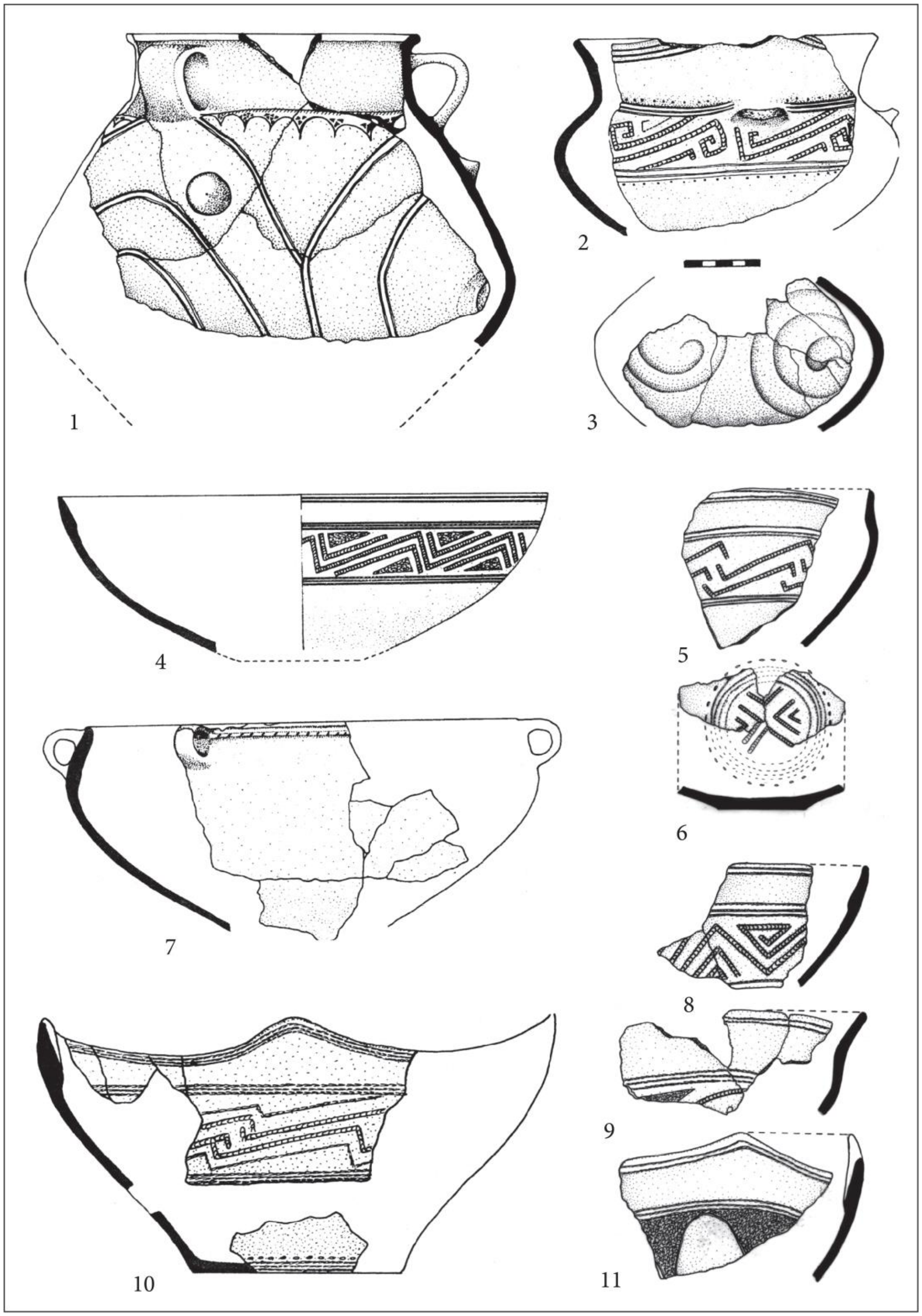


Figure 11.8 - A sample of Wietenberg D ceramics found in a ritual pit at Geoagiu de Sus-Viile Satului (after Ciugudean 2010; Ciugudean and Quinn 2015:Plate 9).

In the economic realm, the Classical Wietenberg communities have evidence for greater integration into interregional trade routes. Many Wietenberg settlements, including the largest Classical Wietenberg sites, are positioned along trade routes. O'Shea (2011) has emphasized the importance of riverine transport for the movement of people and commodities during the Middle Bronze Age. The Mureș River, with its low energy meanders, would have been easy for Bronze Age boats with heavy loads to navigate. The terraces immediately above the flood plains of the Mureș would also have been ideal for roads and wagon travel. The Wietenberg Culture has more wagon models, highly typical of the Bronze Age in the Carpathian Basin and Transylvania, than all other cultural groups in the macroregion combined (see Bondár 2012; Boroffka 2004). We found a new fragment of a decorated Wietenberg wagon model in Unit 3 Level 3 at Pețelca-*Cascadă*, in close spatial association with a sandstone mould for bronze pins (Figure 11.9). The importance of wagon models in the Wietenberg Culture is another line of evidence suggesting that trade and exchange was the most important economic institution for organizing Transylvanian communities. This fragment is also important in that one side of it is decorated with incisions normally associated with Wietenberg Type B and the other is decorated with stipples normally associated with Wietenberg Type C ceramics. There is evidence from many sites in the Carpathian Basin for exchange with the Wietenberg culture at this time (Figure 11.10). There is also evidence in Wietenberg sites of imported materials from the Carpathian Basin (Figure 11.11). The increased importance of interregional trade during the Classical Wietenberg would have provided additional opportunities for emerging elite to turn economic bottlenecks into social power and inequality.

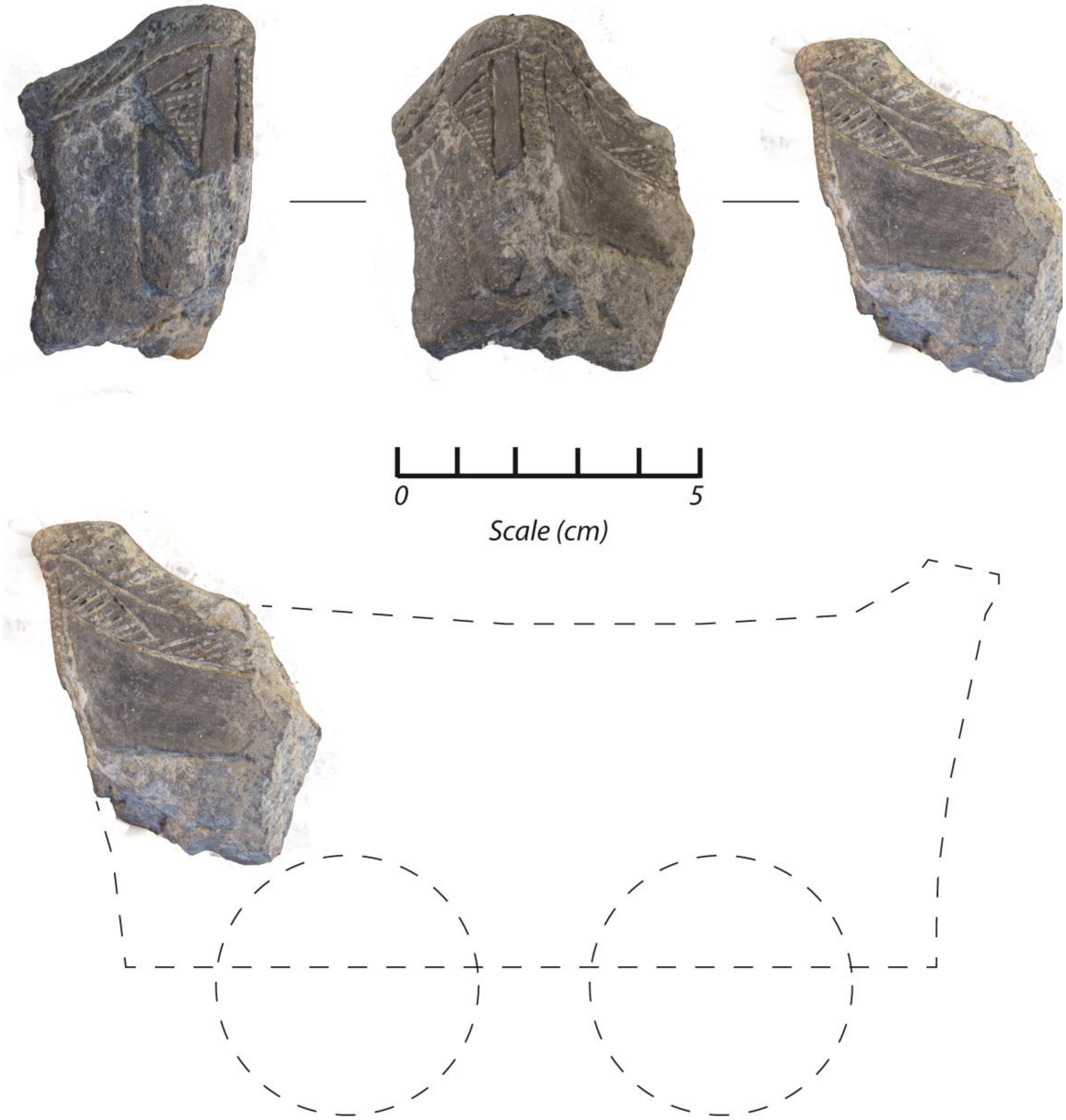


Figure 11.9 – Wagon model fragment from Pețelca-*Cascadă* (Lot 14-047).

Figure 11.10 - A sample of Transylvanian ceramic exports discovered in the Carpathian Basin: a) Wietenberg vessel from Berettyóújfalu-Herpály, Hungary (after Bóna 1992:fig. 15); b) Wietenberg wagon model from Novaj, Hungary (after Bondár 2012:fig. 22/1).

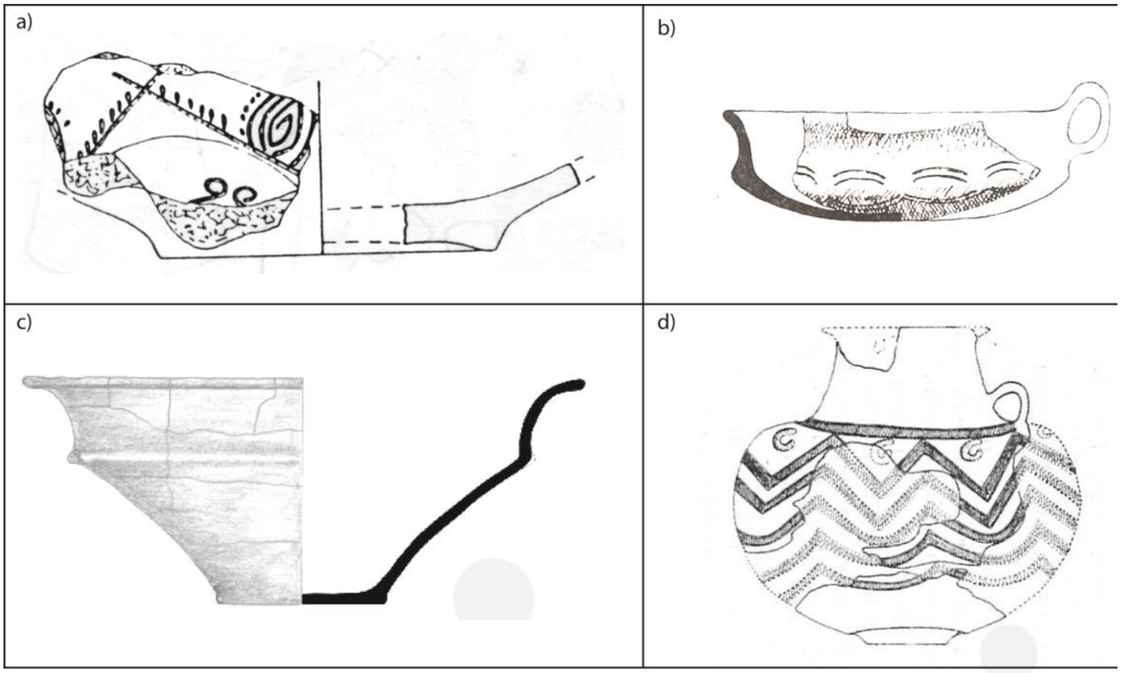


Figure 11.11 - A sample of Carpathian Basin ceramic imports found in Transylvania: a) Balta Sărată fragment found in the Wietenberg site at Sebeş-*Podul Pripocului* (after Boroffka 2004:fig 117/2).; b) Balta Sărată vessel found at the Wietenberg site of Obreja-*Cânepi* (after Soroceanu 1973:pl. II/9); c) possible Balta Sărată or Maros found in the Wietenberg cremation cemetery of Sebeş-*Între Răstoace* (after Fântâneanu et al. 2013:fig. 6/1); d) Hatvan vessel found at the Wietenberg site of Oarța de Sus (after Kacsó 1987:fig. 27/2).

During the Classical Wietenberg, subsistence appears to continue to be organized at the local level. There are differences among the sites based on their position within the landscape, though overall Wietenberg assemblages have a similar mix of domesticated (roughly 75% of the faunal assemblage) and wild (roughly 25%) resources. The portion of wild resources in Wietenberg faunal assemblages is higher than assemblages associated with other EBA or LBA cultures. It is likely that wild resources are acquired through hunting forays that may be embedded within metal procurement forays in the mostly vacant uplands. Metal procurement also appears to be organized at the local scale. While there may be a segmentation within metal production systems between communities engaging in their own domestic needs and those producing for exchange or elite consumption, the evidence from Aiud-*Groapa de Gunoi* suggests that even complex metallurgy was not solely under the purview of emerging elites in regional centers. Aiud-*Groapa de Gunoi* is a small site positioned along the Mureș River, but not in a strategic network position, where evidence of skilled metallurgy, including moulds for complex bronze axes, was recently found (see Bălan et al. 2017b). Given current evidence, neither access to metal nor access to skilled smiths were bottlenecks in the institution of metal production that could have been controlled by any elite communities. It is possible that elite communities were able to differentially access certain high-quality trading partners, or produce metal at more industrial scales than smaller communities, but these possibilities will require more substantial fieldwork at the Classical Wietenberg centers to assess.

The overall settlement system continues to show a segmentation between the economic bases of the network around Alba Iulia-*Recea/Monolit* in the south and Pețelca-*Cascadă* in the central part of the study region. As with the Formative Wietenberg, Pețelca-*Cascadă* is strategically positioned to control the flow of resources, information, and people along the Mureș River corridor, while Alba Iulia-*Recea/Monolit* has better access to metal ores and labor drawn from surrounding communities. The segmentation in regional economies suggests that Wietenberg identity has some more rigid pan-regional conventions (e.g., some burial practices, ceramics, subsistence profiles), but allows significant flexibility across the landscape in how they organize themselves economically.

In the ideological realm, Classical Wietenberg communities continued to bury their dead in ways that did not materialize significant interpersonal inequalities. There are diverse treatments, including cremation and burial in flat cemeteries or EBA tombs, and inhumation in cemeteries and settlements. There is currently no evidence that any of these different mortuary treatments were associated with higher status individuals, though much more work, including bioarchaeological assessments of disease, diet, and trauma, are needed. The paucity of grave goods suggests that mortuary contexts were not places where Wietenberg communities engaged in conspicuous consumption. In daily life, however, there is evidence of increased intramural ritual action. These rituals may provide evidence that communities were increasing in inequality, perhaps including the creation and marking of leadership offices. At the “type site” for the Wietenberg Culture, Sighișoara-*Dealul Turcului/Wietenberg*, a decorated plaster and clay altar feature was found covered with ash (Boroffka 1994a) (Figure 11.12a). There is also an increase in decorated antler pieces in the Classical Wietenberg (e.g., Bălan et al. 2017b). At Lancrăm-*Glod*, there is a decorated antler piece that was likely hafted to a wooden stick that the excavators have interpreted as a scepter, and a marker of a leadership that would have been carried by the ruling elite (Popa and Simina 2004) (Figure 11.12b). The potential "sanctuary" site located on the hill of Oarța de Sus-*Ghiile Botii* represents another potential loci for ritual action where social relationships may have been negotiated (Boroffka 1994a; Kacsó 2011, 2013; Palincaș 2014). The increased diversity in ceramics would have provided the opportunity for more material marking of difference among communities in the Classical Wietenberg, but as yet there is no evidence of ranking among the people who used the different ceramic styles. Mortuary practices likely reinforced the increased segmentation among Classical Wietenberg communities, but likely masked some of the emerging inequalities that were being experienced in daily life.

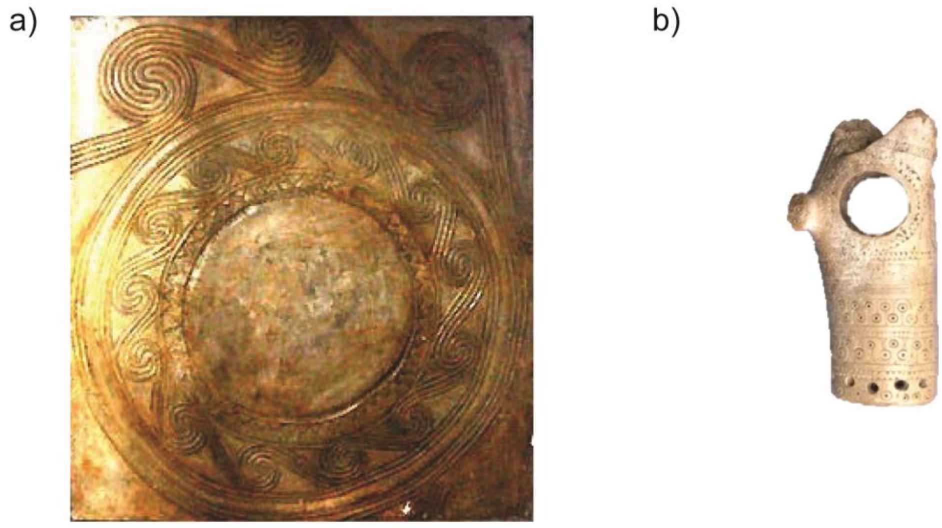


Figure 11.12 - a) Plastered decorated altar/hearth from Sighișoara-*Dealul Turcului/Wietenberg* (at the Sighișoara History Museum), b) decorated antler scepter from Lancrăm-*Glod* (after Popa and Simina 2004).

Classical Wietenberg communities were dissonantly organized around the mode of regional integration with asymmetrical interactions. This continued a trend from the Formative Wietenberg towards both increased integration and more segmentation within communities. Segments do not appear to have been ranked hierarchically relative to each other, but there was likely competition over access to interregional trade routes during this period. Regional asymmetries were present in how people situated themselves in space. The presentation of identities and relationships in death continued to downplay inequalities that were likely increasing in daily life throughout the Middle Bronze Age. Within realms, social institutions were organized coherently, while the other realms had some dissonance, with the most significant being a more asymmetrical pattern in trade and exchange with subsistence production still organized at the local scale.

Terminal Wietenberg (1500-1320 BC)

The end of the Middle Bronze Age and start of the Late Bronze Age had a significant impact on the organization of communities in southwest Transylvania. Around 1500 cal. BC, there were significant transformations across the Carpathian Macroregion, including the the collapse of MBA polities and cultural identities. In Transylvania, the shift was in part precipitated by the movement of communities of the Noua Culture in to Transylvania from the east, starting in the southeast portion of the Transylvanian Plateau and moving to the west. A Noua community established itself at Teiuș-*Fântâna Viilor* in the Geoagiu Valley survey area, near the confluence of the Geoagiu and Mureș Rivers, soon after 1500 BC. The migration of new people into the region would have been a significant event that ruptured existing long-distance and local exchange networks. In southwest Transylvania, like the entire macroregion, the Late Bronze Age ruptures did effect local community organization. However, the changes in southwest Transylvania diverge in important ways from changes in other regions. Perhaps the most important difference is that Wietenberg communities did not disappear at 1500 BC, they persisted for nearly 2 more centuries. In the Terminal Wietenberg, Wietenberg communities reorganized themselves with significant regional hierarchies in the social and economic realms (Figure 11.13, Table 11.7). There is no current evidence that ideological institutions changed from being regionally integrated with some asymmetries and no ideological justification of regional political elites.

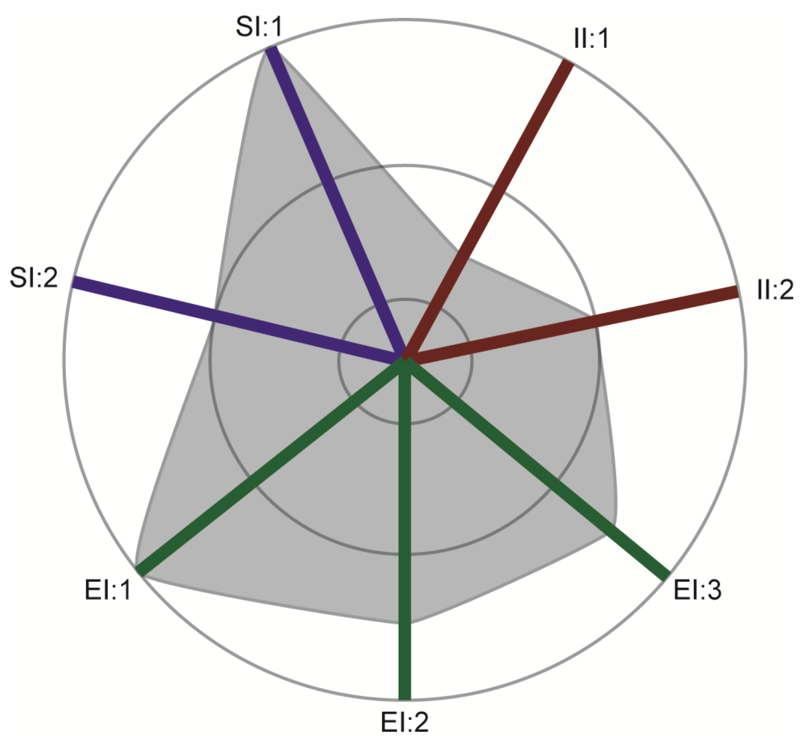


Figure 11.13 – Terminal Wietenberg inter-institutional articulations.

Table 11.7 – Summary of community organization in Terminal Wietenberg.

Institution	Organization
Social Institution 1 (SI:1)	People were situated within a regional settlement hierarchy (Mode 3).
Social Institution 2 (SI:2)	Individual and lineage or household identities were present and marked; large regionally integrative cultural identities strongly marked (Mode 2).
Economic Institution 1 (EI:1)	Metal crafting was hierarchically controlled by regional elite (Mode 3).
Economic Institution 2 (EI:2)	Subsistence production was organized at the regional level (Mode 2/3).
Economic Institution 3 (EI:3)	Trade and exchange differentially influenced by a subset of the regional community (Mode 2/3).
Ideological Institution 1 (II:1)	Minimal inequality was legitimized in mortuary contexts (Mode 1/2).
Ideological Institution 2 (II:2)	Some inequality was legitimized in daily contexts (Mode 2).

In the social realm, there are several changes in how people situate themselves across the landscape. The establishment of a Noua settlement at Teiuş-*Fântâna Viilor* spurred local Wietenberg communities to establish a settlement at Rameț-*Curmatura* that would likely have served as an outpost to acquire nearby metals sources and also control the primary pass in the Geoagiu Valley towards the rich resources of the Metal Mountains (Figure 11.14). This small settlement was contemporaneously occupied with the continued occupation of the large center at Pețelca-*Cascadă* and a reestablishment of a community at Geoagiu de Sus-*Fântâna Mare* after approximately 400 years of hiatus. This produced a three-tier settlement hierarchy, traditionally associated with complex regional polities, for the first time in the Geoagiu Valley. The site at Rameț-*Curmatura* was also a significant distance (nearly 10 km) from the nearest locations where substantial agriculture could be conducted. This upland pastoral catchment had not been utilized for settlements since the EBA, and for Wietenberg communities likely required the provisioning of subsistence resources from other sites lower in the valley. This suggests that communities were integrated and that a centralized elite, likely situated at Pețelca-*Cascadă* was coordinating the movement of subsistence resources between upland sites. The presence of red deer and other upland faunal resources at Pețelca-*Cascadă* hints that some of the upland sites may have been providing resources to lowland elites, potentially as tribute, gifts, or communal feasting.

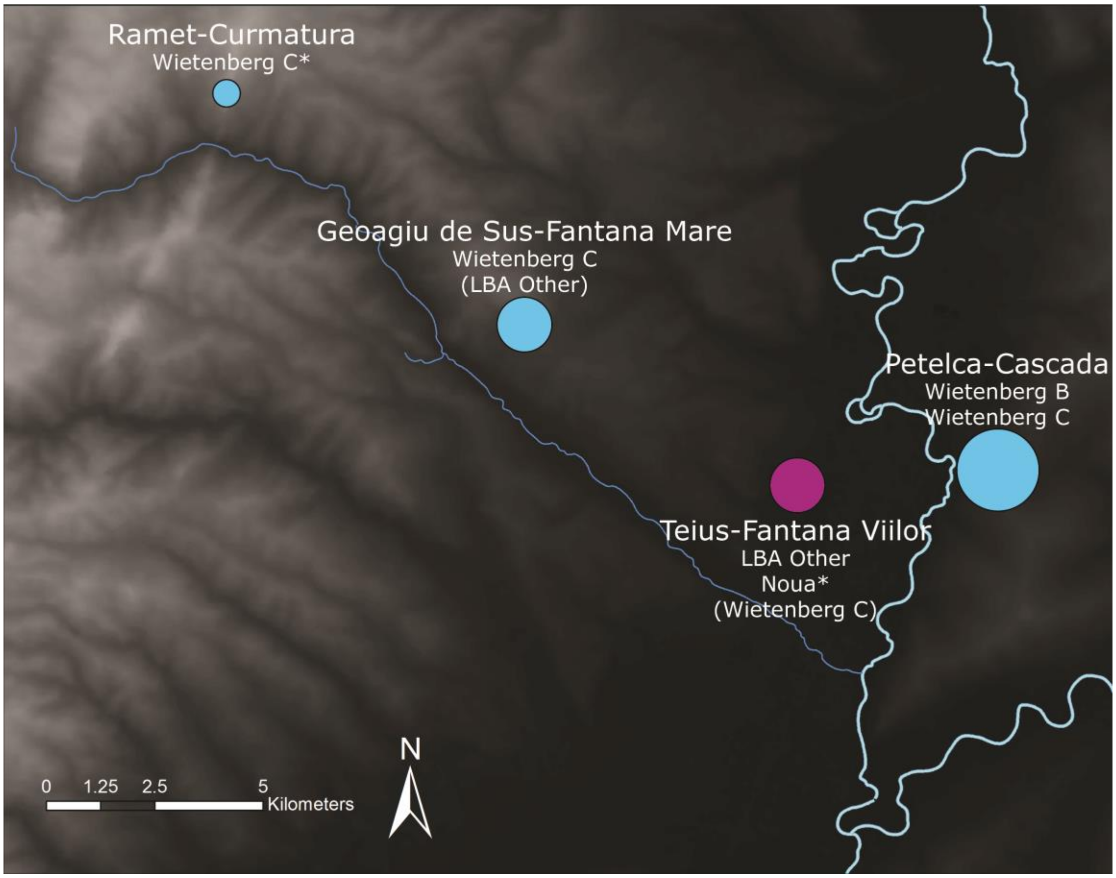


Figure 11.14 – Terminal Wietenberg settlement pattern in Geoagiu Valley.

The Terminal Wietenberg communities continued to mark the same identities as communities in the Classical Wietenberg. The Terminal Wietenberg has only been established in southwest Transylvania because it can only be distinguished from the preceding period through radiocarbon dates. Based on this limited dataset, there is currently no evidence of Terminal Wietenberg mortuary practices, though there does not appear to be any form of burial in the archaeological record that is not already present in the Classical Wietenberg. Noua communities buried their dead as individual inhumations in larger cemeteries. The only difference in signaling between the Classical and Terminal Wietenberg is that there are no dated Wietenberg Type D ceramics in this period, though again this may be a sampling issue. There is continued use of Type B and Type C ceramics, suggesting that segmentation at smaller scales continued throughout the period.

It is currently unclear, however, if the relationships among different identities changed despite there being no changes in how identities themselves were marked through material culture. It is possible that the rupture to social institutions allowed for the rearticulation of different identities into a more hierarchical organization.

The reorganization of settlement systems suggests there was a concurrent shift in the organization of several institutions in the economic realm. The establishment of a settlement at Rameț-*Curmatura* highlights how Wietenberg community organization changed from the Middle to the Late Bronze Age. This site is located near metal resources, but more importantly it controlled the pass from the Mureș Valley through the Trascău Mountains to the Metal Mountains. This demonstrates a greater concern with controlling access to metal than had been present in either the Formative or Classical Wietenberg. The site is located along a limestone ridge that would have had very limited agricultural potential. The community that established a long-term settlement here would likely have relied upon agricultural resources produced by other sites. The reorganization of subsistence institutions at a larger scale necessary to secure the inter-settlement movement of resources represents a drastic change from earlier phases of the Bronze Age. Inter-settlement movement of basic subsistence products is normally associated with more hierarchically organized complex regional polities. At the very least, the Geoagiu Valley evidence suggests inter-settlement integration with asymmetries in interactions between communities. It is currently unclear if provisioning of the community at Rameț-*Curmatura* was coordinated and controlled by centralized elite at Pețelca-*Cascadă*. There is a continued emphasis on interregional trade in the Terminal Wietenberg. At Geoagiu de Sus-*Fântâna Mare*, a fragment of a ceramic vessel from the Carpathian Basin was found within the Terminal Wietenberg occupation fill (Figure 11.15). The presence of imports at a site 10 km up the Geoagiu Valley suggests that upland communities were well integrated into interaction networks with the lowland centers on the trade routes. Terminal Wietenberg economic institutions were much more hierarchically organized than preceding periods. It is likely that the movement of Noua communities into the region spurred this type of reorganization. Terminal Wietenberg and Noua communities employed different ceramic traditions (Figures 11.16, 11.17, 11.18, 11.19). With more than one cultural identity (perhaps even ethnicity) in the region, Wietenberg communities demonstrated a much greater concern over securing permanent access to upland metal resources. This may have cut the new Noua communities off from the richest metal landscapes. To maintain this more hierarchical control of metal sources, there was a necessary transformation in subsistence institutions to foster inter-community provisioning for the first time. Metal procurement and subsistence production would have provided new bottlenecks, in addition to access to interregional trade partners, that emerging elites could have used to create and maintain regional inequality.

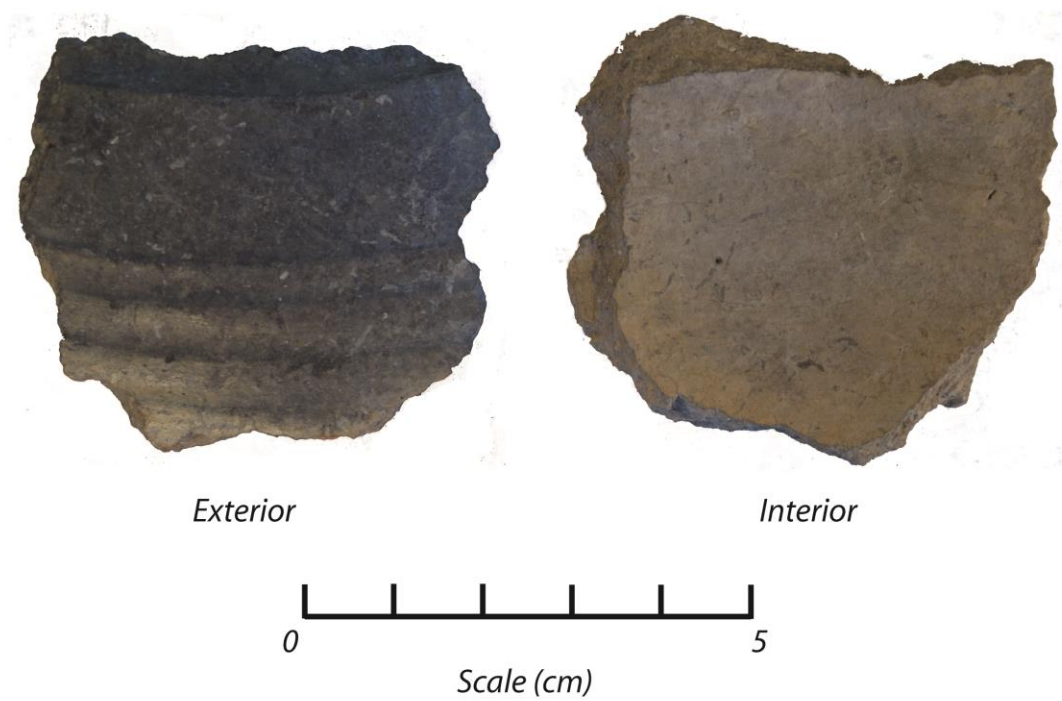


Figure 11.15 – Import ceramic found at Geoagiu de Sus-Fântâna Mare (Lot 12-090).

Figure 11.16 – Sample of Terminal Wietenberg ceramics from Unit 3 Level 4 at Geoagiu de Sus-Fântâna Mare (after Ciugudean and Quinn 2015: Plate 13).

Figure 11.17 – Sample of Terminal Wietenberg ceramics from Unit 3 Level 3 at Geoagiu de Sus-Fântâna Mare (after Ciugudean and Quinn 2015: Plate 12).

Figure 11.18 – Sample of Terminal Wietenberg ceramics from Unit 3 Level 2 at Geoagiu de Sus-Fântâna Mare (after Ciugudean and Quinn 2015: Plate 12).

Figure 11.19 – Sample of LBA ceramics from Teiuș-*Fântâna Viilor* (after Ciugudean and Quinn 2015: Plate 15).

The paucity of data from the Terminal Wietenberg makes it difficult to draw conclusions on the organization of institutions in the ideological realm. However, dates from a range of mortuary features within cemeteries and settlements show that most different mortuary treatments are present in the Classical Wietenberg, and there is no burial mode that is likely to date only to the Terminal Wietenberg. More work to identify cemeteries associated with known Terminal Wietenberg settlements, such as Pețelca-*Cascadă* and Geoagiu de Sus-*Fântâna Mare* may help archaeologists understand what, if any, changes occurred in how inequality was legitimized in mortuary contexts. Similarly, the lack of data make it unclear how inequality was legitimized in lived contexts. The expansion of inequality and regional integration in social and economic institutions, however, make it likely that inequality continued to be materialized in daily life contexts. Given the importance of ideological institutions to the maintenance of Wietenberg identity, it is more likely that there were minimal changes in how inequality was materialized in burials, as there were minimal changes in the identities materialized in the social realm. To change ceramic decoration or mortuary practices too much may have undermined the communal aspects of Wietenberg that made it a socially integrative regional identity. However, if there was a major change and regional inequality was legitimized in both mortuary contexts and daily life, it would further support the idea that the introduction of Noua communities fundamentally transformed Wietenberg lifeways.

Terminal Wietenberg communities were dissonantly organized, with institutions in the social and economic realms organized hierarchically and ideological institutions likely organized with some regional asymmetries. The constellations of institutions in the Terminal Wietenberg are very different than Wietenberg communities in the Middle Bronze Age. Subsistence production was organized above the local scale for the first time in the Bronze Age. Metal procurement and settlement systems exhibit hierarchical organization as well. While inequalities were much more prevalent in how people experienced their daily lives, it is likely that ideological institutions did not similarly reorganize to justify these new inequalities. This would have presented a tension where ideological systems increasingly masked inequalities people would have experienced in daily life. Within realms, there was more coherence among economic institutions, but social and ideological institutions were dissonant, as the underlying material signals of Wietenberg identity do not appear to change in step with changing settlement and economic systems.

The Dynamics of Social Change in Bronze Age Transylvania

Tracing the changes in institutions and inter-institutional articulation across the different subphases of the Bronze Age makes it possible to distinguish microevolutionary, macroevolutionary, and social transformative changes (Figure 11.20). After the EBA I, there is a general trend towards increasing regional integration that started to produce regional asymmetries. The movement of Iernut communities into the region during the EBA III prompted a reorganization of local Șoimuș communities to become increasingly centralized and competing over upland landscapes. The transition to the Middle Bronze Age led to the creation of the Wietenberg cultural template. This cultural ethnogenesis became increasingly elaborate, with more homogenous regional identities being complemented with increased segmentation at smaller scales. The gap between how ideological institutions exhibited inequality in the Wietenberg culture widened as daily life contexts became increasingly asymmetrical and hierarchical. The shift to the Late Bronze Age, in part precipitated by the movement of Noua communities from the Eurasian Steppe into Transylvania, sparked a significant socio-economic reorganization in Wietenberg communities. The new, more hierarchically organized, Terminal Wietenberg communities persisted for a while, but eventually collapsed. This final collapse may have been caused in part because ideological institutions remained organized asymmetrically rather than hierarchically. Noua communities, where there was coherence in hierarchical systems across all realms, led to subsequent changes in Late Bronze Age Transylvania as Wietenberg cultural contributions waned.

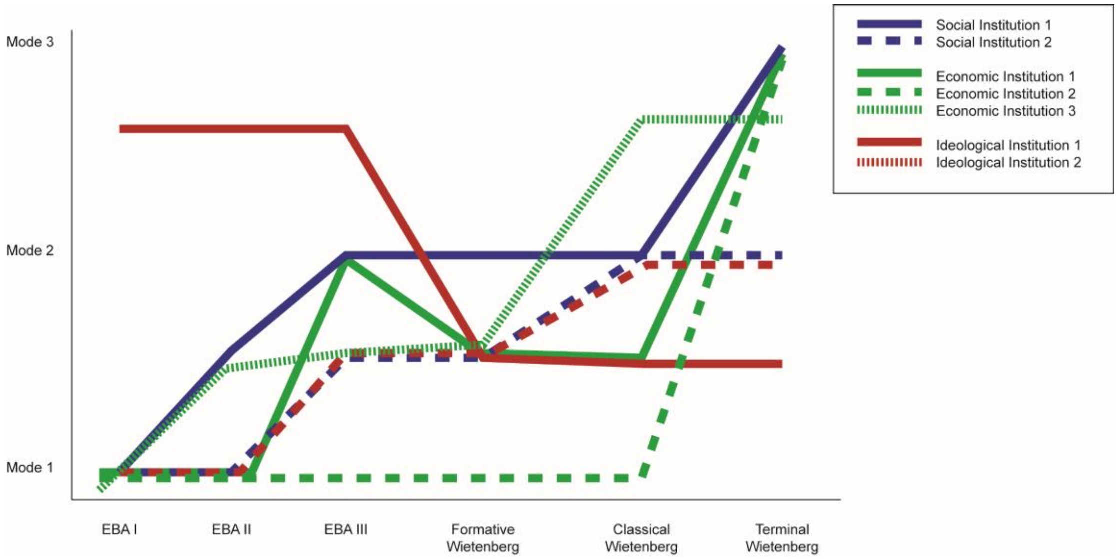


Figure 11.20 – Diachronic change in inter-institutional articulations in southwest Transylvania.

From the EBA I to the EBA II, there is evidence of microevolutionary change in how institutions articulate, primarily driven by changes in how people situated themselves in space and the organization of trade and exchange. Settlement systems gradually became more regionally integrated. Larger communities began to emerge in key landscapes and network positions for controlling both local trade and interregional exchange. There were only minor changes in other institutions. The trend from the EBA I to the EBA II was towards increasing coherence across different institutions as the gap between inequalities in daily life and mortuary contexts.

From the EBA II to EBA III, there was macroevolutionary change possibly spurred by Iernut communities moving into the region. While inequality continued to be signaled in mortuary practices, this period sees a much broader institutional trend towards regional asymmetries in how people situate themselves in space and how metal systems were organized. Changes towards regional asymmetry appear to have been rapid, as people actively contested access to key economic resources through settlement and cemetery placement. The only other institution that continued with only minor changes was subsistence production, which continued to be organized at a smaller scale. The shift from EBA II to EBA III did not, however, include novel coherence at new scales that produced a new equilibrium point. As such, these changes cannot be considered social transformations in community organization.

The transition from the EBA to the MBA – from the EBA III to the Formative Wietenberg – saw a general retreat from dissonance and increasing asymmetries, as more integrative identities were established to promote cooperation among southwest Transylvanian communities. This shift was also a macroevolutionary change to a different constellation of institutions that were still dissonant as subsistence production continued to be organized at the local scale and settlement systems continued to promote regional asymmetries. The emergence of MBA cultural identities appears to have been a process that occurred across the Carpathian Macroregion and represented a fundamental shift in how communities organized relative to each other, but did not include the creation of new scales of political integration.

From the Formative Wietenberg to the Classical Wietenberg, there is a general trend towards increasing regional integration and some legitimization of inequality in lived contexts. The changes can be conceptualized as macroevolutionary, as they touch all three social realms, though the changes do not represent a significantly different constellation of dissonant institutions than was present in the Formative Wietenberg. The biggest shift was the increased centralization of interregional trade that likely was spurring the growth of an incipient elite at some of the major centers. The shifts within the Classical Wietenberg towards increased lived inequalities did not include the emergence of regional control of any single institution. As such, the changes in the MBA were not social transformations.

The shift from the MBA to the LBA, with the introduction of Noua communities and the change to the Terminal Wietenberg may represent the first social transformation in the southwest Transylvanian Bronze Age. Changes after 1500 BC were rapid, were felt at multiple scales, and occurred across most institutions. People were positioned across the landscape in a three-tier settlement hierarchy to control access to metal. The placement of sites in agriculturally poor uplands minimally required strong inter-settlement interactions, and possibly required centralized political elite to ensure their provisioning. The concern over securing access to metal had a significant impact on how communities used space in the Terminal Wietenberg. The stark contrast with the

Classical Wietenberg suggests that there was much less concern about whether households and communities would be able to meet their immediate needs, and that there was little benefit from actively contesting and defending sources. The strongly marked Wietenberg identity may have served a role of minimizing competition among southwest Transylvanian communities even in the absence of a strong regional polity dictating procurement strategies. The only question about whether this represents an actual social transformation comes from how ideological institutions were organized. If ideological institutions changed to legitimize inequality in the Terminal Wietenberg, it would undoubtedly represent novel coherence of complex regional polities. If ideological institutions did not change, as seems more likely at this point, it would leave the social and economic realms in dissonance with the ideological systems. If people were living lives full of inequality, but inequality was not tolerated ideologically, it would only have been a matter of time for those systems to resolve themselves and lived inequalities would have diminished or ideology would have eventually been tolerated and even sanctioned through ideological systems. More work on this critical period is needed to better understand the dynamics at play.

The success of the potential social transformation in the Terminal Wietenberg can be debated. On one hand, the reorganization of Wietenberg communities into a hierarchical complex regional polity led to the persistence of Wietenberg communities for 150 years longer than elsewhere in the eastern Carpathian Basin. However, the Wietenberg identity was ultimately abandoned in the LBA as Noua and other groups from the Eurasian Steppe were more efficiently organized as hierarchical polities. The potential dissonance that remained in Wietenberg society, if there was no ideological shift to fully justify social hierarchy, may have contributed to its ultimate fracturing.

The transition from the Classical and Terminal Wietenberg was made possible due to a variety of proximate and ultimate mechanisms. The most immediate proximate mechanism appears to have been the movement of Noua communities into Transylvania after 1500 cal. BC. This event provided a rupture to existing social networks at both local and interregional scales. Importantly, the long-distance exchange systems along the Mureș corridor would have been disrupted at a time when interregional trade had become the most important political economic bottleneck in Wietenberg society. The rupture would have allowed emerging elite to take control of social, economic, and possibly ideological institutions to successfully institutionalize their privileged position within society.

This was not the first time a non-local group moved into Transylvania and triggered local communities to reorganize. In the EBA III, the movement of Iernut community into southwest Transylvania in part led to a reorganization of Șoimuș communities. This reorganization, however, did not result in a social transformation. What was the difference between the EBA III and Terminal Wietenberg? In the latter case, there were likely smaller groups of people that were differentially benefiting from social, political, and economic organization. While these elite communities likely lacked sufficient authority to exert regional control during the MBA, they were well positioned to make the most of the fallout of the Noua-precipitated ruptures. Any incipient elite identities were only possible due to increased segmentation within Wietenberg communities that expanded throughout the Classical Wietenberg. Ranking is only possible when there are multiple different social units that can be placed hierarchically relative to each other. With increased segmentation in the Wietenberg, there were more social units that marked their autonomy and distinction from each other (e.g., burial clusters in Sebeș-*Între Răstoace*). While there is currently minimal evidence of ranking among social segments in Wietenberg society during the MBA, the segmentation that occurred over five centuries provided the necessary conditions for reorganization into regional polities in the Terminal Wietenberg rather than complete societal collapse.

While metal procurement was important throughout the Bronze Age, there is no evidence that control of access to metal was the most critical factor in how southwestern Transylvanian communities organized themselves. Control over metal mattered in the Terminal Wietenberg, but it represented only one of several factors underlying the potential emergence of complex regional polities. There is no evidence that metal procurement, production, or distribution were the proximate or ultimate causes of social transformations in Bronze Age Transylvania.

Situating Southwest Transylvania within the Carpathian Macroregion

The trajectory of community organization and social change documented for southwest Transylvania can be compared with trajectories in surrounding regions. As a mosaic of complexity, the Carpathian Macroregion is characterized by locally specific factors as well as larger global processes. Comparing southwest Transylvania with other regions can help reveal when, and how, social trajectories in metal-rich landscapes differ from areas where metal is not locally available. These comparisons, examining both the common and unique aspects of southwest Transylvania, are central to understanding community organization and social change in resource procurement zones and how communities in mining landscapes became mining communities.

For most of the Bronze Age, the trajectory of social complexity in southwest Transylvania syncs well with other regions. In both Transylvania and the Carpathian Basin, the changes in cultural identities that mark the start of the Early Bronze Age cooccur between 2800/2700 BC (Boroffka 2013; O'Shea 1991). The transition between the EBA and MBA which resulted in the creation of regionally specific cultural groups was also contemporaneous around 2000 BC (Boroffka 2013; Duffy 2010). The elaboration of ceramics that marked the florescence of the Wietenberg Culture that occurred in southwest Transylvania around 1875 BC is similar in timing to the emergence of a baroque ceramic manufacturing tradition in the Maros Culture (O'Shea and Nicodemus 2017). The shift from the MBA to LBA that ruptured existing community organization in both Transylvania and the Carpathian Basin occurred across the Carpathian Macroregion around 1500/1400 BC. The new radiocarbon based chronology for southwest Transylvania has anchored the local cultural developments in ways that can be compared with surrounding regions, and along the way demonstrated that most of the large-scale temporal changes were experienced across the Carpathian Macroregion.

There are similarities and differences between the trajectory of community organization in southwest Transylvania and other regions in the Carpathian Macroregion. Community organization during the MBA in the Körös region was similarly focused on increased inter-community integration, with site clusters and large sites being situated on riverine exchange networks along the Körös River (Duffy et al. 2013). Despite site-size hierarchies, there is no evidence of centralized regional polities (Duffy 2015). In the

Maros Culture region, there is a similar emphasis on interregional trade and exchange (O'Shea 2011). However, there may be significant differences in the organization of MBA communities at Pecica-*Șanțul Mare*, where control of metal procurement and production may have contributed to the rise of a regional center (Nicodemus 2014; O'Shea and Nicodemus 2017). There are differences between Pecica and Maros communities closer to the confluence of the Tisza, which appear to have been organized less hierarchically (see O'Shea 1996; Papalas 2008). As was the case in MBA southwest Transylvania, despite shared cultural identity, there may have been large differences across regions in how communities organized themselves socially and economically. In the Benta Valley, Earle and Kristiansen (2010) have argued for the emergence of hierarchical regional polities with the inception of the EBA, which is very different from community organization in southwest Transylvania. The researchers have even suggested there were two distinct chiefly polities, each with their own three-tier settlement hierarchy within the 20 km valley – approximately the same size as the Geoagiu Valley – during the MBA (Earle and Kristiansen 2010). It is doubtful that these communities were as complexly organized as the researchers have suggested for one main reason: research design. The researchers have lumped all EBA, MBA, and LBA communities together into their own singular phases. As I have shown in the Geoagiu Valley, just because sites share EBA, MBA, or LBA ceramics does not mean that they were contemporaneously occupied. For now, most of the sites in the Benta Valley remain undated, and it has not been demonstrated that the site-size hierarchies reflect complex regional polities rather than being the product of temporal palimpsests or other social processes (see Duffy 2015). Future work will clarify the extent to which the Benta Valley is an outlier in the Carpathian Macroregion. Within the Transylvanian Plateau, there is variation between southwest Transylvania and trajectories elsewhere. The assessments of chiefly polities in northern and eastern Transylvania during the MBA (e.g., Dietrich 2010; Molnár and Nagy 2013) must be reconsidered in light of new radiocarbon dates that have upended the existing relative ceramic chronology used to draw those conclusions. Dietrich (2010) has emphasized the importance of controlling salt for how communities in eastern Transylvania organized themselves. Harding and Kavruk (2013) have also made similar claims about the importance of salt in Transylvanian prehistory, though evidence of intense salt mining mostly dates to the LBA.

The presence of many general similarities in social trajectories between different regions suggests that there are some global processes at work, likely linked to broad climatic conditions and the expansion of interregional trade networks throughout the Bronze Age. The increase in connectivity across the Bronze Age, facilitated by technological changes in overland and water-based travel, would have integrated the continent on scales previously unseen in European prehistory. These large-scale processes, however, do not result in interregional homogeneity in community organization and change. Instead, local processes, which produce a diverse mosaic of complexity across the continent, give each region and microregion its own unique trajectory. Both local and global scales are central to understanding the organization and evolution of Bronze Age societies.

The most striking difference between the trajectory in southwest Transylvania and surrounding regions came after the movement of Eurasian Steppe communities into the region after 1500 BC. Elsewhere in the Carpathian Macroregion, the MBA-LBA transition involved the end of the MBA cultural identity. In eastern Transylvania, Noua communities moved in and almost immediately replaced Wietenberg communities, as seen in the radiocarbon sequence from Rotbav (Dietrich 2014a). In southwest Transylvania, however, Wietenberg communities persisted until approximately 1320 BC. Rather than being replaced by Noua communities, Wietenberg communities lived alongside the Noua for over a century. As mentioned above, the move was not without its impact on southwest Transylvanian Wietenberg communities; they reorganized to be more politically hierarchical.

The persistence of Wietenberg in southwest Transylvania into the LBA is likely a direct consequence of being located within a resource procurement zone. When Noua and other groups moved into the Carpathian Macroregion, they would have disrupted existing interregional exchange systems. In the lower Mureș River, settlement system shifts suggest there was a reorganization of exchange systems from riverine corridors towards overland pathways. The disruption of exchange networks would have been devastating for communities that relied upon trade to meet their basic economic needs. Communities in the Carpathian Basin and central and eastern Transylvania relied on trade to get metal ores and products. In southwest Transylvania, while MBA socio-economic institutions were focused on access interregional trade, communities did not rely on trade to meet their basic economic needs. All of the necessary resources, including metal, salt, timber, agricultural and pastoral lands, were locally available.

The transition to the LBA and persistence of Wietenberg is the first time in the Bronze Age where the trajectory of community organization owes its specific path to being in a resource procurement zone. Throughout the EBA and MBA, there was very little in the trajectory of social change in southwest Transylvania that was fundamentally different from trajectories in non-resource procurement zones. As a resource procurement zone, there were different political economic bottlenecks in southwest Transylvania – namely connections to interregional exchange networks – than in areas where metal was imported and access could be controlled by emerging elites. The movement of Noua communities into Transylvania was a catalyst for social change. However, the Wietenberg communities in metal-rich landscapes were the only ones able to maintain their cultural identity. In southwest Transylvania, the relative success of Wietenberg communities comes from their strategic position within the macroregional landscape.

Chapter Summary

This chapter has presented a holistic discussion of community organization and social change in southwest Transylvania. Community organization in southwest Transylvania was not simply a reflection of how metal procurement was organized. While undoubtedly important, access to metal was one of several factors impacting the local trajectory of social change. Community organization in the EBA and MBA was dissonant, with ideological institutions first exaggerating, then masking, emerging inequalities in daily life. The movement of Noua communities into Transylvania at the onset of the LBA ruptured existing socio-economic networks and allowed for the reorganization of Wietenberg communities as hierarchical polities. The trajectory of social complexity in southwest Transylvania was broadly similar to trajectories in other parts of the Carpathian Macroregion, but differed in the persistence of the MBA Wietenberg identity well into the LBA. While the Noua migration was a critical catalyst for social change, the hierarchical reorganization and persistence of Wietenberg communities in southwest Transylvania was only possible due to over a millennia of more incremental changes. The increased segmentation of identity that expanded from the EBA throughout the MBA provided opportunities for social units to be reordered and ranked. The short-lived reorganization of more hierarchical Terminal Wietenberg communities may in part be the consequence of dissonance with ideological institutions not legitimizing the degree of inequality experienced in daily life. This case study has shown how multiscalar approaches to community organization and social change in the Carpathian Macroregion that do not overly homogenize community organization through social types can reveal the processes by which quantitative changes produced qualitative transformations in European prehistory. In the final chapter, I discuss the broader impacts of the Transylvanian case study for our understanding of middle-range societies and resource procurement zones in the past and present.

Chapter 12 - Conclusion

The Crucible of Complexity

The European Bronze Age was a period of significant social, economic, political, and ideological change. By the end of the Late Bronze Age, hierarchically organized complex regional polities with institutionalized inequality dominated social interactions across the continent. These changes, however, did not spring out of thin air. The transformation of Bronze Age societies was a long-term process, rooted in historically specific trajectories, that occurred differently across the heterogeneous natural and cultural landscapes of Europe. The Bronze Age was a crucible in which new forms of social complexity were generated. Through daily practice and episodic ritual events, communities experimented with new technologies and scales of integration to articulate social, economic, and ideological institutions in novel ways.

The social transformation that led to these new social dynamics in southwest Transylvania was stimulated by an event: the movement of new communities into the region at the start of the Late Bronze Age. However, the reorganization of the local Wietenberg society was only possible due to millennia of incremental changes that provided the necessary context for social change. Throughout the Early and Middle Bronze Ages, communities from across the continent became much more socially and economically integrated. Regional asymmetries between communities began to emerge out of different productive catchments and strategic positions within regional settlement networks. The demographic and socio-economic centralization that was the result of these regional asymmetrical interactions co-occurred with a segmentation of identity during the Middle Bronze Age. While social segmentation was necessary for hierarchical ranking to occur, there is no evidence that any social units were hierarchically ranked prior to the LBA. By the end of the MBA, all of the components necessary for regional polities were present, and the movement of Noua communities into the region served as the catalyst for social transformation. There was no intention necessary to create the ideal conditions for complex regional polities to emerge. It is unclear how the trajectory of inequality in southwest Transylvania would have progressed if Noua communities had not arrived and ruptured Wietenberg social, economic, and political institutions.

The forms of community organization seen in southwest Transylvania and elsewhere in the Carpathian Macroregion do not easily fit within existing social typologies. The inter-institutional dissonance seen in these communities is likely repeated in many other social contexts. To most Bronze Age peoples in southwest Transylvania, these institutional constellations would have made perfect sense. From EBA mortuary practices that legitimized a degree of social inequality that was not experienced in daily life, to MBA subsistence production being organized at a local level while trade and exchange was increasingly asymmetric across the region, these dissonant institutions would have not seemed odd to people in the past. Inter-institutional dissonance, however, would have impacted the trajectories of social change in ways visible to archaeologists employing a long-term perspective. In southwest Transylvania, this is perhaps most clear in the lack of development of complex regional polities in the MBA. There was nothing inherent in the economies of MBA communities that would have precluded the successful institutionalization of inequality. Instead, it is likely that the ideological institutions that promoted communal integration, opened access to burial to most people, and legitimized equality in body treatment and grave goods worked as inhibitors that did not sanction inequality. Dissonance in this context likely inhibited social transformations, though it is likely that there are other contexts where dissonance leads to instability and inter-institutional ruptures. Conceptualizing community organization in Bronze Age Transylvania as articulating institutions has allowed for a discussion of community organization that is less reductive than traditional typological approaches and allows for qualitative change in contrast to dimensional approaches.

In the resource-rich procurement zone of southwest Transylvania, it is clear that more than metal mattered in how communities organized themselves. EBA communities contested access to metal using episodic mortuary rituals, but situated their settlements to intensify agricultural production and tap into interregional trade routes. MBA communities expanded the focus on interregional trade, and did not appear to actively regulate access to metal sources. In the LBA, Terminal Wietenberg communities did exert control on the procurement of metal, perhaps as a consequence of a social transformation rather than the cause of it. According to the expanded political economic perspective employed in this study, it would have been difficult for any emerging elites to control access to metal sources. Access to trade routes, through which metal ores and products flowed, would have provided a more easily controlled bottleneck for Transylvanian communities. While metal was a key resource for local communities, restricting access and controlling the flow of raw ores, processed ores, ingots, and finished objects was only one of several important economic systems. This study has demonstrated that resource procurement zones must be studied holistically to more fully understand community organization and social change.

Making Mining Communities

Communities in southwest Transylvania did not start the Bronze Age as mining communities. With the LBA reorganization, Terminal Wietenberg societies established the first permanent settlements focused on extracting and monitoring the movement of metals. In the process of institutionalizing inequality, communities in southwest Transylvania started to define themselves, in part, by the abundant natural resources in their landscape.

here is little evidence that the trajectory of community organization in this resource procurement zone during the EBA and MBA was different than communities that were not located in resource procurement zones. The cultural changes in southwest Transylvania (e.g., EBA-MBA transition; MBA elaboration of ceramics) occur at the same time and likely in the same ways as in surrounding regions. While the potential political economic bottlenecks in southwest Transylvania were different than those in areas where metal is not locally available, the availability of natural resources does not appear to have produced social phenomena unique to resource procurement zones. There is no evidence that southwest Transylvania was part of a core-periphery interregional relationship traditionally associated with world systems during the EBA or MBA. There is, however, extensive evidence of increased interaction with communities in non-resource procurement zones. Additionally, there were likely politically complex communities in surrounding regions (e.g., Pecica-*Șanțul Mare*). There is no evidence, however, that southwest Transylvanian communities were exploited, or controlled, by non-local communities.

Wietenberg communities persisted in southwest Transylvania into the LBA, while Wietenberg communities in central and southeast Transylvania were replaced. I argue that the reason southwest Transylvanian Wietenberg communities persisted is that they were economically self-sufficient while Wietenberg communities elsewhere in Transylvania had to import metal through long-distance exchange networks. The establishment of settlements in the metal-rich uplands supports the notion that Terminal Wietenberg communities persisted because they were able to maintain access to the local metal resources. In a very real way, the metal resources saved Wietenberg lifeways for over a century. In this social context, it is likely that Wietenberg communities would have been cognizant of the critical role the local resources had on their long-term cultural organization. This process would have forged a new link between Wietenberg communities and the landscape. Rather than simply being communities that lived near resources, they were communities that survived because of these resources. The Late Bronze Ag in southwest Transylvania saw *communities in mining zones* transformed into *mining communities*.

Social Change in Middle-Range Societies

The case study from southwest Transylvania contributes to anthropological approaches to community organization and social change in middle-range societies. The Carpathian Macroregion is home to several millennia of cultural evolution in prehistory without the emergence of state-level societies. As a result, the Macroregion is an ideal context for studying the long-term dynamics in social complexity.

The institutional approach employed here is one way to resolve the differences between dimensional and typological approaches. As continuous dimensions, institutions can be organized in an infinite number of ways. Human agency and institutional organization are mutually constitutive, and constantly changing as new individuals make new choices to accept or reject the rules and obligations set out by social institutions. The different ways institutions articulate, coherently or dissonantly, present opportunitiesay to conceptualize qualitative change that is not possible within a single institution. In the Bronze Age of southwest Transylvania, community organization was often dissonant, which may have helped shape the overall trajectory of social complexity in the region. There were many different events and processes that may have led to the successful institutionalization of inequality, but did not. The movement of Iernut communities into Transylvania did spur a reorganization of Șoimuș communities, but Șoimuș community institutions did not rearticulate hierarchically. The shift from the EBA to MBA, and the development of regionally-specific identities did not spur a social transformation. In the end, it was the movement of Noua communities into the region – a pattern similar to what occurred in the EBA III – that provided the proximate mechanism for Wietenberg communities to reorganize hierarchically. In this study, I have emphasized how smaller-scale microevolutionary changes in institutions, particularly the segmentation of identities and demographic centralization, provided the necessary conditions for this event to produce transformative change. It is equally important to note that changes within institutions, such as in material culture, cultural identity, and economic organization may have little overall impact on the degree of social complexity in the past.

The approach employed in this study can be applied to other archaeological contexts. More comparative trajectories may reveal how dissonant inter-institutional articulations foster or inhibit social transformations. With more cases, it is likely that archaeologists will begin to recognize new forms of institutional constellations that do not have equivalents in the post-state societies ethnographic record. As anthropological archaeologists gain a better understanding of the organizational diversity of middle-range societies, we can better understand their role in the evolution of human societies.

Future Directions

As with any substantive research project, this study has raised more questions than it has answered. This study was the first project in Transylvania to employ regional survey and radiocarbon dating at a large scale and has made significant contributions to the region's basic culture historical framework. At the same time, the conclusions from this project are tentative, as future work has the potential to continue to transform our understanding of the trajectory of social complexity in southwest Transylvania. In archaeological contexts with longer histories of study, projects of a similar scale as this dissertation are unlikely to fundamentally transform the culture history. Because of the paucity of systematic research across the region, future work is likely to have a significant impact on our understanding of Bronze Age societies in southwest Transylvania. There are several directions in which future work should be pursued to expand on the foundation presented in this study.

The multiscalar survey techniques employed in the Geoagiu Valley can be applied to other areas within southwest Transylvania. Pedestrian survey helped identify previously unknown Bronze Age sites in the Geoagiu Valley. The largest Wietenberg site in southwest Transylvania, Pețelca-*Cascadă* (over 8 ha), was previously unknown. While ongoing highway construction projects are providing critical views into prehistoric settlements, they are focused on narrow tracks of land. Additional survey to fill in gaps in our understanding of Bronze Age landscape use will provide the opportunity to challenge socio-economic models developed in this study based on known settlement placement and network position.

One of the most critical gaps in our understanding of Bronze Age metal procurement is the lack of documented prehistoric mines in the region. While there are a few sites where prehistoric mining was likely (see Boroffka 2006; Ciugudean 2012a), archaeologists have yet to find definitive evidence of Bronze Age mines. While most evidence of prehistoric mining in the richest mining areas such as Roșia Montană, Bucium, and Zlatna was likely destroyed by later industrial-scale mining, there are still fruitful avenues of research to pursue. Smaller hydrothermal vents which would have provided sufficient ore for Bronze Age communities may not have proved economically viable for larger-scale mining. Consequently, there is likely prehistoric mining evidence both in the metal-rich Metal Mountains and less-rich Trascău Mountains that systematic research could uncover.

In the future, large-scale excavation is needed to test some of the patterns observed at the regional scale. Excavating multiple houses across individual settlements can help identify socio-economic inequalities that are not evident at the regional scale. Teiuș-*Coastă* is a critical site for documenting how Șoimuș communities changed in response to the movement of Iernut communities into southwest Transylvania. Excavations at the site of Pețelca-*Cascadă* would help understand how large Wietenberg settlements were organized and evolved over time. Work at Geoagiu de Sus-*Fântâna Mare* would be able to reveal how Wietenberg communities changed in response to the movement of Noua communities into southwest Transylvania. The landscape around Geoagiu de Sus-*Fântâna Mare* also likely contains metal in hydrothermal vents (e.g., at Măgura Geomal), and the settlement may provide important evidence of how the organization of metal procurement changed across the EBA, MBA, and LBA.

In addition to large-scale excavation at several of the sites in the Geoagiu Valley, more small-scale testing of known sites is needed to help refine the regional settlement chronology – particularly to identify Terminal Wietenberg settlements in other parts of southwest Transylvania. As Șoimuș and Wietenberg ceramics are no longer reliable chronological marker for subphases of the Early and Middle Bronze Age respectively, the known sites across southwest Transylvania can be investigated using test excavations and radiocarbon dating to better understand the tempo of their occupations.

More excavation of Early Bronze Age and Wietenberg cemeteries are needed to more fully reconstruct mortuary patterns in southwest Transylvania. No EBA cemeteries have been fully excavated using modern excavation and data recording methods. Excavation of a full cemetery will allow for a complete reconstruction of the tempo of burial and identification of variation across contemporary social segments. Exploring cemeteries in strategic positions near metal sources and distribution pathways, such as those near Rameț-*Gugului*, can reveal how mortuary rituals were used to contest access to metals, territories, and social inequalities in EBA communities. While Sebeș-*Între Răstoace* was mostly excavated as part of a motorway project, the excavation of additional Wietenberg cemeteries would reveal the extent to which practices at Sebeș were broadly shared by Wietenberg communities or idiosyncratic to this community.

The radiocarbon dating program employed in this study needs to be expanded. It is unclear whether this new Wietenberg chronology will hold across the entire Transylvanian Plateau. This new chronology has been developed primarily from radiocarbon samples in southwest Transylvania. It is possible, if not probable, that other regions in Transylvania would have experienced different historical trajectories. For example, there may be no Terminal Wietenberg in southeast Transylvania. Dietrich (2014a, 2014b) has argued that the Noua culture replaced the Wietenberg at the start of the LBA (approximately 1500-1450 cal. BC) in southeast Transylvania. In a similar vein, it is possible that communities in the ore-rich Apuseni Mountains in southwest Transylvania may have developed along a different trajectory, particularly due to the region's unique geo-environmental conditions as well as interaction networks towards the Carpathian Basin (Quinn and Ciugudean, forthcoming). It is critical to continue to test and refine the chronology proposed above, not only within southwest Transylvania, but also across the Wietenberg cultural area to see how it may vary across space.

The previous internal chronology for the Wietenberg, based on seriation of ceramic decoration techniques, is no longer supported by the archaeological record. At this point we do not have enough information about how ceramics changed over time to develop a new ceramic-based chronology. We can no longer point to simple criteria (such as decoration technique) for marking change through time. However, this does not mean that there are no other changes in the ceramics from 2000-1320 cal. BC. It is extremely likely that ceramics changed throughout the course of the Wietenberg Culture. For example, the motifs chosen, the tools used to make decoration, the fabric, production technique, or clay sources may have changed substantially over time. However, we cannot assume that archaeologists will be able to identify discrete criteria for monitoring change through time in the production of Wietenberg ceramics. Instead, we need to develop an analytical basis for any new ceramic chronology. This begins with first generating numerous ceramic assemblages from well dated archaeological contexts (cemeteries or settlements). Next, we need to approach the ceramics with a holistic perspective, adding form, function, and fabric to the traditional assessments of decoration. Finally, we can monitor which ceramic elements changed over time, see if any correlate with each other, and identify any widespread transformations only if time is measured independently. Future work will hopefully contribute the large well-dated ceramic assemblages for the Wietenberg Culture that are needed to conduct these analyses.

The artifact analyses presented in this study are tentative and much more detailed analysis is needed. The metal finds, including raw ores, slags, and finished objects, can be analyzed to determine the sources and techniques of extraction, processing, and production. Future ceramic analyses will help reveal the organization of ceramic crafting activities and identities of inequality. Analyses of decoration, form, and function can be combined with the assessments of fabrics presented here to develop a better index for the presence of elites in southwest Transylvania. Sourcing studies (e.g., thin sections, NAA) can reveal whether ceramics were centrally produced at any point in the Bronze Age. Analyses of human remains, including isotopic assessments of mobility and diet, aDNA, and macroscopic bioarcheological analyses, may provide additional evidence for who was eligible for burial. Assessments of inequality inscribed in bones complement patterns of lived experiences seen in residential systems and can provide a more nuanced view of the tensions between identities communities chose to mark or mask through mortuary rituals. Analysis of the paleobotanical remains from this study are ongoing, and can add an important line of evidence for reconstructing subsistence practices in Bronze Age Transylvania.

Together, these directions for future research provide the opportunity to test the trajectory developed in this study. By expanding multiscalar perspectives on community organization in southwest Transylvania, archaeologists can get a better understanding of the processes of social change in resource procurement zones.

Archaeology as Public Scholarship

Archaeology has a critical role to play in modern discourse on issues of inequality, human-environment interaction, and sustainable development in mining communities. The study of the Bronze Age in southwest Transylvania contributes long-term perspectives on the development of institutionalized inequality that defines political dynamics in mining districts today. With community members in Bucium, we are examining ways archaeologically-oriented and community-engaged scholarship influence awareness and public policy about key social advocacy issues. In a context where transnational mining companies are increasingly active in their pursuit of the rich metal resources of the Apuseni Mountains, local communities have sought ways to stop these projects while continuing to celebrate their own mining heritage. The trajectory of Bronze Age societies in southwest Transylvania, and their transformation from *communities in mining zones* to *mining communities*, has provided an alternitve view on the social dynamics in resource procurement zones.

In the process of institutionalizing inequality, communities in southwest Transylvania invented mining identities, which linked people to both craft and landscape (Figure 12.1). Mining and metal resources are what allowed Wietenberg communities to persist into the Late Bronze Age. Where modern mining threatens the existence of communities, Bronze Age mining was a cultural lifeline for Wietenberg society.

Figure 12.1 – Photograph of Bucium community members panning for gold by Bazil Roman (1938-1939).

The path of complexity upon which European societies were set during the Bronze Age has led to the types of inequality that are threatening Transylvanian mining communities today. As seen in the link between religious symbols and mining in Bucium today, this is not merely an economic issue. The process of institutionalizing inequality required broad systemic transformations in social, economic, and ideological institutions. Reversing the negative impacts of inequality in the Apuseni Mountains requires a similarly broad suite of strategies to provide people with socio-economic opportunities and to retake ownership of their landscapes.

As modern communities look to their future, their past has a role to play. The Bronze Age has shown that mining landscapes in pre-state contexts were diverse, dynamic places. Mining does not require social, economic, and political hierarchy. Bronze Age communities in resource procurement zones benefitted from their local resources and were not exploited by non-local political elite. By reconnecting to this ancient legacy of local autonomy and socio-economic diversity, modern communities in southwest Transylvania can begin to imagine a more sustainable future.

Appendices

Appendix A – Site descriptions

Tested Settlements in the Geoagiu Valley

Gârbova de Jos-În Coastă

ID: 277	Coordinates: E: 5124291.93	N: 707607.75	Elevation (m): 279.58
Landscape Setting: This site is located on a high terrace above the Mureș River. The site is located on the "right bank" of the Mureș, on the mountain side, west of the river. The site extends the length of the terrace edge, approximately 250m, between two erosional drainages off the terrace. The site receives its name ("On the Rib") from the local topography that places this large spur between Aiud and Teius. At this point in the valley, the Mureș River runs close to the "left bank" of the Mureș Valley, which means that this site was likely not directly on the river. While not directly next to the river, the site is positioned with commanding views of the span of the Mureș River between Aiud and Teiuș. The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.			
Horizontal Extent (ha): 1.494			Stratigraphy: None
Cultural/Chronological affiliation: EBA II; Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: Transects		Lots: 13-177; 13-178; 13-179
Test Excavation (y/n): y	Excavation Strategy: STP		Lots: 14-127

Geoagiu de Sus-Fântâna Mare

ID: 97	Coordinates: E: 5126537.99	N: 700285.41	Elevation (m): 476.03
Landscape Setting: This site is located in the middle of the Geoagiu Valley, on the north side of the valley. The site is positioned on the top terrace in a series of three large terraces that descend stepwise down to the Geoagiu Valley. The site is equidistant between the rich metal sources of the upland mountain valleys (9km to northwest) and the Mureș trade corridor (10km to southeast). The site is positioned directly below, to the south, of the Geomal Măgura, a massive limestone dome. The Geomal Măgura is currently home to a large limestone quarry, which has spoil heaps and service roads that extend towards the site. While not currently affecting the site, the quarry will pose a significant threat to the preservation of the site if it continues to grow. The site is located next to a large freshwater spring and well that emerge from the base of the Magura that give the site its name ("Large Well"). The site is on the last large flat terrace as you move up the Geoagiu Valley towards the top of the valley. As such, it is positioned as far up the valley as a site can be positioned yet still have the agricultural land to support			

a large population. The site is also at a key location for moving up and down the Geoagiu Valley – as it is the last point going up the valley where it is relatively easy to move from the valley floor to the valley ridge; and the valley floor becomes impossible to pass by cart. This is important because the site would likely be able to control all movement in and out of the Metal Mountains along the Geoagiu Valley. It is probable that there are nearby metal deposits in close proximity to the site through hydrothermal vents (see Geomal-Măgura gallery mine), particularly gold, that the site inhabitants could have exploited. However, the site is not located in a highly productive catchment for metal. The site is located away from the Mureș interregional trade corridor, has potential for direct access to metal ores, and is located in agricultural land along an ecotone boundary with pasture in the Geoagiu Valley highlands.		
Horizontal Extent (ha): 3.532		Stratigraphy: 5 occupation levels
Cultural/Chronological affiliation: EBA II; Wietenberg (Type A, C)		^{14}C Dates: OS-100919: 3970 ±80 OS-100530: 3610 ±25 OS-100527: 3130 ±20 OS-100529: 3100 ±25 OS-100528: 3070 ±25
Surface Collection (y/n): y	Collection Strategy: 20 m transects; two 10x10m units; field grab.	Lots: 12-029; 12-069; 12-070; 12-074; 12-075; 12-077; 12-096
Test Excavation (y/n): y	Excavation Strategy: Two excavation areas, a 1x2m trench (Units 1 and 2) and a 1x1 unit (Unit 3). Excavated in natural stratigraphy.	Lots: 12-072; 12-073; 12-076; 12-078; 12-080; 12-082; 12-083; 12-084; 12-085; 12-088; 12-090; 12-093; 12-097; 12-099; 12-101; 12-102

Geoagiu de Sus-Viile Satului

ID: 104	Coordinates: E: 5124585.23	N: 700967.65	Elevation (m): 317.19
Landscape Setting: This site is located in the middle of the Geoagiu Valley, on the north side of the valley. The site is positioned near the valley floor. One portion of the site is located on a terrace above the valley floor, while the rest of the site is on a slope that gradually descends to the small Geoagiu Valley flood plain. The site is located directly to the east of the modern village, mostly in an orchard, vineyard, and small agricultural plots. The site takes its name ("Village Vineyard") from the vineyard in which ceramics were first identified on the surface and the test units were placed, though the site extends beyond its boundaries. The site backs up to a steep slope that starts the climb up the valley to the ridge. The site is located at a key point in the valley where the valley starts to narrow as you go up towards the source of the Geoagiu River. However, the site is still approximately 1.5km to the southeast of the point where travel along the valley floor, and movement between the ridge and valley floor, becomes difficult. It is possible that there are nearby metal deposits, though the closest known source (Geomal-Măgura) is over 3km away. The site is located away from the Mureș interregional trade corridor, has potential for direct access to metal ores, and is located in agricultural land.			
Horizontal Extent (ha): 0.945			Stratigraphy: 2 occupation levels
Cultural/Chronological affiliation: Wietenberg (Type C, D); Paleo/Mesolithic			^{14}C Dates: OS-107554: 3470 ±25 OS-107666: 3370 ±45 OS-107555: 3260 ±25
Surface Collection (y/n): y	Collection Strategy: 20 m transects; field grab.		Lots: 12-044; 13-049

Test Excavation (y/n): y	Excavation Strategy: One 1x1 m unit (Unit 1) and one 1x1.5 m unit (Units 2 and 3)	Lots: 13-048; 13-050; 13-053; 13-054; 13-055; 13-056; 13-058; 13-061; 13-062; 13-063; 13-065; 13-068; 13-069; 13-071; 13-073; 13-074; 13-085; 13-086; 13-087; 13-088; 13-089; 13-090; 13-091; 13-092; 13-093; 13-094; 13-095; 13-096; 13-097; 13-098; 13-099; 13-100; 13-101; 13-102; 13-103; 13-104; 13-105; 13-106; 13-107; 13-108; 13-109; 13-113; 13-114; 13-115; 13-116; 13-117; 13-118; 13-119; 13-120

Pețelca-Cascadă

ID: 278	Coordinates: E: 5123748.02 N: 710855.38	Elevation (m): 257.68
Landscape Setting: This site is located on the first, medium height, terrace above the Mureș River. The site is located on the “left bank” of the Mureș, on the Transylvanian Plateau side, east of the river. The site is bounded on the north by an erosional drainage, and extends to the south along the length of the terrace edge, approximately 675m. The southern end of the site is marked by a spring and drainage. The site is situated at a bend in the Mureș River, where the river shifts directly along the terrace below the settlement. The site is named for the cascades at the bend of the river, a shallow section of the Mureș River that provides a ford to cross the river, as the water breaks as it runs over rocks at the bottom of the river. East of the site the landscape gradually rises with the hills of the Transylvanian Plateau. The site is located at a key point along the Mureș River, where movement along the river could be easily monitored. The topography of the lower Geoagiu Valley near Teiuș provides a natural push of the river to the left bank of the Mureș flood plain, and as a result, it is unlikely that the river was in the same position during the Bronze Age. The site is located approximately 9.3km up river (to the north) of the confluence of the Mureș and Târnava Rivers. The site has a wide view of the Trascău Mountains across the river. The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.		
Horizontal Extent (ha): 8.808		Stratigraphy: 8 occupation levels
Cultural/Chronological affiliation: Wietenberg (Type A, B, C); Coțofeni; Gava; Roman; Medieval		^{14}C Dates: UGAMS-18994: 3570 ±25 OS-113605: 3530 ±20 OS-113646: 3330 ±30 OS-113647: 3170 ±20 UGAMS-18993: 3110 ±25 OS-113602: 3050 ±20
Surface Collection (y/n): y	Collection Strategy: 20 m transects; field grab	Lots: 13-168; 13-169; 14-034; 14-037; 14-049; 14-056; 14-057;
Test Excavation (y/n): y	Excavation Strategy: STP; Five total units, off of wall exposed profiles on the edge of the Mureș terrace. Of the five units, Unit 1 was 1x1 m, but also included a 50 cm wide trench to expose	Lots: 14-035; 14-036; 14-038; 14-039; 14-040; 14-041; 14-042; 14-043; 14-044; 14-045; 14-046; 14-047; 14-048; 14-050; 14-051; 14-052; 14-053; 14-

	profile, Units 2, 3, 4 were 1x0.5 m, and Unit 5 was a small 30x30cm shovel test.	054; 14-055; 14-058; 14-059; 14-060; 14-061; 14-062; 14-063; 14-064; 14-065; 14-066; 14-067; 14-068; 14-069; 14-070; 14-071; 14-072; 14-077; 14-078; 14-079; 14-080; 14-081; 14-082; 14-083; 14-084; 14-085; 14-086; 14-087; 14-088; 14-105; 14-106; 14-107; 14-108; 14-109; 14-110; 14-111; 14-112; 14-113; 14-114; 14-115; 14-116; 14-117; 14-118; 14-119; 14-120; 14-121; 14-122; 14-123; 14-124; 14-125; 14-126

Rameț-Curmatura

ID: 191	Coordinates: E: 5131988.82 N: 693936.13		Elevation (m): 923.12
Landscape Setting: This site is located along a large exposed limestone ridge near the top of the Geoagiu Valley, on the north side of the valley. The site is positioned at a gap in the limestone ridge, where the modern, and likely ancient, road from the lower Geoagiu Valley crosses the limestone ridge into the Ponor depression. The site gets its name ("Bend in the Road") from the curvature of the road as it goes around the limestone ridge. The site has also been referred to as "La Cruce" (The Cross) for a cross that is on top of a small mound at the bend in the road. The site has commanding views of the lower Geoagiu Valley (down to the Mureș Valley on clear days) to the east and the upper Geoagiu Valley and Ponor regions to the west of the ridge. The limestone ridge that the site is located on extends to the Geoagiu River the south and is met with another ridge on the south side of the valley to cut off pedestrian and cart access to the upland mountain valley from the lower sections of the Geoagiu Valley. Anyone wanting to access the rich metal sources in the upland valleys through the Geoagiu Valley must pass by the site. As a result, the site is ideally positioned to monitor movement to and from the richest metal deposits in the Geoagiu Valley. The site is positioned in an area that is poor for agriculture, primarily due to the steep slopes and shallow topsoil. There are some man-made terraces, likely constructed during the Copper Age, which could have been used for small garden plots, though large-scale agriculture would have been impossible. The site is located far from the Mureș interregional trade corridor, has potential for direct access to metal ores, and is located in pasture land in the Geoagiu Valley highlands.			
Horizontal Extent (ha): 1.770			Stratigraphy: Mixed deposits
Cultural/Chronological affiliation: EBA, general; Wietenberg (Type C); Coțofeni; Medieval			^{14}C Dates: OS-107556: 875 ±35
Surface Collection (y/n): y	Collection Strategy: Transects; field grab.		Lots: 13-005; 13-123
Test Excavation (y/n): y	Excavation Strategy: STP; Units		Lots: 13-121; 13-122; 13-124; 13-125; 13-126; 13-127; 13-128; 13-129; 13-130; 13-131; 13-133; 13-134; 13-135; 13-138; 13-139; 13-140; 13-141; 13-143; 13-144; 13-145; 13-146; 13-147; 13-151; 13-152; 13-153; 13-154; 13-

		156; 13-157; 13-158; 13-159; 13-160; 13-161; 13-162

Rameț-Gugului

ID: 279	Coordinates: E: 5131257.01	N: 696495.35	Elevation (m): 811.41
Landscape Setting: This site is located on a near the top of the Geoagiu Valley, on the north side of the valley. The site is positioned on top of a spur in the Geoagiu Valley. The modern, and likely ancient, road cuts across the spur with a sharp bend. The site has commanding views of the lower Geoagiu Valley (down to the Mureș Valley on clear days) to the east and south and the limestone ridge near the top of the Geoagiu Valley to the west. The site is positioned 3km from the upland mountain valleys with rich metal deposits and over 15km from the Mureș River. The upland road from the Mureș to the metal metal-rich upland mountain valleys passes by the site. The site is positioned in an area that is poor for agriculture, primarily due to the steep slopes and shallow topsoil. There is no evidence of terracing at the site. The site is located far from the Mureș interregional trade corridor, has potential for direct access to metal ores, and is located in pasture land in the Geoagiu Valley highlands.			
Horizontal Extent (ha): 0.159			Stratigraphy: 1 occupation level
Cultural/Chronological affiliation: EBA I			^{14}C Dates: OS-107558: 145 ±20
Surface Collection (y/n): n	Collection Strategy: n/a		Lots:
Test Excavation (y/n): y	Excavation Strategy: STP; One 1x1m unit (Unit 1)		Lots: 13-136; 13-137; 13-142; 13-148; 13-149; 13-150; 13-155

Stremț-Berc 1

ID: 238	Coordinates: E: 5120903.96	N: 704574.94	Elevation (m): 323.12
Landscape Setting: This site is located at the low end of the Geoagiu Valley, the only recorded Bronze Age site on the south side of the valley. There is a small erosional gulley that extends from the high terrace down to a lower terrace (the terrace where Teiuș-*Coastă* is located), creating a small promontory that is known locally as "Berc". The site is located near the back of the Berc landform. The site has a view of the Bilag area to the south and the Mureș-Târnava confluence to the southeast. While a large row of hedges limits the modern visibility to the north, the mouth of the Geoagiu Valley would have been easy to monitor from this high position. While the site is on the south side of the valley, its position relative to the erosional gully means that it has southerly exposure, similar to all other sites on the north side of the valley. The site is located away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located in pasture land (due to topography and that the settlement takes up much of the higher terrace) along an ecotone boundary with agriculture land widely available in the area around the site.			
Horizontal Extent (ha): 0.505			Stratigraphy: None
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects; two 10x10m surface collection units; field grab.		Lots: 12-017; 12-018; 12-019; 12-022; 12-025; 12-056; 12-060; 12-061
Test Excavation (y/n): y	Excavation Strategy: STP; Units		Lots: 12-054; 12-055; 12-057; 12-058; 12-059; 12-062

Stremț-Fabrică de Alcool

ID: 241	Coordinates: E: 5121545.84	N: 704942.93	Elevation (m): 264.55

Landscape Setting: This site is located in the lower third of the Geoagiu Valley, on the north side of the valley. The site is tucked up into the Geoagiu Valley and would not have had direct access to the Mureș River. Unlike most other Bronze Age sites in southwest Transylvania, the site is not located on a distinct terrace above the Geoagiu Valley. Instead, the site is located on the gradual slop up from the Geoagiu Valley flood plain up to the first terrace. The cultural deposits increase in depth (with more distinct occupation levels from different chronological phases preserved) from the southern to the northern site boundary, which suggests that the slope of the modern ground surface is due in part to cultural deposits and the original site surface was likely flatter. The site takes its name from the large abandoned alcohol factory building built on the east end of the site (likely disturbing the eastern site boundary). The site extends across multiple field systems, a road, and a row of modern houses. The site extent likely varied by time period, though the limited subsurface testing did not allow a phase-by-phase site extent to be determined. The site is located away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land along an ecotone boundary with pasture in the lower Geoagiu Valley flood plain.		
Horizontal Extent (ha): 3.732		Stratigraphy: 7 occupation levels
Cultural/Chronological affiliation: Wietenberg (Type A, C); Criș; Migration Period		^{14}C Dates: OS-107552: 34700 ±190 OS-107553: 3560 ±25 OS-107622: 3560 ±35 OS-107621: 3520 ±30 OS-107620: 3480 ±30 OS-107551: 1520 ±25
Surface Collection (y/n): y	Collection Strategy: 20m transects; two 10x10m surface collection units	Lots: 12-048; 12-051; 12-052; 12-053; 12-064; 12-065; 12-066; 13-011; 13-035;
Test Excavation (y/n): y	Excavation Strategy: STP; three 1x1m units (Units 1, 2, 3)	Lots: 13-006; 13-007; 13-008; 13-009; 13-010; 13-012; 13-013; 13-014; 13-015; 13-016; 13-017; 13-018; 13-019; 13-020; 13-021; 13-022; 13-023; 13-024; 13-025; 13-026; 13-027; 13-028; 13-029; 13-030; 13-031; 13-032; 13-033; 13-035; 13-036; 13-037; 13-038; 13-039; 13-040; 13-041; 13-042; 13-043; 13-044; 13-045; 13-046; 13-047; 13-051; 13-052; 13-057; 13-059; 13-060; 13-064; 13-066; 13-067; 13-070; 13-072; 13-084; 13-110; 13-111; 13-112

Teiuș-Coastă

ID: 276	Coordinates: E: 5119601.25	N: 705734.85	Elevation (m): 281.12
Landscape Setting: This site is located on a high terrace above the Mureș River (second terrace above the Mureș flood plain), on the left as you enter Teiuș from Alba Iulia. The site is located on the "right bank" of the Mureș, on the mountain side, west of the river. The site is concentrated on the southeast corner of the terrace, to the south of the small white water treatment plant. The site is named after the toponym of the terrace ("Rib"). At this point in the valley, the Mureș River runs close to the "left bank"			

of the Mureș Valley, which means that this site was likely not directly on the river. While not directly next to the river, the site is positioned with commanding views of the Mureș River, especially the Mureș-Târnava confluence, and lowlands north of Bilag through which several mountain valleys drain to the Mureș. The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.		
Horizontal Extent (ha): 1.904		Stratigraphy: 2 occupation levels
Cultural/Chronological affiliation: EBA II/III; Criș		^{14}C Dates: OS-113543: 3690 ±20
Surface Collection (y/n): y	Collection Strategy: 20m transects; field grab.	Lots: 13-197
Test Excavation (y/n): y	Excavation Strategy: STP, 3 1x1 m uniits	Lots: 14-089; 14-090; 14-091; 14-092; 14-093; 14-094; 14-095; 14-096; 14-097; 14-098; 14-099; 14-100; 14-101; 14-102; 14-103; 14-104

Teiuș-Fântâna Viilor

ID: 275	Coordinates: E: 5121910.37 N: 706503.03	Elevation (m): 256.90
Landscape Setting: This site stretches from a terrace above the Mureș River flood plain down a gradual slope to the flood plain, primarily on the right side of the road as you enter Teiuș from Aiud. The site is located on the "right bank" of the Mureș, on the mountain side, west of the river. The north end of the site straddles a small stream, stretching on the east-face of the slope, and the south end of the site is close to an erosional drainage that now serves as the primary access road to the Geomal limestone quarry. The site is also known to extend to the east side of the road, as Noua burials were disturbed in the middle of the 20th century where the current gas station is located. There is a large commune building on top of the first distinct terrace above the river (halfway between the flood plain and the high terrace), with an orchard stretching the rest of the way up the slope. The site is named after the freshwater spring ("Vineyard Well") near the commune building at the northwest edge of the site. At this point in the valley, the Mureș River runs close to the "left bank" of the Mureș Valley, which means that this site was likely not directly on the river. The site has a view of the Mureș floodplain from Teiuș towards Aiud, though its lower position than most other sites means that the view is not as commanding. The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.		
Horizontal Extent (ha): 5.383		Stratigraphy: 1 occupation level
Cultural/Chronological affiliation: Wietenberg (Type C, D); LBA; Noua; Coțofeni;		^{14}C Dates: OS-113542: 3080 ±20
Surface Collection (y/n): y	Collection Strategy: 20m transects; field grab	Lots: 13-173; 13-175; 13-190; 13-191; 13-192; 13-193; 13-194; 13-195; 14-006
Test Excavation (y/n): y	Excavation Strategy: STP; Units	Lots: 14-001; 14-002; 14-003; 14-004; 14-005; 14-007; 14-008; 14-009; 14-010; 14-011; 14-012; 14-013; 14-014; 14-015; 14-016; 14-017; 14-018; 14-019; 14-020; 14-021; 14-022; 14-023; 14-024; 14-025; 14-026; 14-027; 14-028; 14-029; 14-030; 14-031; 14-032; 14-033

Untested Settlements in the Geoagiu Valley

Capud-(no name)

ID: 274	Coordinates: E: 5119552.90	N: 711256.47	Elevation (m): 411.05
Landscape Setting: This site is located near a spring halfway between the Mureș and the top of Magură Capudului, on a relatively even portion of the slope. The site is located on the "left bank" of the Mureș, on the Transylvanian Plateau side, east of the river. The site has a wide view of the Mureș Valley from Bilag to Aiud and the Trascău Mountains across the river. The site is close to, but off, the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land.			
Horizontal Extent (ha): EBA II occupation – 0.737; Petrești occupation – 3.946			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II; Petrești			^{14}C Dates: n/a
History of Research: This is a new site recorded by the BATS Project. There has been no previous research at the site.			
Surface Collection (y/n): y	Collection Strategy: 20m transects		Lots: 13-185; 13-186; 13-187; 13-188; 13-189

Capud-(no name)

ID: 284	Coordinates: E: 5120940.21	N: 710232.29	Elevation (m): 278.00
Landscape Setting: This site is located on the high terrace above the Mureș River on the north end of the town of Capud. The site was identified by finding sherds on the east side of the road between Capud and Pețelca, though likely extends to the edge of the terrace near the erosional drainage (a modern house is located in this position). The site has a commanding view of the Mureș flood plain and the Trascău Mountains. The site is positioned along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land.			
Horizontal Extent (ha): 0.705			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general; LBA			^{14}C Dates: n/a
History of Research: This is a new site recorded by the BATS Project. There has been no previous research at the site.			
Surface Collection (y/n): y	Collection Strategy: Field grab		Lots: 13-163

Capud-Magura Capudului

ID: 51	Coordinates: E: 5119961.30	N: 712411.58	Elevation (m): 514.94
Landscape Setting: This site is located on top of a ridge on the northeast of the confluence of the Mureș and Târnava Rivers to the east of the modern town of Capud. The fortified site has commanding views in 360 degrees, especially of the Mureș Valley, the Trascău Mountains, and the Târnava Valley. The site is positioned with a view of, but not directly on, the Mureș interregional trade corridor, has no direct access to metal ores, and is located in pastureland, but with nearby agricultural fields.			
Horizontal Extent (ha): EBA I / Wietenberg – 0.165; Coțofeni – 3.295			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I; Wietenberg (Type A); Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): n	Collection Strategy: n/a		Lots: n/a

Geoagiu de Sus-(no name)

ID: 88	Coordinates: E: 5125830.22	N: 700399.74	Elevation (m): 413.44
Landscape Setting: This site is located in the middle of the Geoagiu Valley, on the north side of the valley. The site is positioned on the middle terrace in a series of three large terraces that descend stepwise down to the Geoagiu Valley. The site is to the east of the springs and wells at Fântâna Mare and Fântâna Mic. The site has a view of the Geoagiu Valley. The site is positioned 10km away from the Mureș interregional trade corridor, has potential direct access to metal ores from hydrothermal vents, and is located in agricultural land, but with nearby access to pastureland in the Geoagiu Valley uplands.			
Horizontal Extent (ha): 0.150			Stratigraphy: n/a
Cultural/Chronological affiliation: Criș; Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects		Lots: n/a

Geoagiu de Sus-La Craia

ID: 100	Coordinates: E: 5125982.56	N: 700086.45	Elevation (m): 427.30
Landscape Setting: This site is located in the middle of the Geoagiu Valley, on the north side of the valley. The site is positioned on the edge of the lowest terrace in a series of three large terraces that descend stepwise down to the Geoagiu Valley. The site is to the west of the springs and wells at Fântâna Mare and Fântâna Mic. The site has a view of the lower Geoagiu Valley. The site is positioned 10km away from the Mureș interregional trade corridor, has potential direct access to metal ores from hydrothermal vents, and is located in agricultural land, but with nearby access to pastureland in the Geoagiu Valley uplands.			
Horizontal Extent (ha): 0.873			Stratigraphy: n/a
Cultural/Chronological affiliation: Criș; Coțofeni (II/III)			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects.		Lots: 12-031; 12-032; 12-033; 12-034

Geoagiu de Sus-Piatra Bulzu

ID: 101	Coordinates: E: 5126344.69	N: 699371.48	Elevation (m): 490.13
Landscape Setting: This site is located in the middle of the Geoagiu Valley, on the north side of the valley. The site is positioned at the base of a large limestone block, a common prehistoric site location within the Trascău Mountains. The site has a view of the lower Geoagiu Valley, which is an even more commanding view when atop the limestone block. The site is positioned 10km away from the Mureș interregional trade corridor, has potential direct access to metal ores from hydrothermal vents, and is located in pastoral land.			
Horizontal Extent (ha): 0.044			Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects.		Lots: 12-036

Geomal-Dealul Pesterii

ID: 108	Coordinates: E: 5128042.92	N: 699658.23	Elevation (m): 729.94
Landscape Setting: This site is located in a small hillock on top of the Geomal Măgura in the middle of the Geoagiu Valley, on the north side of the valley. The site is in a small hill that sticks out of the flat top of the Magura. The entrance to the gallery mine faces east, towards the open plain of the top of the Magura (away from the Geoagiu Valley). The gallery entrance is in a thick brush and forest on the side			

of the hill. The site has poor visibility of the Geoagiu Valley, though a vista view of the surrounding landscape can be reached a short distance away (to the southwest). The site is positioned approximately 10km away from the Mureș interregional trade corridor, has potential direct access to metal ores from hydrothermal vents, and is located in pastoral land.

Horizontal Extent (ha): n/a		Stratigraphy: n/a
Cultural/Chronological affiliation: n/a		^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: grab of geological samples.	Lots: 13-002; 13-003

Pețelca-(no name)

ID: 285	Coordinates: E: 5121832.83 N: 710523.82	Elevation (m): 290.28
Landscape Setting: This site is located on the first, high, terrace above the Mureș River. The site is located on the "left bank" of the Mureș, on the Transylvanian Plateau side, east of the river. The site is on the south side of a stream and gully that forms the southern boundary of the modern Pețelca town. The site hugs the terrace edge, between small erosional drainages. The high position of the site means that it would have had a commanding view of the Mureș River valley, as well as west to the Trascău Mountains, however movement between the river and the site would have been difficult due to the significant and rapid elevation change (around 70 meters). The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.		
Horizontal Extent (ha): 1.224		Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni		^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects.	Lots: 13-164; 13-165

Stremț-(no name)

ID: 244	Coordinates: E: 5122385.50 N: 704672.02	Elevation (m): 323.00
Landscape Setting: This site is located in the lower portion of the Geoagiu Valley, on the north side of the valley. The site is positioned on the southern face of a spur on the primary high terrace above the Mureș River flood plain. The site has a wide view of the Geoagiu Valley and to Bilag beyond. Towards the top of the site, there is a good view of the Mureș-Trascău confluence. The southern boundary of the site follows road to the Geomal quarry. The site is positioned approximately 2km away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land.		
Horizontal Extent (ha): 43.009		Stratigraphy: n/a
Cultural/Chronological affiliation: Roman		^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20m transects; field grab.	Lots: 12-103; 13-075; 13-076; 13-077; 13-078; 13-079; 13-080; 13-081; 13-082; 13-083; 13-132

Stremț-Berc 2

ID: 239	Coordinates: E: 5120500.03 N: 704756.48	Elevation (m): 300.85
Landscape Setting: This site is located at the low end of the Geoagiu Valley, on the south side of the valley. There is a small erosional gulley that extends from the high terrace down to a lower terrace (the terrace where Teiuș-*Coastă* is located), creating a small promontory that is known locally as "Berc". The site is located near the front of the Berc landform, along the south-facing slope from the gully up to the top of the landform. The site has a view of the Bilag area, and lowlands between Bilag and Teiuș, to the		

south and the Mureș-Târnava confluence to the southeast. The site has southerly exposure, similar to all other sites on the north side of the valley. The site is located 1km away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land.		
Horizontal Extent (ha): 1.959		Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni		^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20 m transects, field grab, 10x10 m surface collection	Lots: 12-020; 12-025

Stremț-Berc 3

ID: 240	Coordinates: E: 5120577.17	N: 704977.47	Elevation (m): 300.38
Landscape Setting: This site is located at the low end of the Geoagiu Valley, on the south side of the valley. There is a small erosional gulley that extends from the high terrace down to a lower terrace (the terrace where Teiuș-*Coastă* is located), creating a small promontory that is known locally as "Berc". The site is located at the front of the Berc landform, in a small strip from the top of the gully to the top of the Berc formation. The site has a view of the Bilag area, and lowlands between Bilag and Teiuș, to the south and the Mureș-Târnava confluence to the southeast. The site has southerly exposure, similar to all other sites on the north side of the valley. The site is located 1km away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located on an ecotone between agricultural pastoral land.			
Horizontal Extent (ha): 0.262			Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20 m transects		Lots: 12-021

Stremț-Sub Berc

ID: 242	Coordinates: E: 5120477.75	N: 705256.81	Elevation (m): 277.93
Landscape Setting: This site is located at the low end of the Geoagiu Valley, on the south side of the valley. The site is located along a terrace edge facing the Geoagiu Valley below the Berc landform. This terrace is the first high terrace above the Mureș River. The northwest edge of the site ends where the terrace meets the Berc spur, while the southeast end of the site ends at an erosional drainage, a length of approximately 150m. The site has a view of the lower Geoagiu Valley and to the northeast of the Mureș River valley. The site is located 1km away from the Mureș interregional trade corridor, has no direct access to metal ores, and is located on an ecotone between agricultural and pastoral land.			
Horizontal Extent (ha): 0.329			Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni			^{14}C Dates: n/a
Surface Collection (y/n): y	Collection Strategy: 20 m transects		Lots: 12-024

Teiuș-(no name)

ID: 245	Coordinates: E: 5118836.51	N: 705212.59	Elevation (m): 262.98
Landscape Setting: This site is located on a middle terrace above the Mureș River (first high terrace above the Mureș flood plain, below the high terrace on which Teiuș-*Coastă* is located), on the left prior to entering Teiuș from Alba Iulia. The site is located on the "right bank" of the Mureș, on the mountain side, west of the river. The site spreads along the terrace edge, bounded by a drop down to the low terrace to the south and on the north by modern structures (barns and houses). At this point in the valley, the Mureș River runs close to the "left bank" of the Mureș Valley, which means that this site was likely not directly on the river. While not directly next to the river, the site is positioned with views of the Mureș River, especially the Mureș-Târnava confluence, and lowlands north of Bilag through which			

several mountain valleys drain to the Mureș. The site is along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in agricultural land near an ecotone boundary with pasture in the Mureș flood plain.		
Horizontal Extent (ha): unknown		Stratigraphy: n/a
Cultural/Chronological affiliation: Coțofeni		^{14}C Dates: n/a
Surface Collection (y/n):	Collection Strategy: 20m transects.	Lots: 12-087; 12-095

Teiuș-(no name)

ID: 281	Coordinates: E: 5121171.93	N: 707315.93	Elevation (m): 223.00
Landscape Setting: This site is located on field systems within the town (near the northern extent of housing developments), on the low terrace above the Mureș River flood plain. The site is located on the "right bank" of the Mureș, on the mountain side, west of the river. The site would have been at risk for flooding during significant flooding events, though the local topography is such that the river likely ran a significant distance from the low terrace on which the site is located. The site is concentrated in the northeast of the large open field system area, and is likely damaged by a row of houses that are directly on the terrace edge. With its low position, the site has limited visibility of the Mureș river itself, but would have had wide view in all directions of the surrounding hills and mountains. The site is located along the Mureș interregional trade corridor, has no direct access to metal ores, and is located in pastureland within the Mureș flood plain.			
Horizontal Extent (ha): 2.554			Stratigraphy: n/a
Cultural/Chronological affiliation: LBA			^{14}C Dates: n/a
Surface Collection (y/n):	Collection Strategy: 20m transects.		Lots: 13-174; 13-176

Bronze Age Settlements in Southwest Transylvania (outside Geoagiu Valley)

Acmariu-Școală

ID: 286	Coordinates: E: 5092075.13	N: 682811.09	Elevation (m): 220.00
Horizontal Extent (ha): 5.074			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C); Gava			^{14}C Dates: n/a

Acmariu-Valea Feneșului

ID: 287	Coordinates: E: 5092050.58	N: 680653.04	Elevation (m): 269.00
Horizontal Extent (ha): 1.644			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C); Roman			^{14}C Dates: n/a

Aiud-(no name)

ID: 1	Coordinates: E: 5135658.54	N: 707620.68	Elevation (m): 253.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Aiud-Castelul Bethlen

ID: 2	Coordinates: E: 5132063.95	N: 709226.54	Elevation (m): 262.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III			^{14}C Dates: n/a

Aiud-Cetățuie

ID: 3	Coordinates: E: 5128663.1	N: 708811.65	Elevation (m): 251.34
Horizontal Extent (ha): 1.701			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II, Wietenberg (Type C)			^{14}C Dates: n/a

Aiud-Groapa de Gunoi

ID: 291	Coordinates: E: 5134127.15	N: 709280.57	Elevation (m): 240.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C)			^{14}C Dates: n/a

Aiud-Tinod

ID: 4	Coordinates: E: 5129463.94	N: 707844.78	Elevation (m): 237.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C; Type D)			^{14}C Dates: n/a

Alba Iulia-(no name)

ID: 290	Coordinates: E: 5103343.30	N: 700787.33	Elevation (m): 217.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Alba Iulia-Bazin Olimpic

ID: 283	Coordinates: E: 5106275.29	N: 69843.44	Elevation (m): 238.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: LBA (pre-Noua)			^{14}C Dates: 1) Hd-29183: 3062 ±21

Alba Iulia-Recea/Monolit

ID: 6	Coordinates: E: 5103669.55	N: 697849.05	Elevation: 226.00
Horizontal Extent (ha): 8.399			Stratigraphy: Y
Cultural/Chronological affiliation: EBA III, Wietenberg (Types A, C)			^{14}C Dates:

	1) Hd-29515: 3448 ±21 (Wietenberg Type C) 2) Hd-29143: 3492 ±23 (Wietenberg Type A)

Alba Iulia-Strada Sinia

ID: 7	Coordinates: E: 5104347.16	N: 699037.23	Elevation (m): 246.46
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Ampoița-La Bulz

ID: 21	Coordinates: E: 5113953.08	N: 685344.47	Elevation (m): 993.76
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I			^{14}C Dates: n/a

Ampoița-La Pietri

ID: 27	Coordinates: E: 5110186.75	N: 691554.24	Elevation (m): 357.27
Horizontal Extent (ha): 0.388			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I, EBA II			^{14}C Dates: n/a

Ampoița-Pestera Liliecilor

ID: 37	Coordinates: E: 5112068.22	N: 684983.28	Elevation (m): 570.94
Horizontal Extent (ha): 0.018			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Ampoița-Piatra Caprii

ID: 38	Coordinates: E: 5111893.23	N: 685242.76	Elevation (m): 648.99
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Bărăbanț-(no name)

ID: 41	Coordinates: E: 5109699.55	N: 699081.45	Elevation (m): 264.24
Horizontal Extent (ha): 5.643			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C)			^{14}C Dates: n/a

Benic-(no name)

ID: 44	Coordinates: E: 5120479.00	N: 700544.00	Elevation (m): 300.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Blandiana-La Brod

ID: 45	Coordinates: E: 5092875.00	N: 687640.00	Elevation (m): 212.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Blandiana-Teligrad

ID: 46	Coordinates: E: 5092949.00	N: 685641.00	Elevation (m): 237.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Burcedea Vinoasă-Podei/Curături

ID: 47	Coordinates: E: 5115255.76	N: 695598.89	Elevation (m): 364.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Cetea-La Bai/La Pietri/ Petriș/La Picuiata

ID: 53	Coordinates: E: 5124944.49	N: 696900.56	Elevation (m): 549.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I, Wietenberg (Type B, C, D)			^{14}C Dates: n/a

Cicău-(no name)

ID: 66	Coordinates: E: 5141020.68	N: 705258.01	Elevation (m): 507.39
Horizontal Extent (ha): 0.111			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Coțofeni			^{14}C Dates: n/a

Cicău-Cetățel

ID: 67	Coordinates: E: 5142907.00	N: 704929	Elevation (m): 500.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Cicău-Săliște

ID: 68	Coordinates: E: 5142063.82	N: 705421.94	Elevation (m): 387.84
Horizontal Extent (ha): 0.770			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type A, B, C, D); Coțofeni; La Tene; Roman; Medieval			^{14}C Dates: n/a

Cisteiu de Mureș-Valea Poietii

ID: 69	Coordinates: E: 5136183.00	N: 716532.00	Elevation (m): 304.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C)			^{14}C Dates: n/a

Craiva-Piatra Craivii

ID: 71	Coordinates: E: 5120248.26	N: 691751.09	Elevation (m): 985.79
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C, D)			^{14}C Dates: n/a

Cricău-Biserică Reformată

ID: 76	Coordinates: E: 5116601.90	N: 698006.16	Elevation (m): 304.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Dumitra-(no name)

ID: 78	Coordinates: E: 5109692.87	N: 708772.14	Elevation (m): 321.75
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B); Coțofeni; La Tene; Roman			^{14}C Dates: n/a

Galați-Bulbuci

ID: 79	Coordinates: E: 5107405.58	N: 676733.25	Elevation (m): 547.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Galda de Jos-(no name)

ID: 80	Coordinates: E: 5118843.87	N: 704661.66	Elevation (m): 263.08
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Coțofeni			^{14}C Dates: n/a

Galda de Jos-(no name)

ID: 81	Coordinates: E: 5117355.00	N: 702369.00	Elevation (m): 260.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Gâmbaș-(no name)

ID: 289	Coordinates: E: 5136584.18	N: 709369.22	Elevation (m): 260.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C)			^{14}C Dates: n/a

Gârbova de Jos-Piatră Dani

ID: 82	Coordinates: E: 5130395.33	N: 701494.26	Elevation (m): 536.58
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Gura Arieșului-(no name)

ID: 111	Coordinates: E: 5146203.00	N: 727527.00	Elevation (m): 307.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Hăpria-Valdul Morii

ID: 116	Coordinates: E: 5105346.00	N: 706340.00	Elevation (m): 321.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Heria-Cetățuie

ID: 117	Coordinates: E: 5138004.74	N: 727555.77	Elevation (m): 519.76
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Hopârta-Pârâului Stirbului

ID: 118	Coordinates: E: 5133470.00	N: 720917.00	Elevation (m): 313.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Hopârta-Vaii Ratului

ID: 119	Coordinates: E: 5133059.00	N: 719953.00	Elevation (m): 322.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Ighiel-Dealul Fierului

ID: 120	Coordinates: E: 5112359.59	N: 690537.34	Elevation (m): 469.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Ighiu-(no name)

ID: 121	Coordinates: E: 5113796.51	N: 693688.46	Elevation (m): 295.91
Horizontal Extent (ha): 2.167			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Isca-Lac

ID: 122	Coordinates: E: 5110873.47	N: 682769.38	Elevation (m): 934.63
Horizontal Extent (ha): 1.200			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Lancrăm-Glod

ID: 136	Coordinates: E: 5094676.33	N: 698271.47	Elevation (m): 250.03
Horizontal Extent (ha): 1.608			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg (Type A, B, C)			^{14}C Dates: n/a

Livezile-Baia

ID: 137	Coordinates: E: 5135820.12	N: 700805.61	Elevation (m): 628.00
Horizontal Extent (ha): 0.845			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I			^{14}C Dates: Bln-4624: 4109 ±44

Livezile-Dealul Sârbului

ID: 139	Coordinates: E: 5137235.53	N: 701650.38	Elevation (m): 543.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type A, B, C)			^{14}C Dates: n/a

Livezile-Obirsie/Obursi

ID: 143	Coordinates: E: 5135659.50	N: 699183.07	Elevation (m): 753.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I; Wietenberg (Type A, B, C)			^{14}C Dates: n/a

Lopadea Nouă-Cetățuie 1

ID: 148	Coordinates: E: 5130679.57	N: 717388.01	Elevation (m): 463.75
Horizontal Extent (ha): 0.153			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Lopadea Nouă-Cetățuie 2

ID: 149	Coordinates: E: 5130758.12	N: 717178.33	Elevation (m): 411.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I			^{14}C Dates: n/a

Lopadea Veche-Jidovină/Râpa Alba

ID: 150	Coordinates: E: 5139144.54	N: 704172.90	Elevation (m): 332.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg (Type B, C)			^{14}C Dates: n/a

Lopadea Veche-Pahui

ID: 151	Coordinates: E: 5138652.57	N: 704129.45	Elevation (m): 392.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type D)			^{14}C Dates: n/a

Meteș-Piatră Peșteri

ID: 153	Coordinates: E: 5108182.46	N: 684721.53	Elevation (m): 471.13
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Meteș-Vârful Baii

ID: 157	Coordinates: E: 5108318.34	N: 688055.88	Elevation (m): 336.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B)			^{14}C Dates: n/a

Micești-Cigaș

ID: 161	Coordinates: E: 5107308.69	N: 698309.83	Elevation (m): 248.47
Horizontal Extent (ha): 7.612			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg (Type C, D)			^{14}C Dates: OS-108311: 3460 ±25 OS-108811: 3390 ±25

Micoşlaca-(no name)

ID: 162	Coordinates: E: 5138651.99	N: 714192.06	Elevation (m): 293.48
Horizontal Extent (ha): 0.612			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Mirăslău-CAP

ID: 163	Coordinates: E: 5138573.07	N: 708106.39	Elevation (m): 280.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B)			^{14}C Dates: n/a

Oarda de Jos-Bulza

ID: 165	Coordinates: E: 5099323.77	N: 697789.94	Elevation (m): 246.29
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Oarda de Jos-Cutina

ID: 166	Coordinates: E: 5098327.02	N: 698084.36	Elevation (m): 237.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg (Type B)			^{14}C Dates: n/a

Oarda de Jos-Dublihan

ID: 167	Coordinates: E: 5099585.59	N: 697583.35	Elevation (m): 225.00
Horizontal Extent (ha): 1.305			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II, III			^{14}C Dates: n/a

Oarda de Jos-Sesul Orzii

ID: 168	Coordinates: E: 5101292.56	N: 699773.80	Elevation (m): 233.88
Horizontal Extent (ha): 3.770			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg, general			^{14}C Dates: n/a

Obreja-Cânepi

ID: 169	Coordinates: E: 5116700.73	N: 714688.40	Elevation (m): 228.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type A, B, C, D)			^{14}C Dates: n/a

Oiejdea-Bilag 1

ID: 280	Coordinates: E: 5113537.13	N: 700473.50	Elevation (m): 262.74
Horizontal Extent (ha): 4.463			Stratigraphy: n/a
Cultural/Chronological affiliation:			^{14}C Dates: n/a

Oiejdea-Bilag 2

ID: 174	Coordinates: E: 5112929.46	N: 697551.73	Elevation (m): 287.48
Horizontal Extent (ha): 1.363			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Ormeniș-(no name)

ID: 175	Coordinates: E: 5139560.37	N: 710597.19	Elevation (m): 304.84
Horizontal Extent (ha): 1.272			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Ormeniș-Cânepiște/Cânepi/La Pod

ID: 176	Coordinates: E: 5141402.81	N: 709452.75	Elevation (m): 321.87
Horizontal Extent (ha): 0.744			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C)			^{14}C Dates: n/a

Ormeniș-Gruiul cu Mazăre

ID: 177	Coordinates: E: 5142488.07	N: 708022.21	Elevation (m): 437.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type D)			^{14}C Dates: n/a

Pâclișa-Podei

ID: 178	Coordinates: E: 5103900.58	N: 696253.62	Elevation (m): 288.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg (Type D)			^{14}C Dates: n/a

Pianu de Jos-Câmpu de Mijloc

ID: 179	Coordinates: E: 5091991.00	N: 691381.00	Elevation (m): 251.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Pianu de Jos-Cleje

ID: 180	Coordinates: E: 5090292.00	N: 692109.00	Elevation (m): 266.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Poiana Aiudului-Pe Ses/La Cânepi

ID: 182	Coordinates: E: 5137990.60	N: 699039.17	Elevation (m): 459.87
Horizontal Extent (ha): 0.567			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Poiana Aiudului-Vatră Satului/Lângă Biserică

ID: 184	Coordinates: E: 5137868.55	N: 700326.30	Elevation (m): 394.42
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Poiana Ampoiului-Piatra Corbului

ID: 185	Coordinates: E: 5106730.82	N: 684052.02	Elevation (m): 395.64
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I, II			^{14}C Dates: n/a

Presaca Ampoiului-Peștera Șura de Piatră

ID: 189	Coordinates: E: 5110671.02	N: 679394.19	Elevation (m): 777.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C)			^{14}C Dates: n/a

Presaca Ampoiului-Piatră Brații

ID: 190	Coordinates: E: 5106621.21	N: 679987.60	Elevation (m): 438.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Șard-(no name)

ID: 222	Coordinates: E: 5111023.19	N: 694790.80	Elevation (m): 298.19
Horizontal Extent (ha): 0.256			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Șard-Bilag 1

ID: 223	Coordinates: E: 5113422.83	N: 696554.83	Elevation (m): 280.44
Horizontal Extent (ha): 0.352			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Șard-Bilag 2

ID: 224	Coordinates: E: 5111093.44	N: 698031.49	Elevation (m): 262.56
Horizontal Extent (ha): 1.234			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II; Wietenberg (Type B, C)			^{14}C Dates: n/a

Șard-Casaluica

ID: 226	Coordinates: E: 5111153.71	N: 694914.27	Elevation (m): 269.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Sebeș-Podul Pripocului

ID: 228	Coordinates: E: 5091715.97	N: 701016.91	Elevation (m): 262.18
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg (Type A, B, C)			^{14}C Dates: n/a

Șibot-Gară

ID: 229	Coordinates: E: 5088744.00	N: 680869.00	Elevation (m): 219.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Sântimbru-La Tarmure/La Ieruga

ID: 230	Coordinates: E: 5111495.00	N: 703420.44	Elevation (m): 224.00
Horizontal Extent (ha): 2.256			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg (Type A, B)			^{14}C Dates: n/a

Sântimbru-Obreje/La Tabaci

ID: 231	Coordinates: E: 5111210.75	N: 703208.53	Elevation (m): 235.66
Horizontal Extent (ha): 2.563			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I, II; Wietenberg (Type C, D)			^{14}C Dates: n/a

Șpâlnaca-Fântâna lui Simon

ID: 232	Coordinates: E: 5136482.00	N: 723970.00	Elevation (m): 322.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Șpâlnaca-(no name)

ID: 233	Coordinates: E: 5135137.00	N: 724855.00	Elevation (m): 321.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Șpring-Cătun Carpen

ID: 288	Coordinates: E: 5093972.67	N: 710120.22	Elevation (m): 354.00
Horizontal Extent (ha): 6.189			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C); Gava; Iron Aage; Early Medieval			^{14}C Dates: n/a

Straja-Fântâna Bornii

ID: 234	Coordinates: E: 5103927.91	N: 707334.62	Elevation (m): 488.04
Horizontal Extent (ha): 0.196			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Straja-La Cruce

ID: 235	Coordinates: E: 5104802.32	N: 708385.16	Elevation (m): 473.20
Horizontal Extent (ha): 0.159			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Straja-Sub Măgură

ID: 237	Coordinates: E: 5104456.07	N: 708037.38	Elevation (m): 482.36
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Țelna-Gugu

ID: 247	Coordinates: E: 5117468.96	N: 688389.20	Elevation (m): 1045.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type C, D)			^{14}C Dates: n/a

Țelna-Măgură

ID: 248	Coordinates: E: 5114583.92	N: 694029.71	Elevation (m): 413.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I			^{14}C Dates: n/a

Uioara de Jos-Îtardeau/La Parloage

ID: 251	Coordinates: E: 5136036.72	N: 718980.48	Elevation (m): 383.81
Horizontal Extent (ha): 0.174			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg, general			^{14}C Dates: n/a

Uioara de Jos-La Grui/Gruiul lui Sip

ID: 252	Coordinates: E: 5136480.57	N: 719201.97	Elevation (m): 348.73
Horizontal Extent (ha): 0.490			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA III; Wietenberg (Type B, C)			^{14}C Dates: n/a

Uioara de Jos-Strada Vanațorilor

ID: 253	Coordinates: E: 5138985.65	N: 718097.53	Elevation (m): 283.90
Horizontal Extent (ha): 0.062			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Unirea-Dealul Camarii

ID: 254	Coordinates: E: 5141723.27	N: 715459.10	Elevation (m): 254.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C)			^{14}C Dates: n/a

Vălișoara-Peștera Bogsuta

ID: 255	Coordinates: E: 5139972.71	N: 697992.21	Elevation (m): 536.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg (Type B)			^{14}C Dates: n/a

Vălișoara-Pleasa Cornii

ID: 260	Coordinates: E: 5139521.32	N: 699128.83	Elevation (m): 730.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type A, B)			^{14}C Dates: n/a

Vălișoara-Pleasa Pesterii (Poiana Aiudului-Între Pietrâ)

ID: 261	Coordinates: E: 5139680.54	N: 698762.19	Elevation (m): 618.95
Horizontal Extent (ha): 0.061			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general; Wietenberg, general			^{14}C Dates: n/a

Vălișoara-Peștera Pucula

ID: 262	Coordinates: E: 5140025.41	N: 697943.20	Elevation (m): 545.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type B, C)			^{14}C Dates: n/a

Vama Seacă-Drumului cu Plopi

ID: 263	Coordinates: E: 5136148.00	N: 726469.00	Elevation (m): 287.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Vinerea-(no name)

ID: 264	Coordinates: E: 5084386.00	N: 683523.00	Elevation (m): 271.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA, general			^{14}C Dates: n/a

Vințu de Jos-Deasupră Satului

ID: 265	Coordinates: E: 5095123.47	N: 692916.03	Elevation (m): 234.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: Wietenberg (Type A, B, C)			^{14}C Dates: n/a

Vințu de Jos-Lunca Fermei

ID: 267	Coordinates: E: 5093642.68	N: 687259.72	Elevation (m): 204.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a

Cultural/Chronological affiliation: EBA III	^{14}C Dates: n/a

Vințu de Jos-Viile Lancranjenilor

ID: 268	Coordinates: E: 5096063.31	N: 695381.18	Elevation (m): 260.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Zlatna-Colțul lui Blaj

ID: 270	Coordinates: E: 5113656.24	N: 671817.97	Elevation (m): 849.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I			^{14}C Dates: n/a

Zlatna-Dumbrăvița

ID: 271	Coordinates: E: 5112586.54	N: 672434.94	Elevation (m): 823.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA I, II			^{14}C Dates: n/a

Zlatna-Măgură Dudașului

ID: 272	Coordinates: E: 5109189.26	N: 672649.31	Elevation (m): 612.00
Horizontal Extent (ha): n/a			Stratigraphy: n/a
Cultural/Chronological affiliation: EBA II			^{14}C Dates: n/a

Early Bronze Age Cemeteries in Southwest Transylvania

Ampoița-Colții Româneșii

ID: 292	Coordinates: E: 5112710.82	N: 685128.5541	Elevation (m): 841.04
Number of Tombs: 5		Average Tomb Diameter (m): n/a	

Ampoița-Dealul Doștiorului

ID: 293	Coordinates: E: 5109639.42	N: 688164.22	Elevation (m): 466.00
Number of Tombs: 4		Average Tomb Diameter (m): n/a	

Ampoița-La Bulz

ID: 294	Coordinates: E: 5114153.49	N: 684880.98	Elevation (m): 921.75
Number of Tombs: 5		Average Tomb Diameter (m): n/a	

Ampoița-(no name)

ID: 295	Coordinates: E: 5113028.17	N: 686409.08	Elevation (m): 1040.72
Number of Tombs: 3		Average Tomb Diameter (m): n/a	

Ampoița-Peret

ID: 296	Coordinates: E: 5110976.22	N: 691859.26	Elevation (m): 455.74
Number of Tombs: 9		Average Tomb Diameter (m): 10.78	

Ampoița-Vârful Marului

ID: 297	Coordinates: E: 5112505.54	N: 686892.65	Elevation (m): 990.71
Number of Tombs: 2		Average Tomb Diameter (m): n/a	

Ampoița-Vârful Vârtopulor

ID: 298	Coordinates: E: 5112992.34	N: 685520.30	Elevation (m): 936.77
Number of Tombs: 2		Average Tomb Diameter (m): n/a	

Bărăbanț-(no name)

ID: 299	Coordinates: E: 5110412.82	N: 700955.32	Elevation (m): 401.30
Number of Tombs: 2		Average Tomb Diameter (m): 20.00	

Capud-Măgura Capudului

ID: 300	Coordinates: E: 5119598.47	N: 712060.38	Elevation (m): 490.68
Number of Tombs: 2		Average Tomb Diameter (m): n/a	

Cetea-La Bai/La Pietri

ID: 301	Coordinates: E: 5124944.49	N: 696900.56	Elevation (m): 542.00
Number of Tombs: 5		Average Tomb Diameter (m):	

Cheile Aiudului-Dealul Velii

ID: 302	Coordinates: E: 5138592.67	N: 698555.68	Elevation (m): 628.66
Number of Tombs: 16		Average Tomb Diameter (m):14.33	

Craiva-Piatrâ Craivii 1

ID: 303	Coordinates: E: 5119988.39	N: 692420.83	Elevation (m): 803.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Craiva-Piatrâ Craivii 2

ID: 304	Coordinates: E: 5120643.77	N: 691219.00	Elevation (m): 926.61
Number of Tombs: 2		Average Tomb Diameter (m):5.00	

Cricău-(no name)

ID: 305	Coordinates: E: 5121371.90	N: 691666.62	Elevation (m): 737.86
Number of Tombs: 1		Average Tomb Diameter (m): 15.00	

Gârbova de Sus-(no name)

ID: 306	Coordinates: E: 5130221.33	N: 701661.30	Elevation (m): 486.09
Number of Tombs: 4		Average Tomb Diameter (m): 7.00	

Gârbova de Sus-Piatră Danii

ID: 307	Coordinates: E: 5130479.91	N: 701290.16	Elevation (m): 574.02
Number of Tombs: 1		Average Tomb Diameter (m): 7.00	

Geoagiu de Sus-Cuciu

ID: 308	Coordinates: E: 5127116.25	N: 699731.74	Elevation (m): 642.20
Number of Tombs: 11		Average Tomb Diameter (m): 8.50	

Geoagiu de Sus-Geoagiu-Cetea 1

ID: 309	Coordinates: E: 5125132.50	N: 698888.51	Elevation (m): 540.28
Number of Tombs: 1		Average Tomb Diameter (m): 6.00	

Geoagiu de Sus-Geoagiu-Cetea 2

ID: 310	Coordinates: E: 5125490.90	N: 697992.49	Elevation (m): 558.26
Number of Tombs: 1		Average Tomb Diameter (m): 9.00	

Geoagiu de Sus-(no name) 1

ID: 311	Coordinates: E: 5129841.70	N: 698876.01	Elevation (m): 690.00
Number of Tombs: 2		Average Tomb Diameter (m): 16.5	

Geoagiu de Sus-(no name) 2

ID: 312	Coordinates: E: 5126520.19	N: 697677.33	Elevation (m): 543.07
Number of Tombs: 1		Average Tomb Diameter (m): 14.00	

Geoagiu de Sus-(no name) 3

ID: 313	Coordinates: E: 5126007.18	N: 698444.13	Elevation (m): 519.09
Number of Tombs: 1		Average Tomb Diameter (m): 8.00	

Geomal-Măgura 1

ID: 314	Coordinates: E: 5127497.54	N: 700165.30	Elevation (m): 724.00
Number of Tombs: 3		Average Tomb Diameter (m): 7.67	

Geomal-Măgura 2

ID: 315	Coordinates: E: 5127769.58	N: 699714.83	Elevation (m): 716.00
Number of Tombs: 3		Average Tomb Diameter (m): 6.33	

Geomal-Măgura 3

ID: 316	Coordinates: E: 5126453.04	N: 700858.94	Elevation (m): 492.00
Number of Tombs: 2		Average Tomb Diameter (m): n/a	

Hăpria-Capu Dosului

ID: 317	Coordinates: E: 5107598.91	N: 706332.93	Elevation (m): 429.00
Number of Tombs: 2		Average Tomb Diameter (m):	

Hâpria-(no name)

ID: 318	Coordinates: E: 5106839.52	N: 707750.56	Elevation (m): 427.00
Number of Tombs: 4		Average Tomb Diameter (m): 12.00	

Izvoarele-Gruiul Roșu

ID: 319	Coordinates: E: 5142559.75	N: 695856.34	Elevation (m): 669.11
Number of Tombs: 5		Average Tomb Diameter (m): n/a	

Izvoarele-La Cruce

ID: 320	Coordinates: E: 5140869.59	N: 694278.70	Elevation (m): 828.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Izvoarele-La Furci

ID: 321	Coordinates: E: 5141796.65	N: 695777.29	Elevation (m): 612.22
Number of Tombs: 7		Average Tomb Diameter (m): n/a	

Livezile-Baia

ID: 322	Coordinates: E: 5135909.57	N: 700717.60	Elevation (m): 663.89
Number of Tombs: 6		Average Tomb Diameter (m): n/a	

Livezile-Cărpeniș

ID: 323	Coordinates: E: 5134830.58	N: 700416.72	Elevation (m): 593.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Livezile-Dealul Sârbului

ID: 324	Coordinates: E: 5137214.40	N: 701662.95	Elevation (m): 572.81
Number of Tombs: 3		Average Tomb Diameter (m): 10.67	

Livezile-Obirsie/Obursi

ID: 325	Coordinates: E: 5135659.50	N: 699183.07	Elevation (m): 753.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Meteș-La Meteșel

ID: 326	Coordinates: E: 5108791.17	N: 687063.71	Elevation (m): 515.00
Number of Tombs: 9		Average Tomb Diameter (m): n/a	

Meteș-Pleașa Înaltă

ID: 327	Coordinates: E: 5110575.89	N: 682335.72	Elevation (m): 976.93
Number of Tombs: 1		Average Tomb Diameter (m): 16.00	

Meteș-Toaca

ID: 328	Coordinates: E: 5107810.78	N: 684872.42	Elevation (m): 446.00
Number of Tombs: 9		Average Tomb Diameter (m): n/a	

Meteș-Zapode

ID: 329	Coordinates: E: 5111122.02	N: 683916.04	Elevation (m): 931.74
Number of Tombs: 3		Average Tomb Diameter (m): 13.00	

Oiejdea-Bilag 1

ID: 330	Coordinates: E: 5113566.89	N: 702970.77	Elevation (m): 380.59
Number of Tombs: 2		Average Tomb Diameter (m): 14.00	

Poiana Aiudului-Tacul Mare

ID: 331	Coordinates: E: 5137661.61	N: 698465.49	Elevation (m): 603.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Ponor-(no name)

ID: 332	Coordinates: E: 5131962.86	N: 686314.11	Elevation (m): 923.32
Number of Tombs: 4		Average Tomb Diameter (m): 7.00	

Rameț-Gugului

ID: 333	Coordinates: E: 5131300.81	N: 696492.97	Elevation (m): 814.01
Number of Tombs: 7		Average Tomb Diameter (m): 8.00	

Rameț-La Cruce

ID: 334	Coordinates: E: 5131855.16	N: 695899.14	Elevation (m): 858.63
Number of Tombs: 2		Average Tomb Diameter (m): 6.00	

Rameț-(no name) 1

ID: 335	Coordinates: E: 5132736.39	N: 692168.07	Elevation (m): 1029.00
Number of Tombs: 2		Average Tomb Diameter (m): 7.00	

Rameț-(no name) 2

ID: 336	Coordinates: E:	N:	Elevation (m): 945.00
Number of Tombs: 3		Average Tomb Diameter (m): 14.67	

Rameț-Dealul Vârfului

ID: 337	Coordinates: E: 5131713.40	N: 696491.62	Elevation (m): 861.28
Number of Tombs: 7		Average Tomb Diameter (m): 10.00	

Rameț-(no name) 3

ID: 338	Coordinates: E: 5131035.25	N: 697836.00	Elevation (m): 783.96
Number of Tombs: 3		Average Tomb Diameter (m): 6.33	

Rameț-(no name) 4

ID: 339	Coordinates: E: 5130366.80	N: 697963.07	Elevation (m): 777.22
Number of Tombs: 1		Average Tomb Diameter (m): 12.00	

Rameț-Ticera

ID: 340	Coordinates: E: 5131107.17	N: 697268.34	Elevation (m): 776.29
Number of Tombs: 5		Average Tomb Diameter (m): 5.40	

Roșia Montană-Sesul Monului

ID: 341	Coordinates: E: 5130956.17	N: 664201.46	Elevation (m): 1056.94
Number of Tombs: 4		Average Tomb Diameter (m): n/a	

Șard-Bilag

ID: 342	Coordinates: E: 5113235.27	N: 696532.63	Elevation (m): 317.11
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Sebeș-(no name)

ID: 343	Coordinates: E: 5090202.35	N: 701797.04	Elevation (m): 275.75
Number of Tombs: 1		Average Tomb Diameter (m): 23.00	

Straja-Măgura

ID: 344	Coordinates: E: 5104362.26	N: 707548.78	Elevation (m): 554.48
Number of Tombs: 1		Average Tomb Diameter (m): 12.00	

Stremț-(no name)

ID: 345	Coordinates: E: 5122643.75	N: 701237.68	Elevation (m): 435.63
Number of Tombs: 1		Average Tomb Diameter (m): 5.00	

Țelna-Dealul Chicerii

ID: 346	Coordinates: E: 5116173.75	N: 693078.10	Elevation (m): 531.00
Number of Tombs: 2		Average Tomb Diameter (m): n/a	

Țelna-Rupturii

ID: 347	Coordinates: E: 5117057.13	N: 692628.38	Elevation (m): 538.00
Number of Tombs: 9		Average Tomb Diameter (m): n/a	

Țelna-Sălășele

ID: 348	Coordinates: E: 5116278.74	N: 688533.54	Elevation (m): 836.00
Number of Tombs: 4		Average Tomb Diameter (m): n/a	

Vălișoara-Gruiu Darului

ID: 349	Coordinates: E: 5140036.72	N: 698664.18	Elevation (m): 596.52
Number of Tombs: 3		Average Tomb Diameter (m): n/a	

Vălișoara-La Strunga

ID: 350	Coordinates: E: 5139798.49	N: 698942.12	Elevation (m): 688.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Vințu de Jos-Viile Lacranjenilor

ID: 351	Coordinates: E: 5096095.43	N: 695244.70	Elevation (m): 268.00
Number of Tombs: 1		Average Tomb Diameter (m): n/a	

Wietenberg Mortuary Sites in Southwest Transylvania

Ampoița-Dealul Doștiorului

ID: 293	Coordinates: E: 5109639.42	N: 688164.22	Elevation (m): 907.00
Site Type: Reused EBA Tomb		Number of Burials: 1	

Cetea-La Bai/La Pietri

ID: 301	Coordinates: E: 5124944.49	N: 696900.56	Elevation (m): 546.00
Site Type: Reused EBA Tomb		Number of Burials: 1	

Cheile Aiudului-Dealul Velii

ID: 302	Coordinates: E: 5138592.67	N: 698555.68	Elevation (m): 628.66
Site Type: Reused EBA Tomb		Number of Burials: 1	

Micești-Cigaș

ID: 161	Coordinates: E: 5107308.69	N: 698309.83	Elevation (m): 248.47
Site Type: Settlement		Number of Burials: 2	

Obreja-Cânepi

ID: 170	Coordinates: E: 5116703.04	N: 714657.54	Elevation (m): 228.00
Site Type: Settlement		Number of Burials: 1	

Oiejdea-Bilag 1

ID: 280	Coordinates: E: 5113537.13	N: 700473.50	Elevation (m): 262.74
Site Type: Cemetery		Number of Burials: 3	

Sebeș-Între Răstoace

ID: 273	Coordinates: E: 5093806.08	N: 700900.22	Elevation (m): 237.00
Site Type: Cemetery		Number of Burials: 61	

Sibișeni-Deaspura Satului

ID: 266	Coordinates: E: 5094862.17	N: 693066.81	Elevation (m): 234.00
Site Type: Cemetery		Number of Burials: 43	

Uioara de Jos-Îtardeau/La Parolage

ID: 251	Coordinates: E: 5136036.72	N: 718980.48	Elevation (m): 383.81
Site Type: Settlement		Number of Burials: 1	

Appendix B – Radiocarbon Dates and Site-Specific Bayesian Models

A total of 49 samples were analyzed during 2012-2014. Of these, 42 samples produced accurate dates from the Bronze Age. Of the remaining dates, 1 was from a Coțofeni (Copper Age) deposit, 4 dates were not in appropriate stratigraphic context (likely due to bioturbation), and 2 additional dates that appear to have been contaminated as a result of field collection or laboratory preparation procedures. All Bayesian modeling of radiocarbon dates was conducted using OxCal v.4.2.4 (Bronk Ramsey 2013) and the IntCal13 atmospheric curve (Reimer et al. 2013). Models were evaluated using agreement indices. Agreement indices quantitatively evaluate how well the prior model agrees with the observations (dates). OxCal produces multiple agreement indices, including individual agreement indices (A) for each sample in order to identify which samples agree or do not agree with the model, a model agreement index (A_{model}) that is used to evaluate whether the model as a whole is likely given the data available, and an overall individual agreement index ($A_{overall}$) which is similar to the model agreement. The established threshold for evaluating the validity of a model is if its agreement value is above 60% (e.g., A_{model} >60.0). For each model, I present both the model and overall agreement index, and discuss individual agreement indices when appropriate. Here the samples and their absolute dates from settlements, cemeteries, and the other problematic and non-Bronze Age dates are described (dates presented by archaeological site in alphabetical order rather than in chronological order).

Ampoița-Dealul Doștiorului

One sample was run from an Early Bronze Age cemetery at Ampoița-*Dealul Doștiorului*. A fragment of long bone was selected and processed at the National Ocean Sciences Accelerator Mass Spectrometry Facility (NOSAMS). The cemetery was excavated by Horia Ciugudean in 1987-1990. The cemetery at *Ampoița-Dealul Doștiorului* was made up of five tombs, two of which were excavated. The sample comes from Burial 3 in Tomb 1; one of 4 burials (a total of 6 individuals) identified in Tomb 1. Burial 3 included two individuals; one primary inhumation and secondary bones, likely from an individual who had died previously, which was interred with the primary inhumation. The sample from the primary inhumation in Burial 3 produced a date of 3850 ±35 (OS-100961) (Table B.1; Figure B.1).

Table B.1 – Modelled radiocarbon date from Ampoița-*Dealul Doștiorului*.

	Modeled date – 1-sigma(68%)	Modeled date – 2-sigma(95%)
Burial 3 – EBA	2435-2210 cal. BC	2459-2206 cal. BC

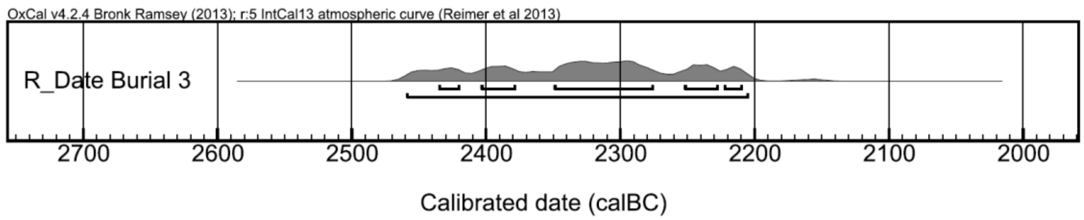


Figure B.1 - Ampoița-*Dealul Doștiorului* calibrated date.

The calibrated date confirms the tomb is from the EBA. Copper Age (Coțofeni Culture) ceramics were also found in the mantle of the tomb, but likely come from settlement occupation debris upon which the EBA cemetery was placed. This pattern of EBA cemeteries placed on top of Coțofeni settlements is widespread (see Ciugudean 1996, 1997a).

Geoagiu de Sus-Fântâna Mare

Five samples were run from Geoagiu de Sus-*Fântâna Mare*; all from Bronze Age deposits. All samples came from a single 1x1m excavation unit (Unit 3) on unidentified wood charcoal through NOSAMS. Within Unit 3 there were 6 stratigraphic levels (Figure B.2). Level 1 (plowzone) was undated. Level 6 is the occupation level associated with EBA Type II ceramics and produced a date of 3970 ±80 BP (OS-100919). Level 5 is an occupation level with Wietenberg Type A ceramics and produced a date of 3610 ±25 BP (OS-100530). Levels 4, 3, and 2 are all levels with Wietenberg Type C ceramics and produced dates of 3100 ±25 BP (OS-100529), 3070 ±25 BP (OS-100528), and 3130 ±20 BP (OS-100527) respectively.

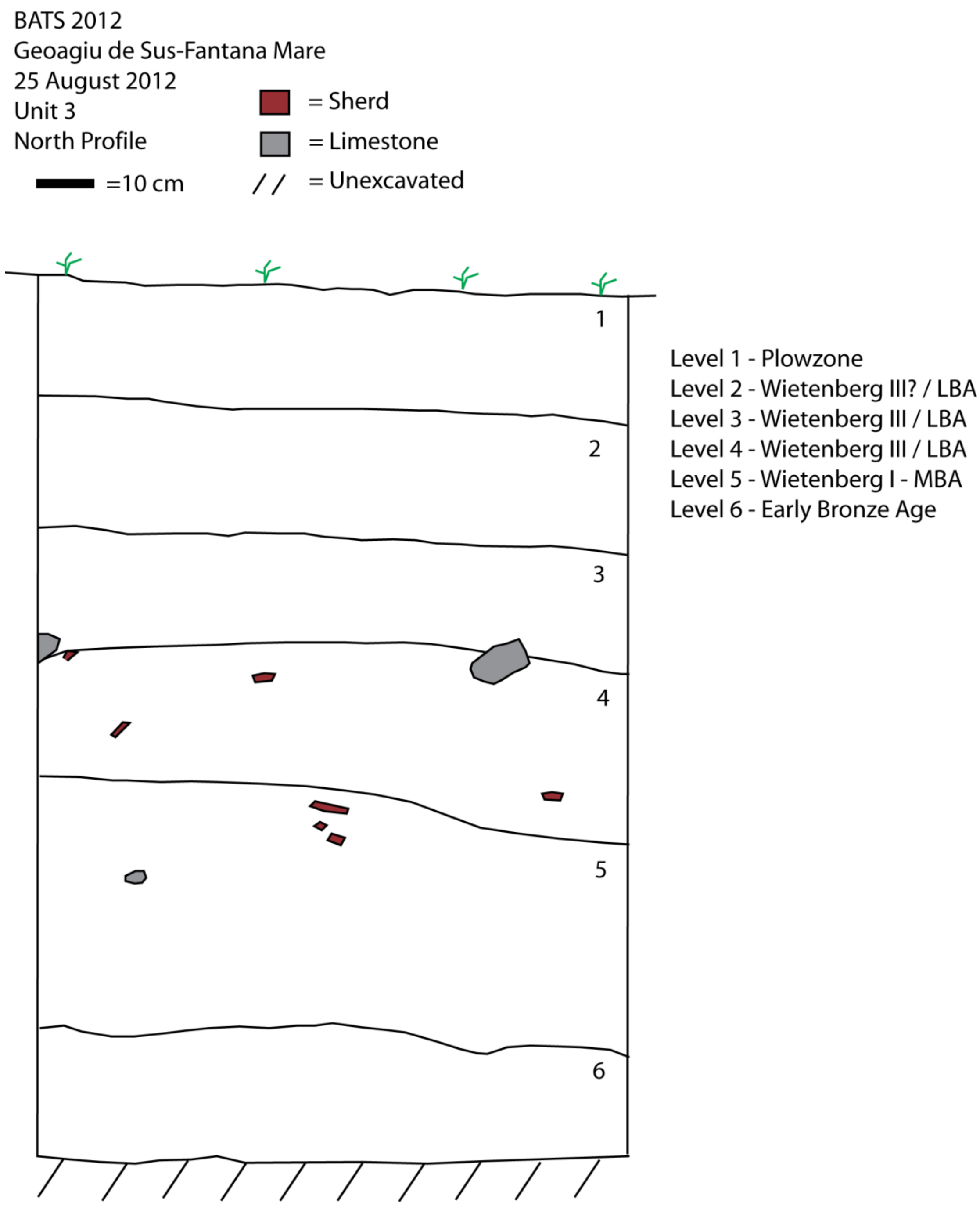


Figure B.2 – Geoagiu de Sus-Fântâna Mare Unit 3 north profile.

The dates were first modeled using a stratigraphic sequence model (Model 1), based on the order of stratigraphic deposition (Figure B.3; Table B.2). Model 1 is supported by the samples (A_{model}=65.0; $A_{overall}$=65.8), however there is poor agreement with OS-100527 (A=41.2), which is older than two samples located below it in the stratigraphic profile. Model 2 was developed to allow the possibility that bioturbation had caused the samples from Levels 2, 3, and 4 to be moved out of order. Model 2 has three phases, but stratigraphic information is not included within each phase (Figure B.4). Model 2 is also feasible based on the samples, with a much higher agreement index than Model 1 (A_{model}=96.5; $A_{overall}$=96.6).

Table B.2 – Modelled radiocarbon dates from Geoagiu de Sus-*Fântâna Mare*.

	Model 1 (A_{model}=65.0)*	Model 2 (A_{model}=96.5)
Level 6 – EBA II	2561-2293 cal. BC	2557-2293 cal. BC
Level 5 – Wietenberg Type A	2019-1935 cal. BC	2019-1935 cal. BC
Level 4 – Wietenberg Type C	1420-1381 cal. BC	1415-1308 cal. BC
Level 3 – Wietenberg Type C	1388-1334 cal. BC	1394-1298 cal. BC
Level 2 – Wietenberg Type C	1340-1315 cal. BC	1433-1395 cal. BC

*=Modeled dates based on 1-sigma (68%).

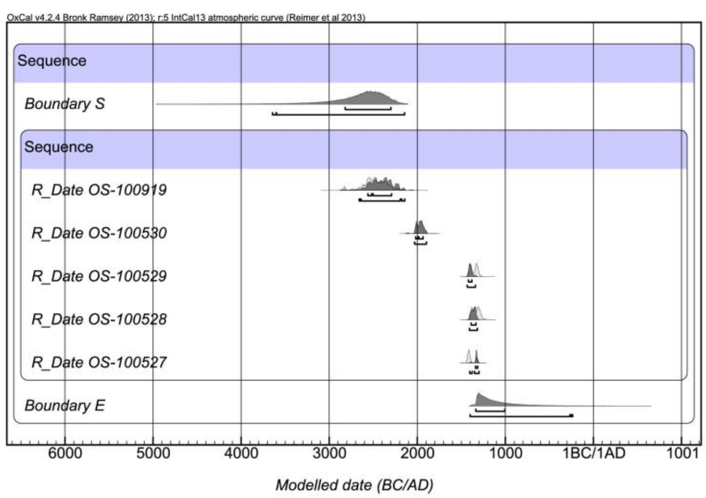


Figure B.3 – Geoagiu de Sus-Fântâna Mare chronological Model 1.

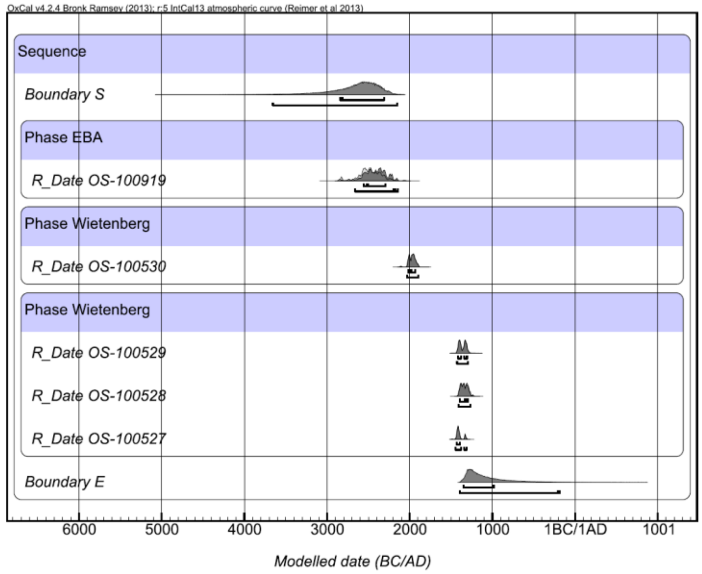


Figure B.4 – Geoagiu de Sus-Fântâna Mare chronological Model 2.

Both models agree with the first two phases of occupation: there is an Early Bronze Age occupation sometime between 2560-2290 cal. BC, and there is an early Wietenberg occupation between 2020-1935 cal. BC. There are minor differences in the overall occupation duration associated with the Wietenberg Type C ceramics. Model 1 suggests the site was occupied between 1420-1315 cal. BC. Model 2 suggests the site was occupied between 1435-1300 cal. BC. Overall, the two models are in reasonable agreement about the occupation, though Model 2 suggests the site occupation likely lasted 130 years, while Model 1 suggests the site only lasted just over 100 years. Given that there was limited evidence of significant bioturbation recorded in the field (and no documented evidence of vertical movement of ceramics), I argue that the occupation was likely more in line with Model 1; it took approximately 100 years for the 60cm of cultural deposits recorded in Unit 3.

Geoagiu de Sus-Viile Satului

Three samples from the bell-shaped pit at Geoagiu de Sus-*Viile Satului* were run; all associated with Bronze Age fill deposits. All samples came from Unit 3, were wood charcoal, and were processed at NOSAMS. Unit 3 contained five levels of site stratigraphy (Figure B.5). Level 1 was plowzone. Level 2 was the Wietenberg occupation level, and where the bell-shaped pit in the northeast corner of the unit originated. Level 3 was a level of culturally sterile colluvium that washed down from the slope to the north. Level 4 was an unknown cultural level that had some minimal flecks of charcoal and one flaked stone tool. The absence of ceramics, the presence of the lithic tool, and the pre-Bronze Age colluvium level suggests that Level 4 pre-dates early Neolithic occupation within Transylvania. No samples were run from Level 4. Level 5 was culturally sterile subsoil (formed in multiple alternating bands of clay-sand sediment and gravel). The pit had four distinct stratigraphic levels. The upper level (Level 6) above the constriction for the lower bell-shaped part of the pit was a grey-brown deposit and produced a date of 3370 ±45 BP (OS-107666). The main stratigraphic unit within the bell of the pit (Level 7) was thermally altered orange-brown sediment that produced a date of 3470 ±25 BP (OS-107554). Below was a grey-brown fill level (Level 8) that was likely an early post-use fill prior to the pit being burned and closed. No samples were run from Level 8. The lowest stratigraphic level within the pit was a mound of highly burnt orange-brown sediment with a high quantity of charcoal and burnt seeds (barley). This level produced a date of 3260 ±25 BP (OS-107555).

The dates were first modeled using a stratigraphic sequence model (Model 1), based on the order of stratigraphic deposition (Figure B.6; Table B.3). This model had poor agreement (A_{model}=0.1; $A_{overall}$=0.6), primarily because the date from the base of the pit post-dates the upper fill levels, and the middle fill deposit produced a date that pre-dated both other samples. The pit was highly bioturbated (likely by rodents) that may have contributed to the dates being out of stratigraphic order. Model 2 was developed to allow the possibility that bioturbation had caused the samples from Levels 5, 6, and 7 to be moved out of order. Model 2 had one phase for all three dates and had a good agreement index value (A_{model}=95.4; $A_{overall}$=95.6) (Figure B.7).

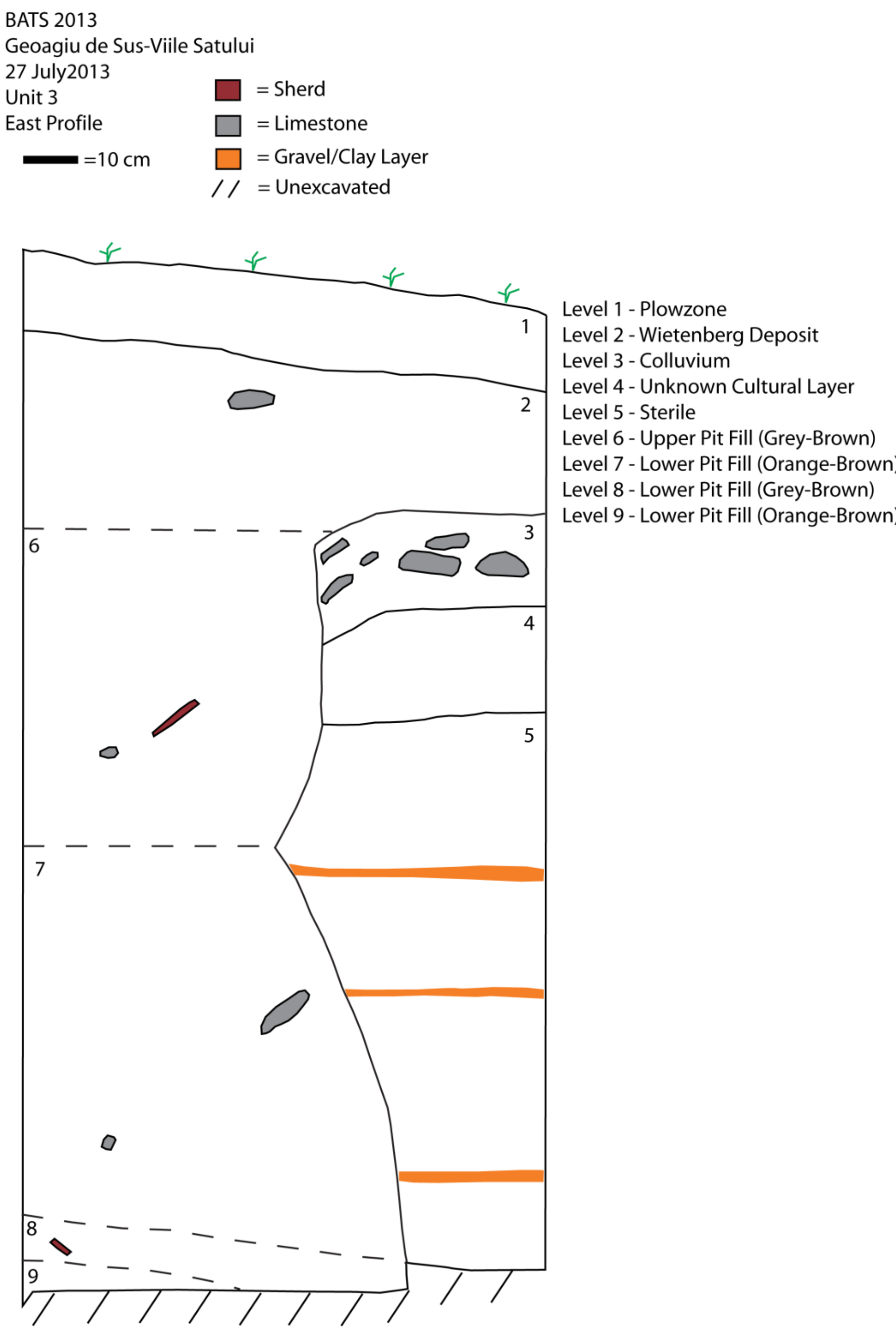


Figure B.5 – Geoagiu de Sus-Viile Satului Unit 3 east profile.

Table B.3 - Modelled radiocarbon dates from Geoagiu de Sus-*Viile Satului*.

	Model 1 (A_{model}=0.1)*	Model 2 (A_{model}=95.4)
Level 7 – Wietenberg Type C/D	1734-1654 cal. BC	1611-1505 cal. BC
Level 6 – Wietenberg Type C/D	1721-1644 cal. BC	1860-1696 cal. BC
Level 5 – Wietenberg Type C/D	1691-1631 cal. BC	1736-1617 cal. BC

*=Modeled dates based on 1-sigma (68%).

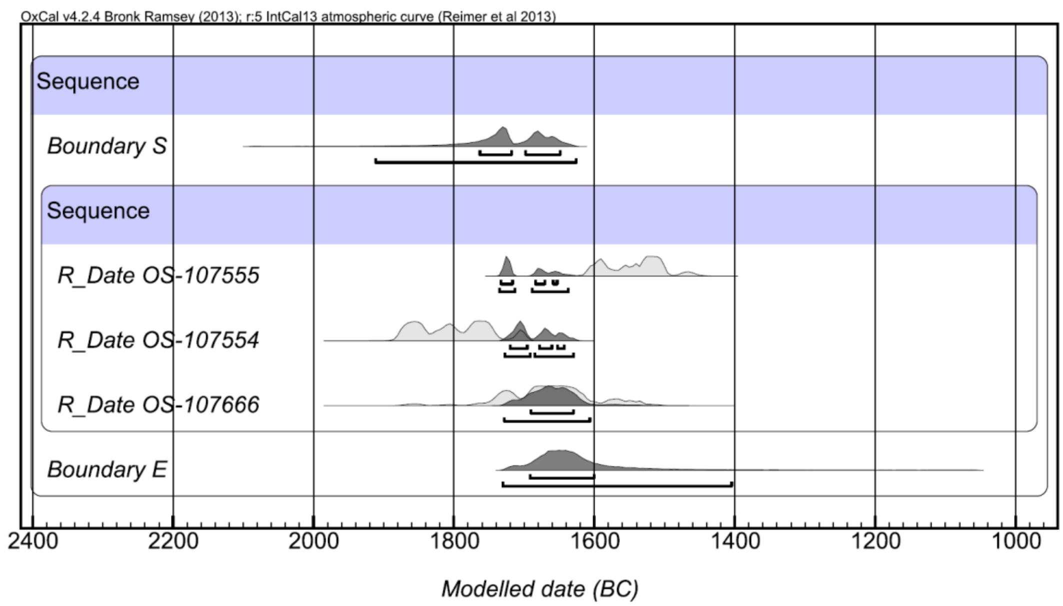


Figure B.6 - Geoagiu de Sus-Viile Satului chronological Model 1.

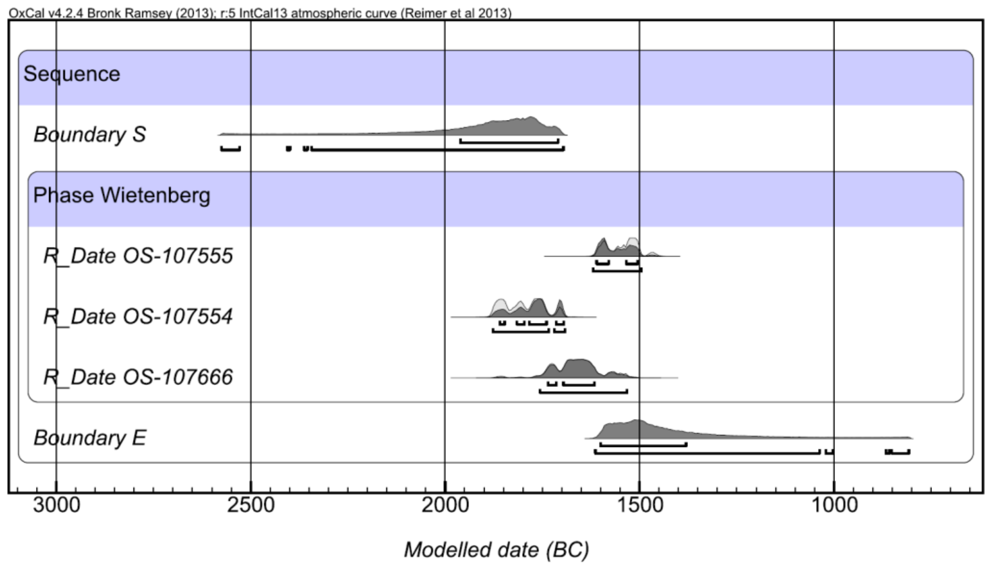


Figure B.7 - Geoagiu de Sus-Viile Satului chronological Model 2.

There are several ways to interpret the results from Model 2. First, if we believe the site was towards the longer end of the spectrum, then we can suggest that the site was occupied within 1860-1505 cal. BC. However, it is likely that the site (and the occupation levels from which the pit fill originated) was significantly shorter; primarily because the Wietenberg occupation level is approximately 20-30cm deep. As a second alternative interpretation, we can focus on the modeled start and end dates, which suggest the site occupation began by approximately 1710 cal. BC and ended by approximately 1505 cal. BC, although it could have ended as early as 1601 cal. BC. In this interpretation, the site was occupied over a range of between 100 and 200 years, approximately between 1710-1505 cal. BC. A third alternative interpretation focuses on the most likely modes of the posterior density estimate on the modeled dates and places the site occupation between approximately 1775-1575 cal. BC. Based on the dates currently run, it is not possible to definitively identify the date of the construction or sequence of filling of the pit. More samples, and a wider sampling of other areas of the site, can provide significant refinements to this current model.

Mediaș-Valea Viilor

One sample of human bone was analyzed from a burial at the Noua cemetery at Mediaș. The burial was previously excavated and curated at the Brukenthal Museum in Sibiu, Romania. The individual is an adult male. A long-bone fragment was submitted to NOSAMS, with collagen extraction conducted by Noreen Tuross. The burial is associated with a highly diagnostic Noua vessel currently on display in the museum's exhibit hall. This burial produced a date of 3060 ±25 (OS-108807) (Table B.4; Figure B.8).

Table B.4 - Modelled radiocarbon date from Mediaș-*Valea Viilor*.

	Modeled date – 1-sigma(68%)	Modeled date – 2-sigma(95%)
Mediaș Burial	1386-1281 cal. BC	1407-1236 cal. BC

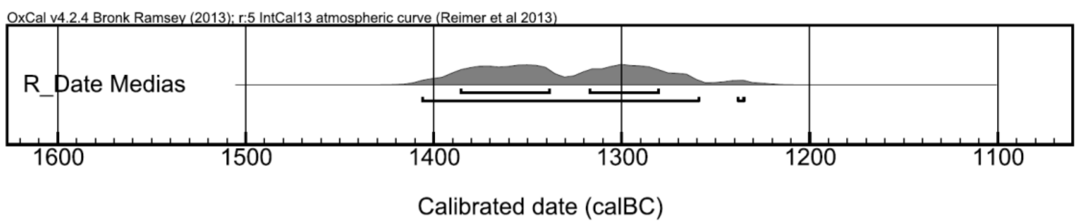


Figure B.8 – Mediaș-*Valea Viilor* calibrated date.

This date supports other chronological evidence (from Eurasia) and material evidence (from Transylvania) that places the movement of Noua cultural elements into Transylvania in the 15th-12th centuries BC. This also means that communities using Noua ceramics were living in southwest Transylvania contemporaneously with some Wietenberg communities; at least for a period of time.

Meteș-La Meteșel

Two samples of human bone were analyzed from a disarticulated comingled burial from Tomb 1 in the Early Bronze Age cemetery of Meteș-*La Meteșel*. The cemetery contained 10 total tombs, 8 of which were intact, and one of which was excavated by Horia Ciugudean in 1994. The tomb contained 7 discrete burials, with a minimum of 10 individuals. Three individuals – an adult male, an adult female, and a sub-adult – were buried in the center of the tomb (M.7), interpreted by Ciugudean as the primary (earliest) burials within the mound. Portions of long-bones from the adult male and adult female in M.7 were submitted to NOSAMS, with collagen extraction conducted by Noreen Tuross. The adult female was dated to 4400 ±30 BP (OS-108309), while the adult male was dated to 4280 ±25 (OS-108310). An additional radiocarbon date was previously published by Claudia Gerling and Horia Ciugudean (2013) as part of a study of stable isotopes in Transylvanian cemeteries. The sample from M.3, which is on the western margins of the tomb, dated to 3660 ±50 (Poz-42714). Because the deposition sequence of individual burials is unknown (no priors), the dates were modeled as a single phase. This model has high agreement (A_{model}=99.4) (Table B.5; Figure B.9).

Table B.5 - Modelled radiocarbon dates from Meteș-*La Meteșel*.

	Modeled date – 1 sigma (68%) (A_{model}=99.4)*	Modeled date – 2 sigma (95%) (A_{model}=99.4)
M.7 – Adult Female	3083-2926 cal. BC	3095-2918 cal. BC
M.7 – Adult Male	2908-2889 cal. BC	2918-2881 cal. BC
M.3	2137-1976 cal. BC	2200-1920 cal. BC

*=Modeled dates based on 1-sigma (68%).

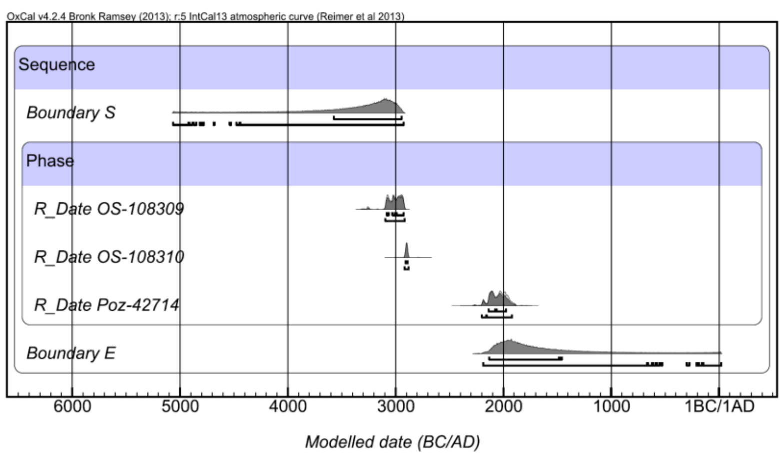


Figure B.9 - Meteș-*La Meteșel* chronological model.

The individuals that were buried in M.7 did not die at the same time, and there is a significant gap in time between when the two individuals in M.7 died and when the individual in M.3 died. The adult female from M.7 died prior to 2918 cal. BC, while the male from M.7 died within a brief 20-40 year window after 2918 cal. BC. The individual in M.3 died more than 700 years after the individuals in M.7. The model likely supports the excavator's judgement that M.7 represented the earliest burial in the tomb, though it is unclear exactly when the individuals were buried (as the bone collagen dates their death, rather than burial). There are multiple scenarios that would be supported by the model. It remains unclear if they were buried at the time of their death, if their remains were curated and eventually deposited at a much later point in time, or if they were initially buried somewhere else and only later reinterred in this tomb. The bones were disarticulated, so it is likely that they were not buried close to the time of death, though at least the disarticulation of the adult female may have been a result of later opening and interring other individuals. The remaining alternative explanations for the early date of the burials in M.7 cannot be resolved without a more detailed osteological analysis of M.7 and dating the remaining burials in the tomb. The burial in M.3 is currently the latest date associated with Early Bronze Age tomb use. Based on the model, it is likely that M.3 was placed in the tomb long after its initial construction, and potentially marked an episode of tomb reuse after a long hiatus in mortuary activity at the site.

Micești-Cigaș

Two samples of human bone were analyzed from within the settlement at Micești-*Cigaș*. The samples came from two different pits in which humans were interred after their primary use (likely as storage facilities) was completed. The two dates came from Complex 7/2009 and Complex 11/2012 and were excavated by the Muzeul Național al Unirii-Alba Iulia. Samples were selected during the autumn of 2013; a long bone fragment from C.11/2012 and a rib fragment from C.7/2009. Samples were submitted to NOSAMS, with collagen extraction conducted by Noreen Tuross. Both samples came from pits in association with Wietenberg Type D ceramics, though the site also has Wietenberg Type C ceramics. C.7/2009 produced a date of 3460 ±25 BP (OS-108311) and C.11/2012 produced a date of 3390 ±25 BP (OS-108811) (Figure B.10; Table B.6). There is no known stratigraphic relationship between the samples.

Table B.6 - Modelled radiocarbon dates from Micești-*Cigaș*.

	Modeled date – 1-sigma (68%)	Modeled date – 2-sigma (95%)
Complex 7/2009 – Wietenberg Type D	1872-1700 cal. BC	1880-1693 cal. BC
Complex 11/2012 – Wietenberg Type D	1736-1645 cal. BC	1745-1627 cal. BC

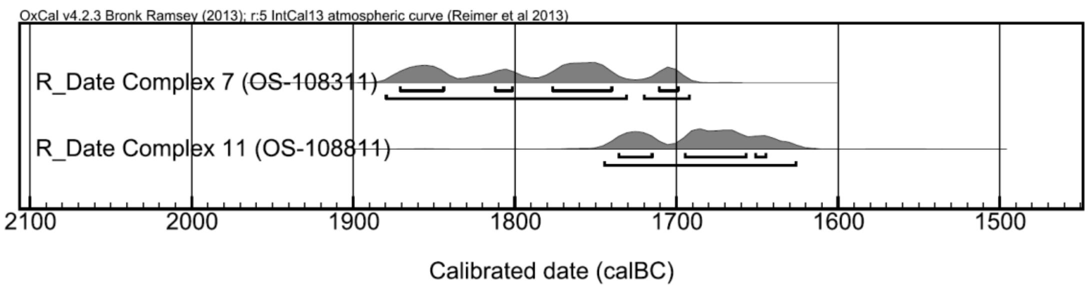


Figure B.10 - Micești-*Cigaș* chronological model.

The calibrated dates suggest the site was occupied and burials were placed in the pits between 1875-1630; although if the occupation was short it may have occurred between 1775-1650. There is limited overlap in the dates of death of the two individuals buried within the pits, suggesting that burial within the settlement was an ongoing tradition rather than a single event (such as a closing ceremony).

Pețelca-Cascadă

A total of 8 samples were run from Bronze Age deposits at Pețelca-*Cascadă*. Samples came from two distinct locations at the site (Unit 1 and Unit 2). Unit 1 samples were associated with Wietenberg Type B ceramics, while Unit 2 samples were associated with Wietenberg Type C ceramics. All wood charcoal samples were processed at NOSAMS, while the animal bone samples were processed at the University of Georgia AMS Laboratory. Unit 1 contained nine levels of stratigraphy. Level 1 was plowzone/topsoil and Level 9 was sterile subsoil. Levels 2, 3, and 4 are distinct layers of post-Wietenberg occupation, all contain Roman and post-Roman artifacts (as well as a few Wietenberg and Gava ceramics), and were not dated using radiocarbon dating techniques. Level 8 is the lowest occupation level. The level appears to be a mixed deposit of Cotofeni and some (potentially intrusive) Wietenberg Type B ceramics. A wood charcoal sample from this deposit dated the earlier Cotofeni occupation to 4560 ±20 BP (OS-113603). Levels 7, 6, and 5 contained Wietenberg Type B ceramics. A wood charcoal sample from Level 7 produced a date of 3530 ±20 BP (OS-113605). An initial wood charcoal sample from Level 6 produced a date of 3810 ±20 BP (OS-113604); however this date is problematic as it is earlier than the date that is from the stratigraphic layer below it. Another sample from Layer 6, run on animal bone, produced a date of 3570 ±25 BP (UGAMS-18994). A wood charcoal sample from Layer 5 produced a date of 3050 ±20 BP (OS-113602). Out of concern that this seemingly late date for Wietenberg Type B ceramics may have been associated with a later Late Bronze Age stratigraphic layer (e.g., Gava and Noua ceramics that have been found elsewhere on the site), we ran a second sample – this time on animal bone that is less likely to be disturbed through bioturbation – that produced a date of 3110 ±25 BP (UGAMS-18993). As both dates, run on different materials at different labs, produced similar dates, the dates can be confidently associated with the Wietenberg Type B ceramics.

Unit 2 was located on a river cut, exposing 6 layers of stratigraphy, including Level 1 (plowzone) and Level 6 (sterile subsoil). Level 2 post-dates Bronze Age occupation and contains Roman artifacts. Levels 4 and 3 contained Wietenberg Type C ceramics, while Level 5 had no diagnostic ceramics (though the non-diagnostics are consistent with the Wietenberg Type C ceramic assemblages). A wood charcoal sample from Level 5 produced a date of 3170 ±20 BP (OS-113647). A wood charcoal sample from Level 4 was sent to NOSAMS for processing, but the sample dissolved during pretreatment. A wood charcoal sample from Level 3, in direct association with a decorated wagon cart model and fragments of stone molds for metallurgy, produced a date of 3330 ±30 BP (OS-113646).

The two dates from Unit 2 are stratigraphically inverted (the younger date lower than the older date), which is likely due to significant bioturbation moving charcoal throughout the soil column. The two dates both likely date the occupation associated with the Wietenberg Type C ceramics. More dates, particularly on animal bone that is less susceptible to movement through bioturbation, are needed to elucidate the exact sequencing of samples within this column. Additionally, the lack of a date from Level 4 may also be producing a gap in the duration of occupation that we are otherwise unable to fill.

These dates can be modeled for both individual units as well as across the site. Starting with Unit 1, the early date from Level 6 causes a simple model based on dates in stratigraphic order to be invalid (A=0.0). Therefore, Model 1 discards this date (OS-113604) and focuses on the stratigraphic order of the other five dates (Table B.7; Figure B.11). Model 1 is supported by the samples (A_{model}=64.5; $A_{overall}$=73.3). Model 2 allows for the possibility that bioturbation has caused some samples to be out of stratigraphic order. Model 2 instead groups the dates within three distinct clustered occupation phases (Phase 1 = Level 8; Phase 2 = Levels 7 and 6; Phase 3 = Level 5) (Figure B.12). Model 2 is also feasible based on the samples, with a much higher agreement index than Model 1 (A_{model}=92.9; $A_{overall}$=92.9).

Table B.7 - Modelled radiocarbon dates from Peţelca-*Cascadă* Unit 1.

	Model 1 (A_{model}=64.5)*	Model 2 (A_{model}=92.9)
Level 8 – Cotofeni	3363-3137 cal. BC	3363-3137 cal. BC
Level 7 – Wietenberg Type B	1931-1883 cal. BC	1905-1781 cal. BC
Level 6 – Wietenberg Type B	1915-1784 cal. BC	1946-1890 cal. BC
Level 5 – Wietenberg Type B – animal bone	1426-1325 cal. BC	1422-1313 cal. BC
Level 5 – Wietenberg Type B – charcoal	1375-1266 cal. BC	1383-1273 cal. BC

*=Modeled dates based on 1-sigma (68%).

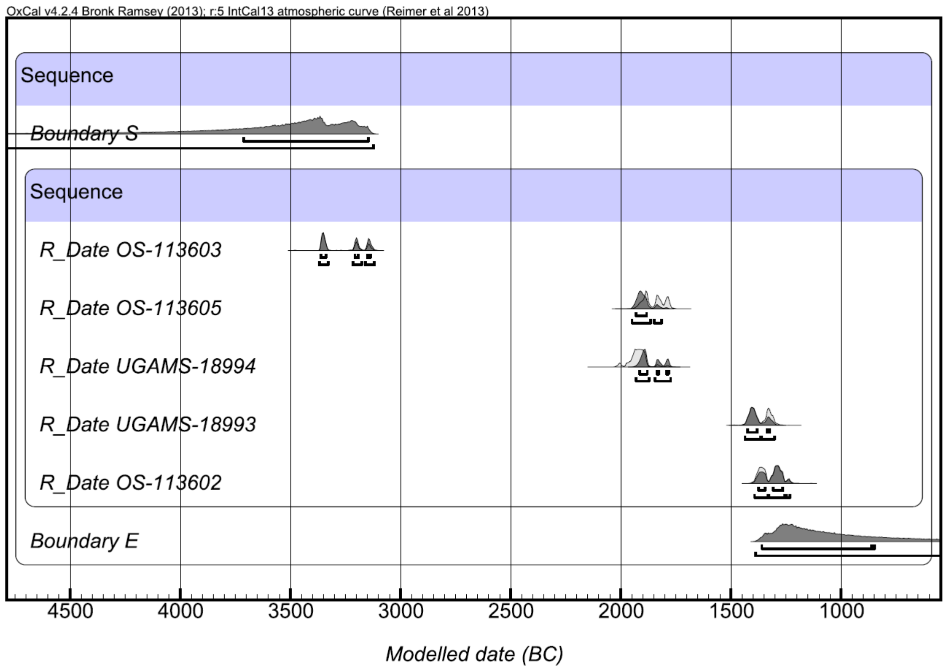


Figure B.11 - Peţelca-*Cascadă* Unit 1 chronological Model 1.

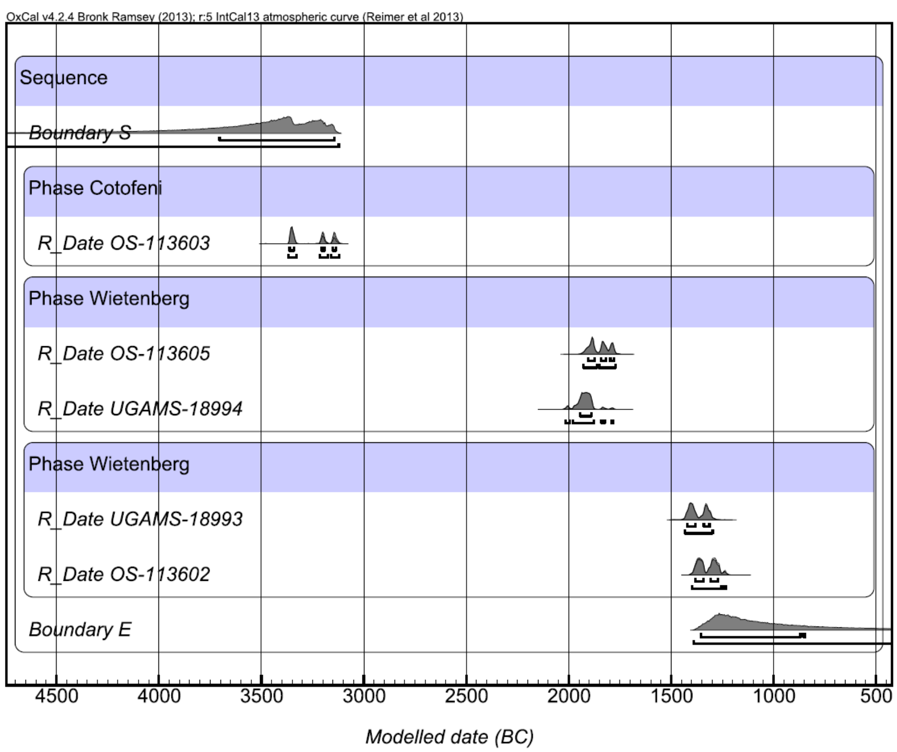


Figure B.12 - Peţelca-*Cascadă* Unit 1 chronological Model 2.

In Unit 2, a simple model based on dates in stratigraphic order is invalid due to dates having moved through bioturbation (A=0.0). Additionally, a lack of funds and appropriate samples limited the number of samples taken from this unit, which means there are undated deposits (e.g., Level 4). As such, a simple single phase model (Model 3) is presented here (Table B.8; Figure B.13). Model 3 is well supported by the samples (A_{model}=94.2; $A_{overall}$=94.0).

Table B.8 - Modelled radiocarbon dates from Pețelca-*Cascadă* Unit 2.

	Model 3 (A_{model}=94.2)*
Level 3 – Wietenberg Type C	1642-1531 cal. BC
Level 5 – Wietenberg Type C	1495-1423 cal. BC

*=Modeled dates based on 1-sigma (68%).

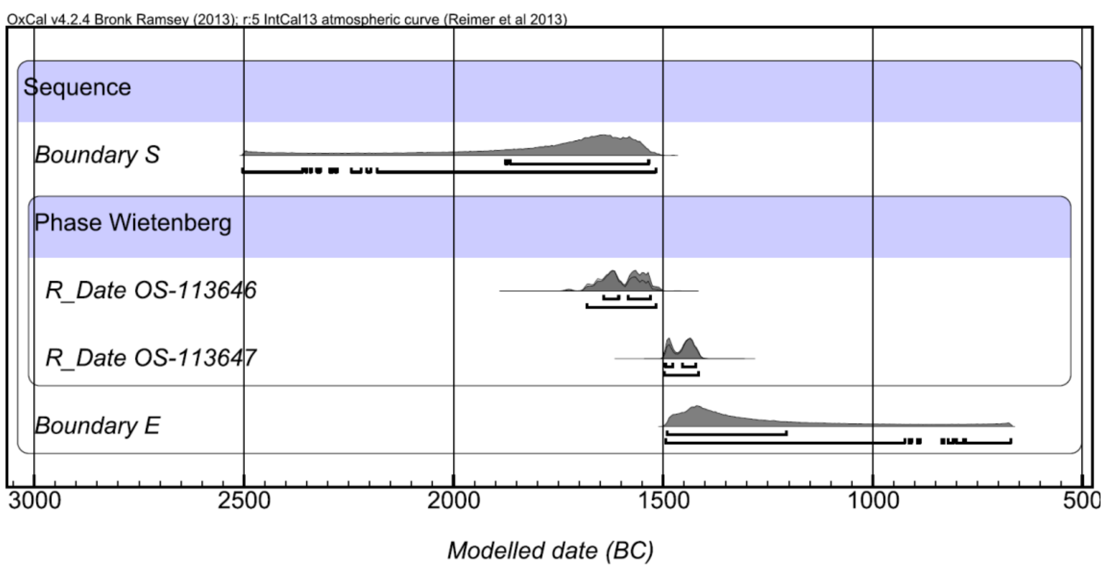


Figure B.13 - Pețelca-*Cascadă* Unit 2 chronological Model 3.

Because of the bioturbation that has affected the samples, particularly the samples run from charcoal, it is best to lump the dates together to provide an overall site-based model for occupation. Model 4 lumps all Wietenberg samples together and separate from the Coțofeni date (Table B.9; Figure B.14). The model has good agreement with the samples (A_{model}=91.6; $A_{overall}$=91.6).

Table B.9 - Modelled radiocarbon dates from Pețelca-*Cascadă*.

	Model 4 (A_{model}=91.6)*
Unit 1 - Level 8 – Coțofeni II	3362-3136 cal. BC
Unit 1 – Level 7 – Wietenberg Type B	1905-1781 cal. BC
Unit 1 – Level 6 – Wietenberg Type B	1946-1890 cal. BC
Unit 2 – Level 3 – Wietenberg Type C	1661-1546 cal. BC
Unit 2 – Level 5 – Wietenberg Type C	1492-1421 cal. BC
Unit 1 – Level 5 – Wietenberg Type B (animal bone)	1423-1313 cal. BC
Unit 1 – Level 5 – Wietenberg Type B (charcoal)	1385-1274 cal. BC

*=Modeled dates based on 1-sigma (68%).

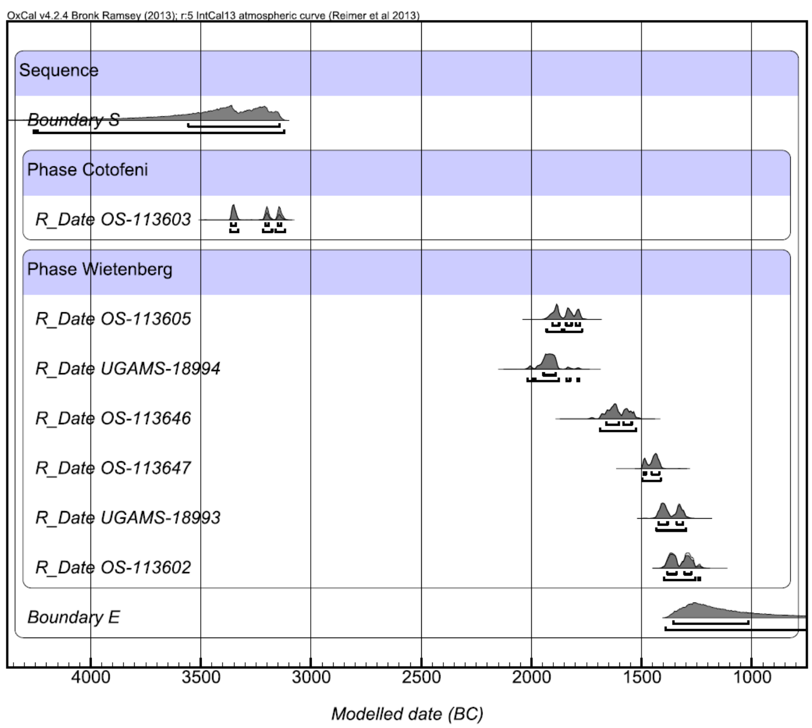


Figure B.14 - Pețelca-*Cascadă* Site chronological Model 4.

Based on the overall site model, there was a break between the Coțofeni and Wietenberg occupations at the site. It is possible that there was a disturbed EBA component at the site. An out of context wood charcoal sample from Level 6 in Unit 1 produced an EBA date of 3810 ±20 BP (OS-113604), and there are a handful of ceramics that may be EBA found at the site. The Wietenberg occupation appears to begin approximately 1930 cal. BC and ends by 1313 cal. BC. Within this period, there are two distinct periods of occupation (Period 1 – 1930-1781 cal. BC; Period 2 – 1661-1313), with a gap of approximately 120 years between the two phases of occupation. However, this gap is likely a statistical gap due to our inadequate sampling rather than a true occupational gap. It is interesting that the dates from the two parts of the site do not overlap. This fits with traditional interpretations of site occupations moving horizontally along terrace edges rather than building up vertically as in tell sites more common to the Carpathian Basin. The lack of overlap in dates from Wietenberg Type C and Type B ceramics also seems to fit the existing chronology, however the fact that Wietenberg Type B ceramics are found in deposits that both pre-date and post-date Wietenberg Type C ceramics means that the existing seriation-based ceramic chronology cannot be wholly correct. Given the large size of the site, and the limited samples taken, it is likely (but not assured) that the occupation gap will be filled with more fieldwork and radiocarbon samples. This site is the largest Wietenberg site currently known within Transylvania (both horizontally and vertically), and demands much more significant attention before a full site-based history can be completed.

Stremț-Fabrică de Alcool

A total of six samples were run from Stremț-*Fabrică de Alcool*. All samples were wood charcoal and were processed at NOSAMS. Samples came from two distinct locations at the site (Unit 2 and Unit 3). Unit 2 contained four levels of stratigraphy, including the plowzone (Level 1) and the sterile subsoil (Level 4). Level 2 was a Migration Period occupation, and no sample was run from within the level. Level 3 was primarily a pit associated with Wietenberg Type A ceramics, although two small sherds with very typical Wietenberg Type C ceramic decoration were found within the pit. Level 3 was highly bioturbated (and the Wietenberg Type C ceramics likely originated in a higher, post Level 3, layer that was destroyed by the Migration Period occupation (other Wietenberg Type C ceramics were found in the area around Unit 2 on the surface). A wood charcoal sample from Level 3 produced a date of 1520 ±25 BP (OS-107551), and is intrusive from the Migration Period occupation (likely due to the large amount of bioturbation in the pit). As a result, no date from Unit 2 directly dates the Bronze Age settlements.

Unit 3 contained nine levels of stratigraphy, including plowzone (Level 1) and sterile subsoil (Level 8). In addition to the Bronze Age occupation layers, there was an early Neolithic (Criș Culture) occupation (Level 7) that also contained a pit into sterile (Level 9) as well as a later Migration Period occupation (Level 2). Level 6 contained Wietenberg Type A ceramics, likely the same occupation as the layer and pit in Unit 2, which produced a date of 3560 ±35 BP (OS-107622). Levels 5 and 4 were associated with Wietenberg Type C ceramics. Two samples were taken from Level 5; one from within the burnt feature that produced a date of 3520 ±30 BP (OS-107621), and one that postdated the collapse of the burnt feature 3480 ±30 BP (OS-107620). Level 4 produced a date of 3560 ±25. Level 3 was associated with non-culturally diagnostic Late Bronze Age ceramics. A charcoal sample from Level 3 was run and produced a date of 34700 ±190, which is obviously contaminated. Level 3 remains undated, though may be associated with the Wietenberg or Noua ceramics found in the plowzone at the site.

The dates from Unit 3 can be modeled to provide a site occupation history (Table B.10). Model 1 is a stratigraphic sequence model that assumes that dates are in sequential order (Figure B.15). Model 1 is not fully supported (A_{model}=50.6; $A_{overall}$=60.9), primarily due to the date from Level 4 being earlier than expected (A=33.5). Model 2, on the assumption that charcoal sampled may have moved vertically through the soil column, lumps all dates together (Figure B.16). Model 2 has good agreement with the samples (A_{model}=101; $A_{overall}$=100.1).

Table B.10 - Modelled radiocarbon dates from Stremț-*Fabrica de Alcool*.

	Model 1 (A_{model}=50.6)*	Model 2 (A_{model}=101)
Level 6 – Wietenberg Type A	1937-1834 cal. BC	1936-1824 cal. BC
Level 5 Thermal Feature – Wietenberg Type C	1908-1825 cal. BC	1907-1816 cal. BC
Level 5 Post-Thermal Feature – Wietenberg Type C	1891-1817 cal. BC	1890-1812 cal. BC
Level 4 – Wietenberg Type C	1887-1779 cal. BC	1930-1831 cal. BC

*=Modeled dates based on 1-sigma (68%).

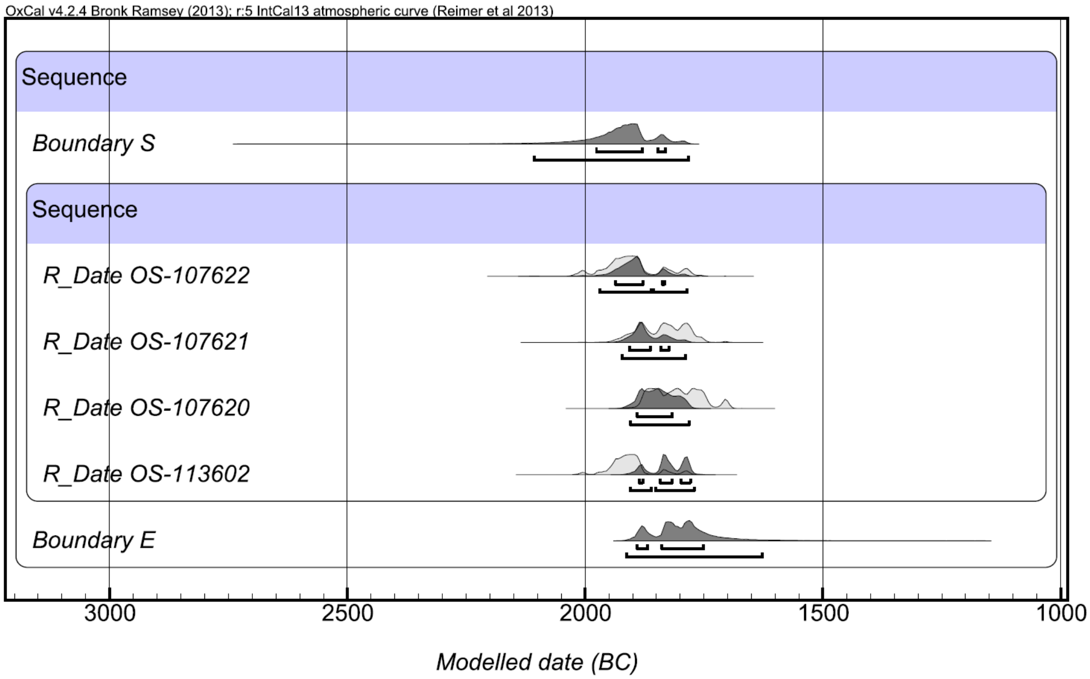


Figure B.15 - Stremț-Fabrica de Alcool chronological Model 1.

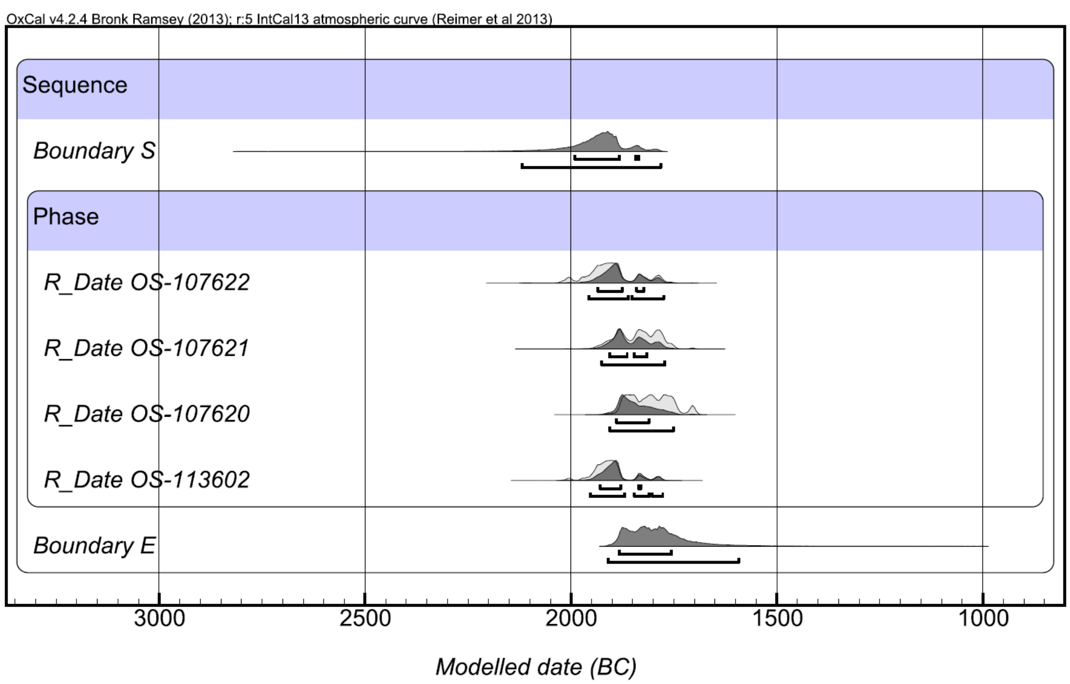


Figure B.16 - Stremț-Fabrica de Alcool chronological Model 2.

While Model 1 is not fully supported, it cannot be rejected. Samples from Unit 3 come from much more secure context than those in Unit 2 where significant amounts of bioturbation were easily identifiable. In Unit 3, the date from Level 6 is directly below the intact thermal feature in Level 5, and is likely securely capped by the thermal feature. The two dates associated with the thermal feature also are securely later than the sample from Level 6 and in sequenced (within the feature and in the capping rubble). The sample from Level 4, which is less securely separated from Level 5 (than the contact between Levels 5 and 6), is earlier than expected, but not so much as to be impossible. While Model 2 has high agreement, it explains only the duration of occupation, not the internal development of the Bronze Age settlement. Both models suggest the site was occupied between approximately 1940-1800 cal. BC. While more samples are needed, particularly to date the Late Bronze Age occupation at the site, the internal sequence seen in the material culture is supported through the chronological models.

Teiuș-Coastă

One sample was run from the Bronze Age occupation at Teiuș-*Coastă*. The wood charcoal sample was processed at NOSAMS. The sample comes from a metalworking feature in the Early Bronze Age component of the site. The sample came from Unit 1, which has three stratigraphic units: Level 1 is plowzone, Level 2 is the Early Bronze Age component (with EBA Type 2 ceramics), and Level 3 is sterile subsoil. Elsewhere on the site (identified in STP 3) is an early Neolithic (Criș Culture) component that was not dated. Additionally, a sherd that is diagnostic to Early Bronze Age Type 3 (Iernut Group) was also found on the surface and is likely from the same single Bronze Age occupation as Level 2. The metalworking feature in Level 2 produced a date of 3690 ±20 BP (OS-113543) (Figure B.17; Table B.11).

Table B.11 - Modelled radiocarbon date from Teiuș-*Coastă*.

	Modeled date – 1-sigma (68%)	Modeled date – 2-sigma (95%)
Unit 1 – EBA II	2131-2035 cal. BC	2141-1984 cal. BC

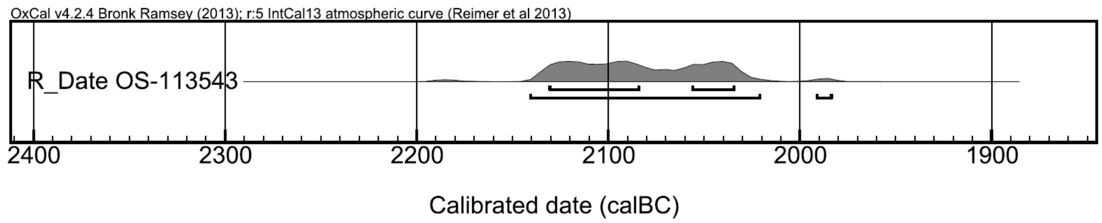


Figure B.17 - Teiuș-*Coastă* calibrated date.

Based on the single calibrated date from the site, it is likely the site was occupied between 2141-2022 cal. BC. This time period is normally associated with the Iernut heavily rusticated ceramics, this site is dominated by the traditional Șoimuș ceramics from the second phase of the EBA. One rusticated sherd was found on the site, but rusticated ceramics are normally found in huge quantities when the site is attributed to the Iernut phase. This suggests that Șoimuș ceramics were produced right up until the transformation to the Middle Bronze Age and the emergence of the Wietenberg Culture. It also suggests that communities using Iernut and Șoimuș ceramics co-existed, and interacted, within the last two centuries of the EBA. The deposits are shallow, so it is not expected that the site was long-lived. However, more dates from across the large site (the largest EBA site recorded in southwest Transylvania at almost 2 hectares) are needed to fully characterize the tempo of EBA occupation.

Teiuș-Fântâna Viilor

A total of two samples were run from Teiuș-*Fântâna Viilor*. All samples were wood charcoal and were processed at NOSAMS. Samples came from two distinct locations at the site (Unit 1 and Unit 2). Unit 1 was made up of three stratigraphic layers; including plowzone (Level 1) and sterile subsoil (Level 3). Level 2 was intact lower fill of a Bronze Age pit dug into sterile and truncated by the plowzone. The ceramics in Level 2 were highly burnished yet not associated with known Late Bronze Age cultures such as Wietenberg or Noua. The ceramics most closely resemble ceramics found at Alba Iulia-*Bazin Olimpic*. Wietenberg and Noua ceramics have been found elsewhere in the site. Significant erosion and plow damage has destroyed any intact cultural layers near Unit 1. Layer 2 produced a date of 3080 ±20 BO (OS-113542) (Figure B.18; Table B.12).

Table B.12 - Modelled radiocarbon date from Teiuș-*Fântâna Viilor*.

	Modeled date – 1-sigma (68%)	Modeled date – 2-sigma (95%)
Unit 1 – LBA	1397-1302 cal. BC	1411-1284 cal. BC

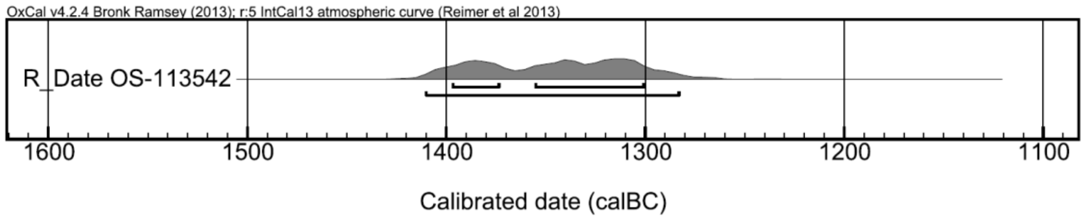


Figure B.18 - Teiuș-*Fântâna Viilor* calibrated date.

Unit 2 contained four stratigraphic layers, including plowzone (Level 1) and sterile subsoil (Level 4). Level 3 was intact occupation fill with Coțofeni ceramics; no sample was run from this level. Level 2 is an occupation fill that appeared to have non-culturally diagnostic Bronze Age ceramics, however a sample of wood charcoal from a burnt feature in the level produced a date of 2500 ±20 BP (OS-113645) which would place it in the Iron Age. It is not clear whether this deposit is from the Iron Age, or if the date is intrusive from later activity.

Țelna-Rupturii

Six samples of human bone were analyzed from the cemetery at Țelna-*Rupturii*. Țelna-*Rupturii* is a tomb cemetery located on top of a hill just north of the modern village of Țelna. The cemetery contains nine separate burial mounds. The site was initially identified in 1985 and two of the mounds were excavated in 1990 by Horia Ciugudean. Three flexed-inhumation burials were found in Tomb 1 and seven individuals were interred in six separate graves (Burials 4 and 5 were comingled) were found in Tomb 2. Individuals in Tomb 2 were buried both as primary and secondary inhumations. Samples of bone were taken from all three burials in Tomb 1 and three individuals in Tomb 2 for radiocarbon dating (Table B.13). In Tomb 1, Burial 1 produced dates of 4080 ±30 (OS-108278), Burial 2 produced a date of 3960 ±30 (OS-108808), and Burial 3 produced a date of 3990 ±30 (OS-108279). In Tomb 2, Burial 3 produced a date of 3960 ±30 (OS-108810), Burial 4 produced a date of 4130 ±30 (OS-108307), and Burial 7 produced a date of 4170 ±30 (OS-108308).

Table B.13 - Modelled radiocarbon dates from Țelna-*Rupturii*.

	Model 1 (A_{model}=99.4)*	Model 2 (A_{model}=64.4)	Model 3 (A_{model}=112.3)
Tomb 2 Burial 7	2868-2677 cal. BC	2762-2629 cal. BC	2767-2633 cal. BC
Tomb 2 Burial 4	2853-2624 cal. BC	2732-2586 cal. BC	2744-2623 cal. BC
Tomb 2 Burial 3	2566-2461 cal. BC	2566-2541 cal. BC	2556-2461 cal. BC
Tomb 1 Burial 1	2635-2497 cal. BC	2525-2497 cal. BC	2635-2571 cal. BC
Tomb 1 Burial 3	2566-2476 cal. BC	2549-2475 cal. BC	2574-2531 cal. BC
Tomb 1 Burial 2	2565-2463 cal. BC	2552-2464 cal. BC	2556-2461 cal. BC

*=Modeled dates based on 1-sigma (68%).

These dates can be modeled to evaluate three alternative hypotheses – 1) that the tombs are contemporaneous, 2) that the tombs are sequential, and 3) that the tombs were constructed sequentially but some burial activity was contemporaneous. Model 1 assumes the tombs were constructed contemporaneously, as a single phase. While Model 1 has good agreement (A_{model}=99.4; $A_{overall}$=99.3), a quick examination of the calibrated dates makes it clear that Tomb 1 was constructed prior to Tomb 2 (Figure B.19). This is not biased by sampling, as all individuals were sampled within Tomb 1. As a result, this model does not best fit the data. Model 2 tests whether the two tombs were constructed as two temporally distinct phases. Overall the model meets the criteria for agreement (A_{model}=64.4; $A_{overall}$=64.2), however there is poor agreement with Burial 1 from Tomb 1 (A=47.1) (Figure B.20). This model, where the two tombs were not contemporaneously used is statistically possible, but not as likely as other models. Model 3 proposes three phases, in which the tombs were sequentially constructed and then there was contemporaneous activity across the tombs. Model 3 had very good agreement with the samples (A_{model}=112.3; $A_{overall}$=111.1) (Figure B.21).

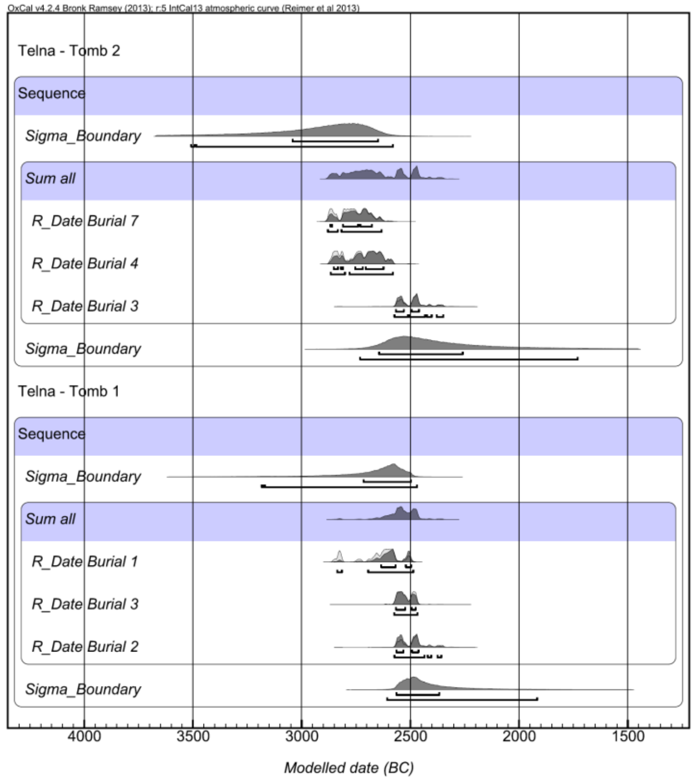


Figure B.19 - Țelna-*Rupturii* chronological Model 1.

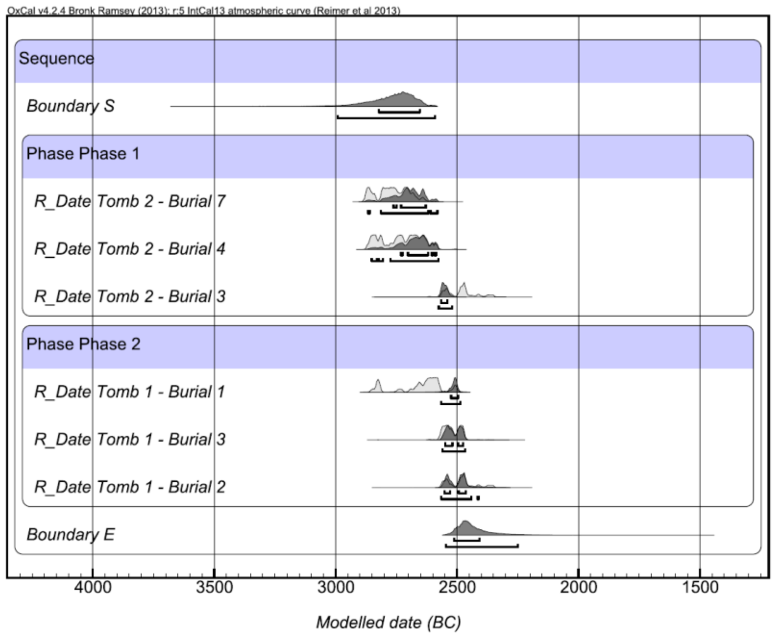


Figure B.20 - Țelna-*Rupturii* chronological Model 2.

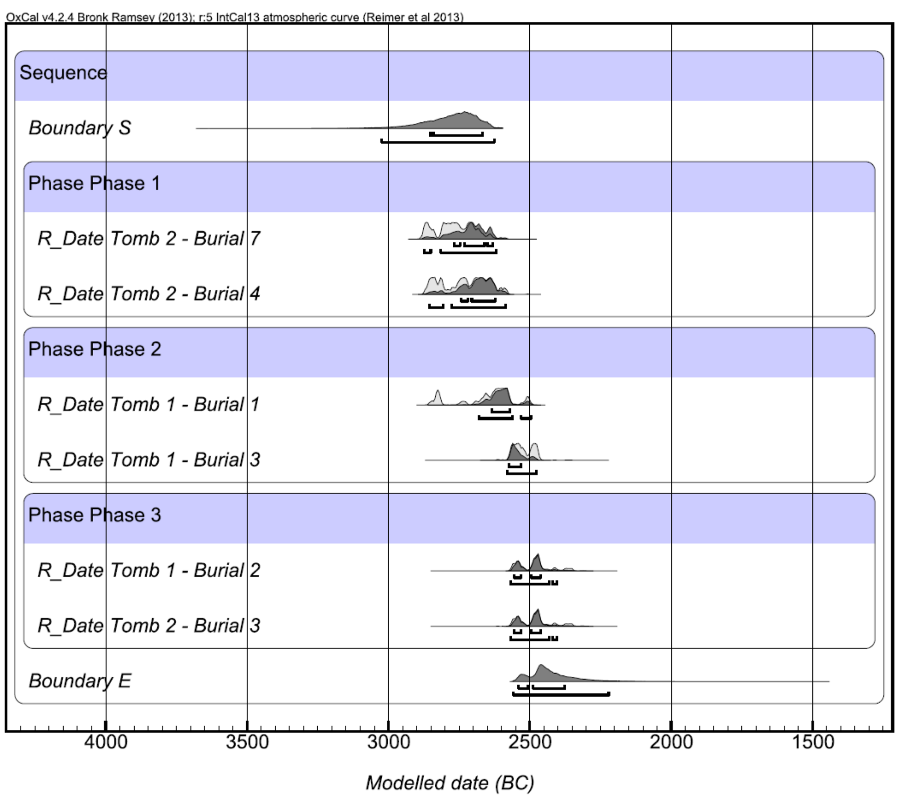


Figure B.21 - Țelna-*Rupturii* chronological Model 3.

It appears that Model 3 is the best fit for the data as currently known. First, two individuals were buried in Tomb 2 (2750-2630 BC). Next, Tomb 1 was constructed and two individuals were buried sequentially (rather than simultaneously) (2630-2550). During this second phase no burial took place in Tomb 2. Finally, burials were placed – potentially simultaneously – in Tombs 1 and 2 (2550-2460 BC). These concurrent burials represent the final interments in the Telna Cemetery.

These data suggest several key factors for the development and abandonment of Țelna. First, the tombs were not constructed simultaneously. Second, the tombs were not constructed in a single event – instead they grow through subsequent burial events (see Scarre 2010, Kuijt and Quinn 2013 for similar patterns from the British Isles). Second, burial was infrequent over a long period of time (six, up to 10, individuals buried within 300 years – though the modeled boundary start and end of the cemetery suggests it could have been as brief as 100 years), suggesting that only special individuals were eligible for burial. Third, the primary phases of tomb construction and use for each tomb do not overlap. Based on this, it is possible that the two tombs may actually have been constructed by a single lineage or community with burial events taking place intermittently and perhaps corresponding with important social events or deaths of important individuals (e.g., lineage heads).

The larger implication of these results is that variability among tombs (including size, grave goods, number of burials, and costliness of construction) in EBA tomb cemeteries that are normally attributed to social differentiation in prehistoric societies may actually be chronological. The apparently contemporaneous final burial in the tombs may be part of a closing ritual for the cemetery. This could perhaps signal a deliberate choice to revisit and connect later communities to the more ancient ancestors as well as rupture the traditional link between the community who used the cemetery and the physical space itself.

Rameț-Curmatura

One sample of wood charcoal from Rameț-*Curmatura* was processed at NOSAMS. The site had Coțofeni, Wietenberg, and Medieval ceramics. The sample came from Unit 2, in close proximity to a Wietenberg Type C ceramic. However, the site was shallow and highly bioturbated and affected by erosion. As a result, there was minimal internal site stratigraphy. The sample ended up dating the Medieval activity at the site to 875 ±35 BP (OS-107556). No date for the Wietenberg component could be obtained.

Rameț-Gugului

One sample of charcoal from Rameț-*Gugului* was processed at NOSAMS. The excavation unit (Unit 1) was located just downslope from the actual site with an Early Bronze Age Type 1 (Livezile group) ceramics and tumuli. The cultural material from Unit 1 was non-diagnostic Early Bronze Age and was fairly worn. The charcoal sample ended up being intrusive into sandy deposits that appear to be partially slopewash from the core of the site. The sample produced a date of 145 ±20 BP (OS-107558). There is still potential to obtain samples of the EBA settlement further up the slope, but none were collected during fieldwork given time constraints.

Sebeș-Între Răstoace

Nine samples were run from the Wietenberg cemetery at Sebeș-*Între Răstoace*. All samples were of cremated human bone recovered during salvage excavations by the Muzeul Național al Unirii-Alba Iulia in 2012 and processed at the University of Arizona Accelerator Mass Spectrometry Laboratory. The cemetery at Sebeș-*Între Răstoace* is the largest Wietenberg cemetery (61 graves) that has been documented. The ceramics from the cemetery belong to Wietenberg Type B. The cemetery has three spatial clusters of burials and burials within each cluster vary based on the presence of grave goods, decoration of urns that held the cremated remains, and the presence of funerary architecture (stone slabs and cists). Samples were selected from the large Cluster 1 (n=6) and from the smaller Cluster 2 (n=3), and were chosen to investigate the wide variety in burial modes (through variable grave goods and funerary architecture). From Cluster 1, Burial 34 produced a date of 3562 ±42 (AA-103616), Burial 32 produced a date of 3555 ±41 (AA-103615), Burial 43 produced a date of 3520 ±41 (AA-103618), Burial 45 produced a date of 3501 ±40 (AA-103620), Burial 44 produced a date of 3495 ±40 (AA-103619), and Burial 36 produced a date of 3425 ±41 (AA-103617). From Cluster 2, Burial 25 produced a date of 3533 ±41 (AA-103614), Burial 17 produced a date of 3517 ±41 (AA-103613), and Burial 2 produced a date of 3445 ±41 (AA-103611).

These dates can be modeled to evaluate two alternative hypotheses – 1) that the clusters are contemporaneous, 2) that the clusters were sequential. Model 1 assumes that all of the burials were deposited contemporaneously, as a single phase across the whole cemetery (Figure B.22). Model 1 has good agreement (A_{model}=87.6; $A_{overall}$=87.7). Model 2 tests whether the two burial clusters were constructed as two temporally distinct phases (Figure B.23). Overall the model meets the criteria for agreement (A_{model}=79.3; $A_{overall}$=80.2), however there is poor agreement with Burial 36 from Cluster 1 (A=47.8). Model 2 is statistically possible, but Model 1 is more likely, particularly given the overlap in the dates between the two clusters. This Bayesian model of the radiocarbon dates suggests the cemetery formed between 1880-1780 cal. BC.

Table B.14 - Modelled radiocarbon dates from Sebeș-*Între Răstoace*.

	Model 1 (A_{model}=87.6)*	Model 2 (A_{model}=79.3)
Cluster 1 – Burial 34 – Wietenberg Type B	1898-1779 cal. BC	1898-1785 cal. BC
Cluster 1 – Burial 32 – Wietenberg Type B	1895-1778 cal. BC	1897-1785 cal. BC
Cluster 2 – Burial 25 – Wietenberg Type B	1886-1779 cal. BC	1836-1772 cal. BC
Cluster 1 – Burial 43 – Wietenberg Type B	1883-1780 cal. BC	1888-1789 cal. BC
Cluster 2 – Burial 17 – Wietenberg Type B	1881-1780 cal. BC	1835-1771 cal. BC
Cluster 1 – Burial 45 – Wietenberg Type B	1880-1781 cal. BC	1885-1807 cal. BC
Cluster 1 – Burial 44 – Wietenberg Type B	1878-1782 cal. BC	1884-1809 cal. BC
Cluster 2 – Burial 2 – Wietenberg Type B	1877-1792 cal. BC	1835-1761 cal. BC
Cluster 1 – Burial 36 – Wietenberg Type B	1877-1769 cal. BC	1878-1804 cal. BC

*=Modeled dates based on 1-sigma (68%).

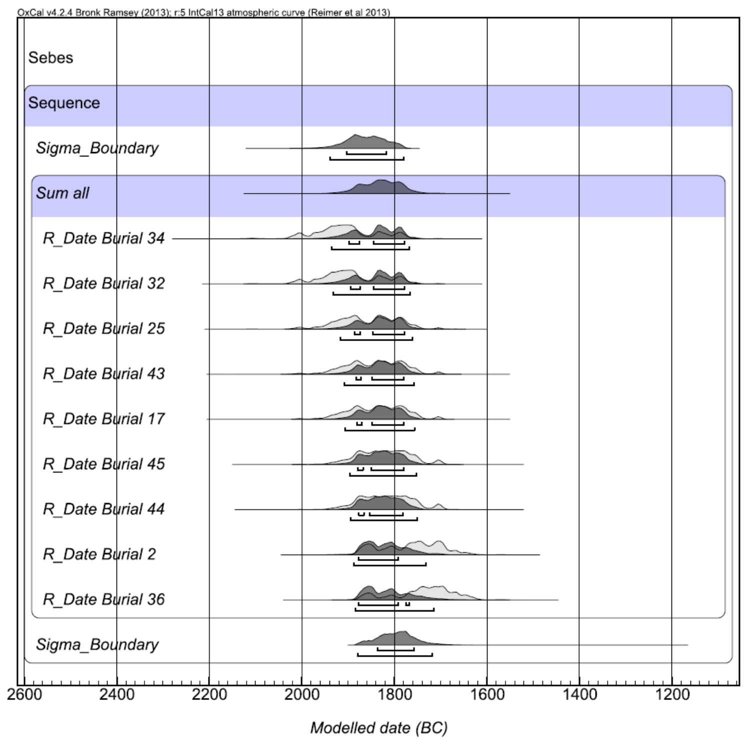


Figure B.22 - Sebes-*Între Răstoace* chronological Model 1.

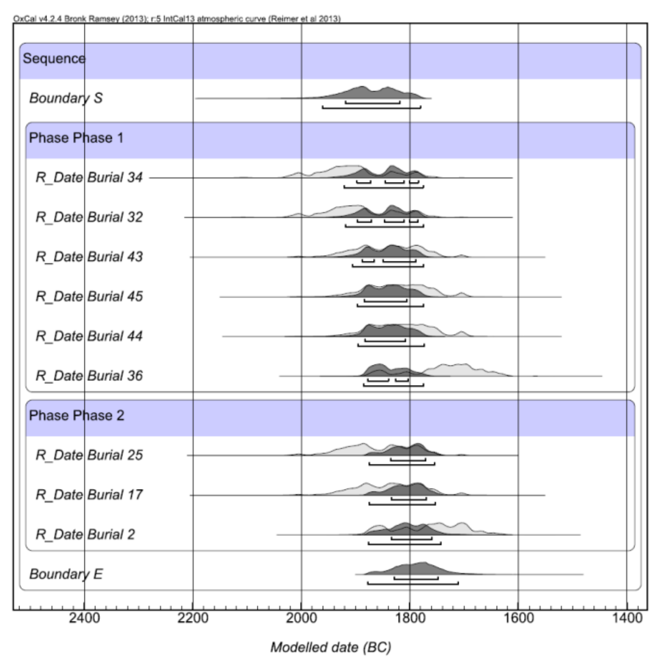


Figure B.23 - Sebeș-*Între Răstoace* chronological Model 2.

The development and abandonment of Sebeș has several implications. First, the spatial clusters observed at the cemetery are likely contemporaneous. Similarly, the variability between different burials in grave goods and complexity of funerary architecture can be attributed to different choices for burial treatment (rather than as changing mortuary customs through time). Unlike the EBA, when new tombs were constructed after the end of returning to previous tombs, multiple social communities (identities) were simultaneously burying their dead at Sebes. This suggests a form of segmentation in the mortuary record not observed in EBA cemeteries. Second, the large quantity of burials in a brief period of time (a minimum of 61 individuals in perhaps as short as 60 years) implies that more community members were eligible for cremation and burial.

More broadly, the shape of the sum density plot suggests that the tempo of burial at Sebeș may follow a demographic profile associated with the rise and fall of a single community. The pattern here suggests that funerary rituals were not necessarily a key aspect in closing rituals. Additionally, the lack of later burials (as seen in many EBA tombs) suggests that once communities moved on, cemeteries did not have a continuing significance in organizing people's use of space. Unlike the EBA, cemeteries were not the focus of particular closing rituals or a continuing presence on the landscape. The pattern of MBA cemetery formation and abandonment is very similar to the formation and abandonment of the Middle Neolithic cemetery at Tara, Ireland (Quinn 2015).

Sibișeni-Deaspura Satului

One sample of cremated human bone was run from the Wietenberg cemetery at Sibișeni-*Deaspura Satului*. This site is the second largest Wietenberg cemetery ever excavated (43 graves). The cemetery has ceramics of Wietenberg Type A, Type B, and Type C (see Boroffka 1994a), though is primarily associated with Wietenberg Type C in the literature (see Paul 1995). However, the only human remains that were curated were from one urn. The cremated human bone is now kept in a cardboard box in the Brukenthal Museum in Sibiu along with the urn and lid in which the remains were originally buried. A sample was taken in the autumn of 2013 from this box for dating. The provenience information (specific burial) is not kept with the remains or in the museum's catalog, however a survey of the published finds from the site (see Paul 1995) suggests the remains came from Burial 4 (although Burial 37 is also a possibility). The cremated remains were processed at the University of Arizona Accelerator Mass Spectrometry Laboratory and produced a date of 3454 ±46 BP (AA-103610) (Figure B.24; Table B.15).

Table B.15 - Modelled radiocarbon date from Sibișeni-*Deaspura Satului*.

	Modeled date – 1-sigma(68%)	Modeled date – 2-sigma(95%)
Burial 4 (or 37)	1877-1693 cal. BC	1891-1645 cal. BC

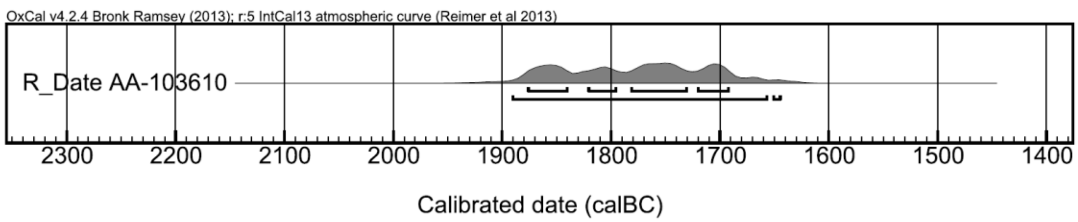


Figure B.24 - Sibișeni-*Deaspura Satului* calibrated date.

This sample firmly anchors the Wietenberg cemetery traditionally dated to the third phase of the Wietenberg (based on conventions by Boroffka 1994a) between 1875-1700 cal. BC. Other samples are unavailable to be able to fully model this important cemetery (and compare it with other large Wietenberg cemeteries such as that at Sebeș-*Între Răstoace*).

Other Important Culturally Unaffiliated Bronze Age Radiocarbon Dates

Recently, Harding and Kavruk (2013) have published an extensive series of radiocarbon dates from the salt production site of Baile Figa in eastern Transylvania. The dates were selected to help reconstruct the history of salt production at the site. The site has little in the way of diagnostic ceramics, though it does have rusticated and textile impressed sherds from Early Bronze Age III (Iernut) (Harding and Kavruk 2013:122). There are numerous other non-diagnostic Bronze Age ceramics (including 359 sherds in

Trench I), but they lack the distinctive decoration of other Early, Middle, or Late Bronze Age cultural groups.

The site was under construction by the 16th-15th centuries BC, starting with the southern end of the site (Trench 1) and eastern spring (Harding and Kavruk 2013:128). A second pulse of activity occurred in the 14th-13th centuries BC, when activity shifted north to the central area of the site (Harding and Kavruk 2013:128). The third phase of activity is found in the northern portion of the site, which seems to start in the 13th century BC, but mostly falls between 1200-800 cal. BC (Harding and Kavruk 2013:128) (Table B.16).

Table B.16 – Radiocarbon dates from Baile Figa.

Sample	Material	Context	Date
OxA-19273	Unburnt Wood	Trench 1, Square C2, Mallet	3837 ±35
OxA-19274	Unburnt Wood	Trench 1, Square B2, Trough 3	3278 ±29
OxA-19109	Unburnt Wood	Trench 1, Square B2, Trough 3	3277 ±27
Hd-27310	Unburnt Wood	Eastern Stream	3248 ±23
OxA-19270	Unburnt Wood	Trench 1, Square B1, Trough 2	3226 ±28
OxA-19295	Plant Material	Trench 1, Square B1, Fill of Trough 2	3221 ±29
OxA-24837	Wattle	Trench 1	3208 ±27
OxA-19296	Binding	Trench 1, Square B1, Binding around Trough 2	3205 ±28
OxA-19108	Unburnt Wood	Trench 1, Square B1, Trough 2	3194 ±27
OxA-19294	Binding	Trench 1, Square B2, Binding under Trough 3	3192 ±28
OxA-21451	Unburnt Wood	Trench 1, Square B1/C1, Bundle of Sticks	3191 ±29
OxA-19111	Unburnt Wood	Trench 1, Square B1, Peg from Trough 2	3189 ±27
OxA-19600	Unburnt Wood	Eastern Stream	3159 ±26
OxA-21452	Unburnt Wood	Trench 1, Square B1/C1, Bundle of Sticks	3158 ±30
OxA-19389	Unburnt Wood	Eastern Stream	3141 ±33
OxA-19388	Unburnt Wood	Eastern Stream	3073 ±29
OxA-19309	Unburnt Wood	Central Dam	3067 ±27
OxA-19387	Unburnt Wood	Eastern Stream	3065 ±30
OxA-19308	Unburnt Wood	Central Dam	3058 ±28
OxA-19306	Unburnt Wood	Central Dam	3005 ±27
OxA-19307	Unburnt Wood	Central Dam	2993 ±27
GrN-30477	Unburnt Wood	Pole at Central Dam	2990 ±50
Hd-27335	Unburnt Wood	Central Dam	2982 ±22
GrN-30475	Unburnt Wood	Timber under Trough 1	2950 ±50

GrN-30479	Unburnt Wood	Trench 3, Pile in Northern Area	2940 ±50
OxA-24820	Unburnt Wood	Trench 3, Plank Supporting Wattle Fence	2936 ±27
OxA-24821	Unburnt Wood	Trench 3, Plank Supporting Wattle Fence	2921 ±27
OxA-19305	Unburnt Wood	Central Dam	2901 ±27
Hd-27309	Unburnt Wood	Trench 3, Plank fom Structure 2	2896 ±30
GrN-29955	Unburnt Wood	Trough 1	2870 ±20
OxA-19277	Wattle	Trench 3, Square A5, Wattle	2858 ±28
OxA-19299	Unburnt Wood	Trench 3, Square D4, Fragment of Small Tray	2852 ±27
OxA-19300	Unburnt Wood	Trench 3, Structure 2 (Timber 61)	2842 ±27
OxA-24842	Unburnt Wood	Trench 3, Massive Timber on Rock Salt	2841 ±25
GrN-29956	Unburnt Wood	Trough 1	2840 ±20
OxA-19386	Unburnt Wood	Trench 3, Structure 2 (Timber 58)	2817 ±31
OxA-19276	Wattle	Trench 3, Square A2, Wattle	2809 ±29
GrN-30476	Unburnt Wood	Pile in Central Area	2800 ±50
OxA-24841	Unburnt Wood	Trench 3, Massive Timber on Rock Salt	2773 ±27
OxA-19278	Wattle	Trench 3, Square A6, Wattle	2766 ±28
OxA-19275	Wattle	Trench 3, Square C2, Wattle	2732 ±27
OxA-24840	Unburnt Wood	Trough 4	2699 ±29

Based on the chronological span of the dates, Harding and Kavruk expect that the site would have also been home to communities that normally would be associated with Wietenberg pottery (Harding and Kavruk 2013:119), however no Wietenberg ceramics have been identified. The lack of diagnostic Wietenberg ceramics is surprising (as all Transylvanian MBA sites are defined by their presence), but may be a result of the site as a special purpose (salt mining) activity area. This also has implications for the lack of known MBA metal mining sites. No mining sites with Wietenberg ceramics have been found, but none have been subject to the intense radiocarbon dating program that is present at Baile Figa. More extensive dating of special purpose sites without culturally diagnostic ceramics may produce even more evidence of Wietenberg activity outside of residential contexts.

Appendix C – Lot Catalog

The lot catalog contains contextual information for each unit of collection.

Table C.1 – Lot Catalog

Lot #	Village	Site Name	Unit #	Level
12-001	Uioara de Jos	La Grui	SITE GRAB	--
12-002	Uioara de Jos	Itardeau / La Parloage	SITE GRAB	--
12-003	Şard	Casa Luica	SITE GRAB	--
12-004	Cicău	Saliste	SITE GRAB	--
12-005	Cicău	(no name)	SITE GRAB	--
12-006	Heria	Cetaţiue	SITE GRAB	--
12-007	Ormenis	Cânepişte, Canepi - La Pod	SITE GRAB	--
12-008	Oiejdea	Bilag 2	SITE GRAB	--
12-009	Hăpria	--	FIELD GRAB	--
12-010	Straja	--	FIELD GRAB	--
12-011	Straja	Măgura	SITE GRAB	--
12-012	Straja	Fântâna Bornii	SITE GRAB	--
12-013	Straja	Fântâna Bornii	SITE GRAB	--
12-014	Gârbova de Sus	Piatra Danii	SITE GRAB	--
12-015	Stremţ	--	DAILY FIELD GRAB	--
12-016	--	--	DAILY FIELD GRAB	--
12-017	Stremţ	Berc 1	SITE GRAB	--
12-018	Stremţ	Berc 1	COLLECTION UNIT 1	--
12-019	Stremţ	Berc 1	COLLECTION UNIT 2	--
12-020	Stremţ	Berc 2	CONTAMINATED SAMPLE	--
12-021	Stremţ	Berc 3	SITE GRAB	--
12-022	Stremţ	Berc 1	COLLECTION UNIT 3	--
12-023	Stremţ	--	DAILY FIELD GRAB	--
12-024	Stremţ	Sub Berc	SITE GRAB	--
12-025	Stremţ	Berc 1 + Berc 2	COLLECTION UNIT 2 + SITE GRAB	--
12-026	Stremţ	Low Valley	DAILY FIELD GRAB	--
12-027	Straja	La Cruce	SITE GRAB	--
12-028	Stremţ	Lower Valley	DAILY FIELD GRAB	--
12-029	Geoagiu de Sus	Fantana Mare	SITE GRAB	--
12-030	Geoagiu de Sus	Near Fantana Mare	DAILY FIELD GRAB	--
12-031	Geoagiu de Sus	La Craia	DAILY FIELD GRAB	--

12-032	Geoagiu de Sus	La Craia	DAILY FIELD GRAB	--
12-033	Geoagiu de Sus	La Craia	DAILY FIELD GRAB	--
12-034	Geoagiu de Sus	La Craia	DAILY FIELD GRAB	--
12-035	Geoagiu de Sus	Cuciu	DAILY FIELD GRAB	--
12-036	Geoagiu de Sus	Piatra Bulzu	DAILY FIELD GRAB	--
12-037	Geoagiu de Sus	In FS 94	DAILY FIELD GRAB	--
12-038	Geoagiu de Sus	Cuciu	DAILY FIELD GRAB	--
12-039	Geoagiu de Sus		DAILY FIELD GRAB	--
12-040	Geoagiu de Sus	Fantana east of spring	DAILY FIELD GRAB	--
12-041	Geoagiu de Sus		DAILY FIELD GRAB	--
12-042	Geoagiu de Sus	east of 102	DAILY FIELD GRAB	--
12-043	Geoagiu de Sus	entrance to village	DAILY FIELD GRAB	--
12-044	Geoagiu de Sus	site at entrance to village	DAILY FIELD GRAB	--
12-045	Geoagiu de Sus	ridge between Geoagiu and Cetea	DAILY FIELD GRAB	--
12-046	Ramet	GPS 004-26-07-2012	DAILY FIELD GRAB	--
12-047	Geoagiu de Sus	Lower Valley SE	DAILY FIELD GRAB	--
12-048	Stremţ	Fabrica de Alcool	DAILY FIELD GRAB	--
12-049	Stremţ	N side of valley	DAILY FIELD GRAB	--
12-050	Stremţ	S side of valley	DAILY FIELD GRAB	--
12-051	Stremţ	Fabrica de Alcool	DAILY FIELD GRAB	--
12-052	Stremţ	Fabrica de Alcool	COLLECTION UNIT 1	--
12-053	Stremţ	Fabrica de Alcool	COLLECTION UNIT 2	--
12-054	Stremţ	Berc 1	UNIT 1	Lv. A
12-055	Stremţ	Berc 1	UNIT 1	Lv. A
12-056	Stremţ	Berc 1	SITE GRAB	--
12-057	Stremţ	Berc 1	UNIT 1	Lv. A
12-058	Stremţ	Berc 1	UNIT 1	Lv. B
12-059	Stremţ	Berc 1	STP 1	--
12-060	Stremţ	Berc 1	DAILY FIELD GRAB	--
12-061	Stremţ	Berc 1	DAILY FIELD GRAB	
12-062	Stremţ	Berc 1	STP 2	
12-063	Stremţ	S side of Berc	DAILY FIELD GRAB	
12-064	Stremţ	Fabrica de Alcool	DAILY FIELD GRAB	
12-065	Stremţ	Fabrica de Alcool	DAILY FIELD GRAB	
12-066	Stremţ	Fabrica de Alcool	DAILY FIELD GRAB	
12-067	Stremţ	S side of Berc	DAILY FIELD GRAB	
12-068	Teius/Galda		DAILY FIELD GRAB	
12-069	Geoagiu de Sus	Fantana Mare	collection unit 1 10x10	
12-070	Geoagiu de Sus	Fantana Mare	DAILY FIELD GRAB	

12-071	Geoagiu de Sus	Cuciu	DAILY FIELD GRAB	
12-072	Geoagiu de Sus	Fantana Mare	UNIT 1	Lv A
12-073	Geoagiu de Sus	Fantana Mare	UNIT 1	Lv B
12-074	Geoagiu de Sus	Fantana Mare	collection unit 2 10x10	
12-075	Geoagiu de Sus	Fantana Mare	DAILY FIELD GRAB	
12-076	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A1 plow zone
12-077	Geoagiu de Sus	Fantana Mare	DAILY FIELD GRAB	
12-078	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-079	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-080	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-081	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-082	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-083	Geoagiu de Sus	Fantana Mare	UNIT 2	Lv A2
12-084	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A1
12-085	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A2
12-086	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A2
12-087	Teius	Across from Somaco	DAILY FIELD GRAB	
12-088	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A2
12-089	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A2
12-090	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-091	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-092	Geoagiu de Sus	Cuciu-Fantana Mare	DAILY FIELD GRAB	
12-093	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-094	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-095	Teius	Across from Somaco	DAILY FIELD GRAB	
12-096	Geoagiu de Sus	Fantana Mare	DAILY FIELD GRAB	
12-097	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-098	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-099	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-100	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-101	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3
12-102	Geoagiu de Sus	Fantana Mare	UNIT 3	Lv A3 profile
12-103	Stremţ	N side of valley large roman site	DAILY FIELD GRAB	
13-001	Rachis	Village grab	Grab	
13-002	Geomal	Magura	Grab	
13-003	Geomal	Magura	Grab	
13-004	Zlatna	Road side tailings	Grab	
13-005	Râmeţ	Curmatura	SITE GRAB	--
13-006	Stremţ	Fabrica de Alcool	STP 1	A

13-007	Stremţ	Fabrica de Alcool	STP 1	B
13-008	Stremţ	Fabrica de Alcool	STP 1	C
13-009	Stremţ	Fabrica de Alcool	STP 1	D
13-010	Stremţ	Fabrica de Alcool	STP 3	A
13-011	Stremţ	Fabrica de Alcool	SITE GRAB	--
13-012	Stremţ	Fabrica de Alcool	STP 2	A
13-013	Stremţ	Fabrica de Alcool	STP 2	B
13-014	Stremţ	Fabrica de Alcool	STP 4	A
13-015	Stremţ	Fabrica de Alcool	STP 4	B
13-016	Stremţ	Fabrica de Alcool	STP 5	A
13-017	Stremţ	Fabrica de Alcool	STP 6	A
13-018	Stremţ	Fabrica de Alcool	UNIT 1	A
13-019	Stremţ	Fabrica de Alcool	UNIT 2	A
13-020	Stremţ	Fabrica de Alcool	UNIT 1	A
13-021	Stremţ	Fabrica de Alcool	UNIT 2	A
13-022	Stremţ	Fabrica de Alcool	UNIT 1	B
13-023	Stremţ	Fabrica de Alcool	UNIT 2	B
13-024	Stremţ	Fabrica de Alcool	UNIT 1	C
13-025	Stremţ	Fabrica de Alcool	UNIT 2	C1
13-026	Stremţ	Fabrica de Alcool	UNIT 2	C1
13-027	Stremţ	Fabrica de Alcool	UNIT 2	C2
13-028	Stremţ	Fabrica de Alcool	UNIT 1	C2
13-029	Stremţ	Fabrica de Alcool	UNIT 1	C1
13-030	Stremţ	Fabrica de Alcool	UNIT 2	C3
13-031	Stremţ	Fabrica de Alcool	UNIT 1	D1
13-032	Stremţ	Fabrica de Alcool	UNIT 2	WALL CLEAN
13-033	Stremţ	Fabrica de Alcool	UNIT 2	C4
13-034	Stremţ	Fabrica de Alcool	STP 7	A
13-035	Stremţ	Fabrica de Alcool	SITE GRAB	--
13-036	Stremţ	Fabrica de Alcool	STP 7	B
13-037	Stremţ	Fabrica de Alcool	STP 7	C
13-038	Stremţ	Fabrica de Alcool	UNIT 2	C5
13-039	Stremţ	Fabrica de Alcool	UNIT 3	A
13-040	Stremţ	Fabrica de Alcool	UNIT 2	C6
13-041	Stremţ	Fabrica de Alcool	UNIT 3	B1
13-042	Stremţ	Fabrica de Alcool	UNIT 2	D1
13-043	Stremţ	Fabrica de Alcool	UNIT 3	B2
13-044	Stremţ	Fabrica de Alcool	UNIT 3	B3
13-045	Stremţ	Fabrica de Alcool	UNIT 3	C1

13-046	Stremţ	Fabrica de Alcool	UNIT 3	C2
13-047	Stremţ	Fabrica de Alcool	UNIT 3	C3
13-048	Geoagiu de Sus	Viile Satului	UNIT 1	A1
13-049	Geoagiu de Sus	Viile Satului	SITE GRAB	--
13-050	Geoagiu de Sus	Viile Satului	UNIT 1	B1
13-051	Stremţ	Fabrica de Alcool	UNIT 3	C4
13-052	Stremţ	Fabrica de Alcool	UNIT 3	D1
13-053	Geoagiu de Sus	Viile Satului	UNIT 2	A1
13-054	Geoagiu de Sus	Viile Satului	UNIT 1	C1
13-055	Geoagiu de Sus	Viile Satului	UNIT 2	B1
13-056	Geoagiu de Sus	Viile Satului	UNIT 2	C1
13-057	Stremţ	Fabrica de Alcool	UNIT 3	D2
13-058	Geoagiu de Sus	Viile Satului	UNIT 2	C2
13-059	Stremţ	Fabrica de Alcool	UNIT 3	D2
13-060	Stremţ	Fabrica de Alcool	UNIT 3	E1
13-061	Geoagiu de Sus	Viile Satului	UNIT 3	A1
13-062	Geoagiu de Sus	Viile Satului	UNIT 2	D1
13-063	Geoagiu de Sus	Viile Satului	UNIT 3	B1
13-064	Stremţ	Fabrica de Alcool	UNIT 3	E1
13-065	Geoagiu de Sus	Viile Satului	UNIT 3	C1
13-066	Stremţ	Fabrica de Alcool	UNIT 3	E1
13-067	Stremţ	Fabrica de Alcool	UNIT 3	F1
13-068	Geoagiu de Sus	Viile Satului	UNIT 2	D2
13-069	Geoagiu de Sus	Viile Satului	UNIT 3	C2
13-070	Stremţ	Fabrica de Alcool	UNIT 3	F1
13-071	Geoagiu de Sus	Viile Satului	UNIT 3	D1
13-072	Stremţ	Fabrica de Alcool	UNIT 3	F2
13-073	Geoagiu de Sus	Viile Satului	UNIT 3	D1 - PIT
13-074	Geoagiu de Sus	Viile Satului	UNIT 2	D3
13-075	Stremt	Roman	SITE GRAB	FS 13-001
13-076	Stremt	Roman	SITE GRAB	FS 13-002
13-077	Stremt	Roman	SITE GRAB	FS 13-003
13-078	Stremt	Roman	SITE GRAB	FS 13-004
13-079	Stremt	Roman	SITE GRAB	FS 13-005
13-080	Stremt	Roman	SITE GRAB	FS 13-006
13-081	Stremt	Roman	SITE GRAB	FS 13-007
13-082	Stremt	Roman	SITE GRAB	Grab at GPS 023-13-07-2013
13-083	Stremt	Roman	SITE GRAB	Field grab
13-084	Stremţ	Fabrica de Alcool	UNIT 3	F3
13-085	Geoagiu de Sus	Viile Satului	UNIT 3	D1 - PIT

13-086	Geoagiu de Sus	Viile Satului	UNIT 3	D1 - NOT PIT
13-087	Geoagiu de Sus	Viile Satului	UNIT 3	D2 - PIT
13-088	Geoagiu de Sus	Viile Satului	UNIT 3	D2 - NOT PIT
13-089	Geoagiu de Sus	Viile Satului	UNIT 2	D4
13-090	Geoagiu de Sus	Viile Satului	UNIT 3	D2 - PIT
13-091	Geoagiu de Sus	Viile Satului	UNIT 3	D3
13-092	Geoagiu de Sus	Viile Satului	UNIT 3	D4
13-093	Geoagiu de Sus	Viile Satului	UNIT 3	D5
13-094	Geoagiu de Sus	Viile Satului	UNIT 3	D6
13-095	Geoagiu de Sus	Viile Satului	UNIT 3	D7
13-096	Geoagiu de Sus	Viile Satului	UNIT 3	D8
13-097	Geoagiu de Sus	Viile Satului	UNIT 2/3	D6
13-098	Geoagiu de Sus	Viile Satului	UNIT 3	D9
13-099	Geoagiu de Sus	Viile Satului	UNIT 2	D9
13-100	Geoagiu de Sus	Viile Satului	UNIT 3	D9
13-101	Geoagiu de Sus	Viile Satului	UNIT 3	D10
13-102	Geoagiu de Sus	Viile Satului	UNIT 2	D10
13-103	Geoagiu de Sus	Viile Satului	UNIT 3	D11
13-104	Geoagiu de Sus	Viile Satului	UNIT 3	D11
13-105	Geoagiu de Sus	Viile Satului	UNIT 2	D11
13-106	Geoagiu de Sus	Viile Satului	UNIT 3	D12
13-107	Geoagiu de Sus	Viile Satului	UNIT 2	D12
13-108	Geoagiu de Sus	Viile Satului	UNIT 3	D13
13-109	Geoagiu de Sus	Viile Satului	UNIT 2	D13
13-110	Stremţ	Fabrica de Alcool	UNIT 3	F3
13-111	Stremţ	Fabrica de Alcool	UNIT 3	F4
13-112	Stremţ	Fabrica de Alcool	UNIT 3	F5
13-113	Geoagiu de Sus	Viile Satului	UNIT 3	D14
13-114	Geoagiu de Sus	Viile Satului	UNIT 2	D14
13-115	Geoagiu de Sus	Viile Satului	UNIT 3	D15
13-116	Geoagiu de Sus	Viile Satului	UNIT 2	D15
13-117	Geoagiu de Sus	Viile Satului	UNIT 3	D16
13-118	Geoagiu de Sus	Viile Satului	UNIT 2	D16
13-119	Geoagiu de Sus	Viile Satului	UNIT 2	D11-D16
13-120	Geoagiu de Sus	Viile Satului	UNIT 3	D11-D16
13-121	Râmeţ	Curmatura	UNIT 1	A1
13-122	Râmeţ	Curmatura	UNIT 1	B1
13-123	Râmeţ	Curmatura	SITE GRAB	--
13-124	Râmeţ	Curmatura	STP 1	--
13-125	Râmeţ	Curmatura	UNIT 1	B1
13-126	Râmeţ	Curmatura	UNIT 1	B2
13-127	Râmeţ	Curmatura	STP 2	--
13-128	Râmeţ	Curmatura	STP 3	--
13-129	Râmeţ	Curmatura	UNIT 1	B3
13-130	Râmeţ	Curmatura	STP 5	--
13-131	Râmeţ	Curmatura	STP 7	--
13-132	Stremt	Roman	SITE GRAB	--
13-133	Râmeţ	Curmatura	UNIT 1	B4

13-134	Râmeţ	Curmatura	UNIT 1	B5
13-135	Râmeţ	Curmatura	STP 8	--
13-136	Râmeţ	Gugului	STP 1	--
13-137	Râmeţ	Gugului	STP 5	--
13-138	Râmeţ	Curmatura	STP 11	--
13-139	Râmeţ	Curmatura	UNIT 1	W PROFILE - 37cm BD
13-140	Râmeţ	Curmatura	UNIT 2	A1
13-141	Râmeţ	Curmatura	UNIT 2	B1
13-142	Râmeţ	Gugului	STP 7	--
13-143	Râmeţ	Curmatura	UNIT 2	B1
13-144	Râmeţ	Curmatura	UNIT 2	B2
13-145	Râmeţ	Curmatura	UNIT 2	C1
13-146	Râmeţ	Curmatura	UNIT 2	C2
13-147	Râmeţ	Curmatura	UNIT 2	C3
13-148	Râmeţ	Gugului	UNIT 1	A1
13-149	Râmeţ	Gugului	UNIT 1	B1
13-150	Râmeţ	Gugului	UNIT 1	B2
13-151	Râmeţ	Curmatura	UNIT 4	A1
13-152	Râmeţ	Curmatura	UNIT 3	A1
13-153	Râmeţ	Curmatura	UNIT 3	B1
13-154	Râmeţ	Curmatura	UNIT 4	B1
13-155	Râmeţ	Gugului	UNIT 1	B3
13-156	Râmeţ	Curmatura	UNIT 3	B2
13-157	Râmeţ	Curmatura	UNIT 4	C1
13-158	Râmeţ	Curmatura	UNIT 3	C1
13-159	Râmeţ	Curmatura	UNIT 3	C2
13-160	Râmeţ	Curmatura	UNIT 4	C2
13-161	Râmeţ	Curmatura	UNIT 3	C3
13-162	Râmeţ	Curmatura	UNIT 1	GRAB - BACKFILL
13-163	Capud	N side entrance to village	SITE GRAB	
13-164	Petelca	possible site S of village	SITE GRAB	
13-165	Petelca	possible site S of village	SITE GRAB	
13-166	Petelca	N of village 3	SITE GRAB	
13-167	Petelca	N of village 2	SITE GRAB	
13-168	Petelca	Cascada (South End)	SITE GRAB	
13-169	Petelca	Cascada (North End)	SITE GRAB	
13-170	Teius	N side of town	DAILY FIELD GRAB	
13-171	Teius	N side of town	SITE GRAB	
13-172	Teius	N side of town	SITE GRAB	
13-173	Teius	Fantana Viilor N of stream	SITE GRAB	
13-174	Teius	N side of town	DAILY FIELD GRAB	
13-175	Teius	Fantana Viilor N of stream	SITE GRAB	
13-176	Teius	N side of town	DAILY FIELD GRAB	
13-177	Girbova de Jos	In Coasta	SITE GRAB	
13-178	Girbova de Jos	In Coasta	SITE GRAB	
13-179	Girbova de Jos	In Coasta	SITE GRAB	
13-180	Sard	Bilag	SITE GRAB	

13-181	Sard	Bilag	SITE GRAB	
13-182	Sard	Bilag	SITE GRAB	
13-183	Santimbru	N of town terrace edge	SITE GRAB	
13-184	Bărăbanț	Bilag - terrace edge across from factory	SITE GRAB	
13-185	Capud	Between Magura and village plowed field	SITE GRAB	
13-186	Capud	Between Magura and village plowed field	SITE GRAB	
13-187	Capud	Between Magura and village southern corn field	SITE GRAB	
13-188	Capud	Between Magura and village southern half, Northern field	SITE GRAB	
13-189	Capud	Between Magura and village northern half, Northern field	SITE GRAB	
13-190	Teius	Fantana Viilor N of stream	SITE GRAB	
13-191	Teius	Fantana Viilor N of stream	SITE GRAB	
13-192	Teius	Fantana Viilor N of stream	SITE GRAB	
13-193	Teius	Fantana Viilor S of stream	SITE GRAB	
13-194	Teius	Fantana Viilor S of stream	SITE GRAB	
13-195	Teius	Fantana Viilor S of stream	SITE GRAB	
13-196	Teius	in town south of Geoagiu	SITE GRAB	
13-197	Teius	Coasta	SITE GRAB	
13-198	Teius	SW high terrace below Berc	DAILY FIELD GRAB	
14-001	Teius	Fantana Viilor	STP 1	
14-002	Teius	Fantana Viilor	STP 2	
14-003	Teius	Fantana Viilor	STP 3	
14-004	Teius	Fantana Viilor	STP 4	
14-005	Teius	Fantana Viilor	STP 5	
14-006	Teius	Fantana Viilor	SITE GRAB	
14-007	Teius	Fantana Viilor	UNIT 1	A1
14-008	Teius	Fantana Viilor	UNIT 1	A1
14-009	Teius	Fantana Viilor	UNIT 1	B1
14-010	Teius	Fantana Viilor	UNIT 1	B2
14-011	Teius	Fantana Viilor	UNIT 1	B2
14-012	Teius	Fantana Viilor	UNIT 1	B3
14-013	Teius	Fantana Viilor	STP 6	
14-014	Teius	Fantana Viilor	STP 7	
14-015	Teius	Fantana Viilor	STP 8	
14-016	Teius	Fantana Viilor	UNIT 2	A1
14-017	Teius	Fantana Viilor	UNIT 3	A1
14-018	Teius	Fantana Viilor	UNIT 2	B1
14-019	Teius	Fantana Viilor	UNIT 3	B1
14-020	Teius	Fantana Viilor	UNIT 2	B2
14-021	Teius	Fantana Viilor	UNIT 3	B2
14-022	Teius	Fantana Viilor	UNIT 2	B2
14-023	Teius	Fantana Viilor	UNIT 3	B2
14-024	Teius	Fantana Viilor	UNIT 3	C1

14-025	Teius	Fantana Viilor	UNIT 2	C1
14-026	Teius	Fantana Viilor	UNIT 3	C2
14-027	Teius	Fantana Viilor	UNIT 2	C2
14-028	Teius	Fantana Viilor	UNIT 3	C1
14-029	Teius	Fantana Viilor	UNIT 2	C2
14-030	Teius	Fantana Viilor	UNIT 3	D1
14-031	Teius	Fantana Viilor	UNIT 3	D2
14-032	Teius	Fantana Viilor	UNIT 2	C3
14-033	Teius	Fantana Viilor	UNIT 2	D1
14-034	Petelca	Cascada	SITE GRAB	--
14-035	Petelca	Cascada	UNIT 4	55CM BS
14-036	Petelca	Cascada	UNIT 3	100CM BS; 85CM AS
14-037	Petelca	Cascada	SITE GRAB	--
14-038	Petelca	Cascada	UNIT 3	0-30CM BS
14-039	Petelca	Cascada	UNIT 3	30-60CM BS
14-040	Petelca	Cascada	UNIT 3	60-90CM BS
14-041	Petelca	Cascada	UNIT 3	90-120CM BS
14-042	Petelca	Cascada	UNIT 2	2
14-043	Petelca	Cascada	UNIT 2	3
14-044	Petelca	Cascada	UNIT 2	4
14-045	Petelca	Cascada	UNIT 2	5
14-046	Petelca	Cascada	UNIT 2	3
14-047	Petelca	Cascada	UNIT 2	3
14-048	Petelca	Cascada	UNIT 2	3
14-049	Petelca	Cascada	SITE GRAB	--
14-050	Petelca	Cascada	UNIT 2	1
14-051	Petelca	Cascada	UNIT 2	2
14-052	Petelca	Cascada	UNIT 2	3
14-053	Petelca	Cascada	UNIT 2	4
14-054	Petelca	Cascada	UNIT 2	5
14-055	Petelca	Cascada	UNIT 4	4
14-056	Petelca	Cascada	SITE GRAB	--
14-057	Petelca	Cascada	SITE GRAB	--
14-058	Petelca	Cascada	UNIT 4	2
14-059	Petelca	Cascada	UNIT 4	3
14-060	Petelca	Cascada	UNIT 4	4
14-061	Petelca	Cascada	UNIT 4	5
14-062	Petelca	Cascada	UNIT 4	6
14-063	Petelca	Cascada	UNIT 3	1
14-064	Petelca	Cascada	UNIT 3	2
14-065	Petelca	Cascada	UNIT 3	3
14-066	Petelca	Cascada	UNIT 3	4
14-067	Petelca	Cascada	UNIT 3	5
14-068	Petelca	Cascada	UNIT 1	UPPER CLEAN
14-069	Petelca	Cascada	UNIT 1	MIDDLE CLEAN
14-070	Petelca	Cascada	UNIT 1	LOWER CLEAN
14-071	Petelca	Cascada	UNIT 1 TRENCH	E-F
14-072	Petelca	Cascada	UNIT 1 TRENCH	F-G

14-073	Sebes	Intre Rastoace	UNIT 1	B1
14-074	Sebes	Intre Rastoace	UNIT 1	B2
14-075	Sebes	Intre Rastoace	UNIT 1	C1
14-076	Sebes	Intre Rastoace	UNIT 1	C1
14-077	Petelca	Cascada	UNIT 1	A2
14-078	Petelca	Cascada	UNIT 1 TRENCH	161-165CM BD
14-079	Petelca	Cascada	UNIT 1 TRENCH	165-175CM BD
14-080	Petelca	Cascada	UNIT 1	A3
14-081	Petelca	Cascada	UNIT 1	B1
14-082	Petelca	Cascada	UNIT 1 TRENCH	175-193CM BD
14-083	Petelca	Cascada	UNIT 1 TRENCH	193-198CM BD
14-084	Petelca	Cascada	UNIT 1	B2
14-085	Petelca	Cascada	UNIT 1	B3
14-086	Petelca	Cascada	UNIT 1 TRENCH	198-208CM BD
14-087	Petelca	Cascada	UNIT 6	--
14-088	Petelca	Cascada	UNIT 1	B4
14-089	Teius	Coasta	STP 1	A
14-090	Teius	Coasta	STP 1	B
14-091	Teius	Coasta	STP 2	A
14-092	Teius	Coasta	STP 2	B
14-093	Teius	Coasta	STP 3	A
14-094	Teius	Coasta	STP 3	B
14-095	Teius	Coasta	STP 5	A
14-096	Teius	Coasta	UNIT 1	A1
14-097	Teius	Coasta	STP 3	C1
14-098	Teius	Coasta	STP 3	C2
14-099	Teius	Coasta	UNIT 1	B1
14-100	Teius	Coasta	UNIT 1	B1
14-101	Teius	Coasta	UNIT 2	A1
14-102	Teius	Coasta	UNIT 2	B1
14-103	Teius	Coasta	UNIT 1	B2
14-104	Teius	Coasta	UNIT 1	B2
14-105	Petelca	Cascada	UNIT 1	B5
14-106	Petelca	Cascada	UNIT 1	C1
14-107	Petelca	Cascada	UNIT 1	C2
14-108	Petelca	Cascada	UNIT 1	C2
14-109	Petelca	Cascada	UNIT 1	D1
14-110	Petelca	Cascada	UNIT 1	E1
14-111	Petelca	Cascada	UNIT 1	E2
14-112	Petelca	Cascada	UNIT 1	F1
14-113	Petelca	Cascada	UNIT 1	F2
14-114	Petelca	Cascada	UNIT 1	G1
14-115	Petelca	Cascada	UNIT 1 TRENCH	B
14-116	Petelca	Cascada	UNIT 1 TRENCH	C
14-117	Petelca	Cascada	UNIT 1 TRENCH	D
14-118	Petelca	Cascada	UNIT 1 TRENCH	E
14-119	Petelca	Cascada	UNIT 1 TRENCH	F1
14-120	Petelca	Cascada	UNIT 1 TRENCH	F2

14-121	Petelca	Cascada	UNIT 1 TRENCH	G1
14-122	Petelca	Cascada	UNIT 1 TRENCH	H
14-123	Petelca	Cascada	UNIT 1 TRENCH	I
14-124	Petelca	Cascada	UNIT 1	G2
14-125	Petelca	Cascada	UNIT 1	H1
14-126	Petelca	Cascada	UNIT 1	I1
14-127	Girbova de Jos	In Coasta	STP 4	--

Appendix D – Ceramic Analysis Database

Ceramics were analyzed based on fabric quality. The samples came from test excavation units at Geoagiu de Sus-*Fântâna Mare* (GFM), Stremț-*Fabrica de Alcool* (SF), Geoagiu de Sus-*Viile Satului* (GVS), Teiuș-*Coastă* (TC), Teiuș-*Fântâna Viilor* (TFV), Pețelca-*Cascadă* (PC), and Stremț-*Berc 1* (SB 1).

Table D.1 – Counts and weights of diagnostic ceramic fabrics by lot number.

Lot Number	Site	Coarse		Medium		Fine		Super Fine	
		Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)
12-073	GFM	0	0	0	0	0	0	0	0
12-078	GFM	2	77.1	5	24.5	0	0	1	3.7
12-080	GFM	0	0	5	18.2	0	0	2	2.4
12-082	GFM	0	0	0	0	0	0	0	0
12-085	GFM	0	0	22	70	3	11.2	3	10.9
12-088	GFM	2	81.6	34	324.6	13	90.6	5	35.1
12-090	GFM	0	0	34	306.5	14	109.6	9	65.1
12-093	GFM	1	44.6	24	284.8	9	64.5	4	9.3
12-097	GFM	4	124.7	32	295.2	12	164	9	52.1
12-099	GFM	0	0	5	49.2	2	7.5	1	3.8
12-102	GFM	0	0	0	0	1	11.5	0	0
13-027	SF	3	17.5	5	65.4	1	28.2	0	0
13-030	SF	0	0	1	0.6	1	1.1	0	0
13-032	SF	0	0	1	6	0	0	0	0
13-033	SF	3	31.1	1	2.5	0	0	0	0
13-038	SF	0	0	5	124.3	2	4.7	0	0
13-040	SF	0	0	3	11.9	0	0	0	0
13-045	SF	0	0	1	2	1	2.2	0	0
13-046	SF	0	0	6	34.6	0	0	0	0
13-047	SF	0	0	7	66.8	4	14.6	0	0
13-050	GVS	1	6.6	0	0	0	0	0	0
13-051	SF	0	0	1	4.1	0	0	0	0
13-052	SF	1	16.7	3	67.5	1	12.9	1	1.8
13-054	GVS	0	0	0	0	0	0	0	0
13-055	GVS	0	0	0	0	0	0	0	0
13-056	GVS	0	0	1	4.1	0	0	0	0
13-057	SF	1	56.4	3	17.2	0	0	0	0
13-058	GVS	0	0	3	34.4	0	0	0	0

13-059	SF	0	0	5	20.7	0	0	0	0
13-060	SF	1	5.8	1	2.2	0	0	0	0
13-062	GVS	0	0	0	0	0	0	0	0
13-063	GVS	0	0	0	0	0	0	0	0
13-064	SF	0	0	0	0	0	0	0	0
13-065	GVS	0	0	0	0	1	0.7	0	0
13-067	SF	0	0	1	4.7	0	0	0	0
13-068	GVS	0	0	2	18	0	0	2	29.9
13-069	GVS	0	0	0	0	0	0	0	0
13-070	SF	0	0	0	0	0	0	0	0
13-071	GVS	0	0	2	11.6	0	0	0	0
13-072	SF	0	0	0	0	0	0	0	0
13-073	GVS	0	0	0	0	1	3.4	3	51.7
13-074	GVS	0	0	0	0	1	3.3	0	0
13-084	SF	0	0	2	55.1	0	0	0	0
13-085	GVS	0	0	1	10	1	6	0	0
13-086	GVS	0	0	0	0	0	0	0	0
13-087	GVS	0	0	4	38.2	1	7.8	1	27.5
13-088	GVS	0	0	0	0	0	0	0	0
13-089	GVS	0	0	0	0	0	0	0	0
13-090	GVS	0	0	2	8.7	1	5.9	2	52.3
13-091	GVS	3	51.5	0	0	2	136.6	4	85.5
13-092	GVS	0	0	2	27.5	1	2.4	3	72.1
13-093	GVS	2	130.1	2	22.2	0	0	2	47.5
13-094	GVS	1	2.8	2	201.3	1	14.3	0	0
13-095	GVS	0	0	0	0	2	11.5	3	98.3
13-096	GVS	0	0	0	0	1	3.3	1	5.4
13-097	GVS	1	10.5	1	16.4	0	0	0	0
13-098	GVS	0	0	0	0	1	7.8	1	6.6
13-099	GVS	0	0	0	0	0	0	0	0
13-100	GVS	0	0	0	0	0	0	0	0
13-101	GVS	0	0	1	12.1	0	0	1	21.9
13-102	GVS	0	0	0	0	0	0	0	0
13-103	GVS	0	0	0	0	1	148.6	3	13.7
13-104	GVS	0	0	0	0	0	0	0	0
13-105	GVS	0	0	0	0	0	0	2	40.5
13-106	GVS	0	0	0	0	0	0	0	0
13-107	GVS	0	0	1	11.7	0	0	1	17.3
13-108	GVS	0	0	0	0	0	0	1	3.8
13-109	GVS	0	0	0	0	0	0	2	43
13-110	SF	0	0	0	0	0	0	0	0

13-111	SF	0	0	0	0	0	0	0	0
13-113	GVS	0	0	0	0	0	0	3	6.9
13-114	GVS	0	0	0	0	0	0	2	62.2
13-115	GVS	0	0	0	0	1	19.3	2	4.9
13-116	GVS	0	0	0	0	0	0	1	4.9
13-117	GVS	0	0	0	0	0	0	1	4.5
13-118	GVS	0	0	1	2.2	0	0	0	0
13-119	GVS	0	0	0	0	0	0	4	81.6
13-120	GVS	0	0	0	0	0	0	1	5.2
14-045	PC	0	0	0	0	0	0	0	0
14-117	PC	0	0	0	0	1	1.4	0	0
14-001	TFV	0	0	1	13.2	1	6.6	0	0
14-002	TFV	0	0	1	24.8	0	0	0	0
14-003	TFV	0	0	0	0	0	0	0	0
14-004	TFV	0	0	0	0	0	0	0	0
14-005	TFV	0	0	0	0	0	0	0	0
14-009	TFV	0	0	9	78	3	49.1	0	0
14-010	TFV	0	0	4	191.7	0	0	5	80.9
14-011	TFV	0	0	8	525.8	4	151.9	0	0
14-012	TFV	0	0	5	109.6	2	12.4	2	66.5
14-013	TFV	0	0	3	25.9	0	0	0	0
14-014	TFV	0	0	4	37.8	1	3.7	0	0
14-015	TFV	0	0	3	19.2	0	0	0	0
14-018	TFV	0	0	3	80.4	0	0	0	0
14-019	TFV	0	0	3	31.2	0	0	0	0
14-020	TFV	0	0	3	57.1	1	41.3	0	0
14-021	TFV	0	0	4	23.5	1	2.7	0	0
14-022	TFV	0	0	1	12.6	1	34	0	0
14-023	TFV	0	0	0	0	0	0	0	0
14-025	TFV	0	0	10	155.5	2	10.9	0	0
14-036	PC	0	0	0	0	1	25	0	0
14-039	PC	0	0	0	0	0	0	0	0
14-040	PC	0	0	1	7.9	2	14.7	0	0
14-041	PC	0	0	1	4.4	1	3	1	1.6
14-042	PC	0	0	0	0	0	0	0	0
14-043	PC	0	0	0	0	1	8.5	0	0
14-044	PC	0	0	0	0	0	0	0	0
14-046	PC	0	0	2	99.7	2	13.3	2	8.3
14-047	PC	0	0	2	106.6	4	56.4	0	0
14-048	PC	0	0	0	0	0	0	0	0
14-052	PC	1	34.2	1	114.5	0	0	1	53.7

14-053	PC	0	0	1	19.9	0	0	0	0
14-054	PC	0	0	0	0	1	22.3	0	0
14-055	PC	0	0	0	0	0	0	1	75.1
14-059	PC	0	0	0	0	2	98.7	1	13.3
14-060	PC	0	0	1	4.4	0	0	1	34.1
14-061	PC	0	0	1	31.4	0	0	0	0
14-065	PC	1	27.9	3	61.5	3	21.2	3	99.2
14-066	PC	1	36.3	1	17.2	1	26.2	0	0
14-068	PC	0	0	3	18.5	0	0	0	0
14-069	PC	0	0	13	220.1	1	12	3	23.1
14-070	PC	0	0	14	342.8	2	13.8	3	65.7
14-071	PC	1	56.5	10	178.6	2	29.1	1	5.1
14-071	PC	0	0	0	0	0	0	0	0
14-072	PC	1	27.3	1	26	2	10.3	0	0
14-078	PC	0	0	5	39.2	1	10.3	1	2.7
14-079	PC	0	0	0	0	0	0	0	0
14-082	PC	0	0	2	14.7	0	0	1	5.5
14-083	PC	0	0	0	0	1	6.6	0	0
14-086	PC	0	0	1	5.3	0	0	0	0
14-108	PC	0	0	1	6.5	1	5.4	2	8.5
14-110	PC	0	0	7	126.2	4	14.1	0	0
14-111	PC	0	0	5	132.7	0	0	0	0
14-112	PC	1	67.7	6	172.5	3	27.9	6	33
14-113	PC	1	29.5	1	11.8	1	14.9	0	0
14-114	PC	0	0	3	12.2	2	6.6	0	0
14-115	PC	0	0	0	0	0	0	0	0
14-118	PC	1	14.8	5	56.6	0	0	1	3.4
14-119	PC	0	0	5	36.1	0	0	5	13.1
14-120	PC	0	0	2	47	2	30.4	2	64.9
14-121	PC	2	27.2	10	84	0	0	1	4.3
14-122	PC	0	0	0	0	1	2.8	0	0
14-123	PC	0	0	0	0	0	0	0	0
14-124	PC	0	0	4	52.4	2	3.7	0	0
14-125	PC	0	0	0	0	0	0	0	0
14-126	PC	0	0	1	6.5	0	0	0	0
14-035	PC	0	0	1	14.3	0	0	0	0
12-054	SB 1	1	7.64	6	39.08	2	13.46	0	0.00
14-089	TC	0	0.00	2	34.19	0	0.00	0	0.00
14-090	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-091	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-092	TC	0	0.00	6	41.05	2	5.36	0	0.00

14-093	TC	0	0.00	1	2.11	0	0.00	0	0.00
14-094	TC	1	19.78	1	4.63	1	3.04	0	0.00
14-095	TC	0	0.00	1	14.01	0	0.00	0	0.00
14-096	TC	1	14.47	5	19.10	0	0.00	0	0.00
14-097	TC	0	0.00	2	55.46	1	11.18	0	0.00
14-098	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-099	TC	8	187.21	17	219.99	4	48.24	0	0.00
14-100	TC	2	8.98	14	247.86	0	0.00	0	0.00
14-101	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-102	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-103	TC	1	12.52	8	142.89	4	20.49	0	0.00
14-104	TC	6	60.25	15	165.68	5	74.68	0	0.00

Table D.2 – Counts and weights of non-diagnostic ceramic fabrics by lot number.

Lot Number	Site	Coarse		Medium		Fine		Super Fine	
		Count	Weight (g)	Count	Weight (g)	Count	Weight (g)	Count	Weight (g)
12-073	GFM	0	0	0	0	0	0	0	0
12-078	GFM	0	0	10	46.8	0	0	0	0
12-080	GFM	0	0	21	43.2	1	2.9	0	0
12-082	GFM	0	0	3	9.7	0	0	0	0
12-085	GFM	5	39.7	65	221.1	4	14.5	15	60.4
12-088	GFM	9	73	104	417.9	10	75.5	25	70.2
12-090	GFM	7	95.2	156	877.4	51	288.9	27	106.8
12-093	GFM	8	61	99	401.2	14	84.3	27	85
12-097	GFM	25	225.5	163	867	31	153.5	28	100.8
12-099	GFM	0	0	12	57.8	6	14.5	0	0
12-102	GFM	0	0	0	0	0	0	0	0
13-027	SF	0	0	20	100.6	2	29	0	0
13-030	SF	2	4.4	14	66.4	2	18.2	1	2.2
13-032	SF	0	0	2	11.6	0	0	0	0
13-033	SF	4	28.2	18	78.3	2	7.3	0	0
13-038	SF	3	48.7	25	164.6	3	11.2	2	7.5
13-040	SF	0	0	14	40.4	3	6.8	1	1.1
13-045	SF	0	0	14	82.4	0	0	1	0
13-046	SF	0	0	28	108.2	1	3.5	0	0
13-047	SF	0	0	35	140.4	3	8.2	0	0
13-050	GVS	0	0	4	15.8	1	0.9	1	3.1
13-051	SF	0	0	19	74.5	1	0.5	0	0
13-052	SF	3	15	15	22.3	0	0	0	0

13-054	GVS	0	0	0	0	0	0	0	0
13-055	GVS	0	0	3	10.8	0	0	0	0
13-056	GVS	0	0	1	6	0	0	0	0
13-057	SF	2	19.8	17	64.6	1	2.9	0	0
13-058	GVS	8	13.7	2	7.3	1	2	1	1
13-059	SF	2	24.7	20	69.1	1	0.3	0	0
13-060	SF	4	123.2	7	20.4	1	14.8	0	0
13-062	GVS	0	0	3	7.4	1	4	0	0
13-063	GVS	0	0	2	12.5	0	0	0	0
13-064	SF	0	0	3	9	2	14.7	0	0
13-065	GVS	0	0	8	39.9	1	8.3	0	0
13-067	SF	0	0	0	0	0	0	0	0
13-068	GVS	2	1.93	0	0	0	0	0	0
13-069	GVS	0	0	1	4.3	0	0	0	0
13-070	SF	0	0	1	1.9	0	0	0	0
13-071	GVS	1	5.8	8	15.3	1	2.9	0	0
13-072	SF	0	0	5	15	0	0	0	0
13-073	GVS	1	8.2	3	4.4	4	16.3	1	13.5
13-074	GVS	0	0	0	0	0	0	0	0
13-084	SF	0	0	12	93.4	0	0	0	0
13-085	GVS	0	0	3	8.1	0	0	1	17
13-086	GVS	0	0	0	0	0	0	0	0
13-087	GVS	2	187.7	13	58.3	1	1.4	1	0.6
13-088	GVS	0	0	0	0	0	0	0	0
13-089	GVS	0	0	1	7.7	0	0	1	5.6
13-090	GVS	1	20.5	1	8.4	0	0	0	0
13-091	GVS	8	94.4	10	53.1	2	3.8	2	32.3
13-092	GVS	4	25.2	5	42.5	2	44.6	3	35.2
13-093	GVS	0	0	7	55.4	1	8	0	0
13-094	GVS	0	0	5	25.4	1	14.3	1	38.7
13-095	GVS	1	18	7	43.7	1	3	2	8
13-096	GVS	0	0	3	29.8	1	4.3	2	60
13-097	GVS	0	0	0	0	0	0	0	0
13-098	GVS	0	0	0	0	3	10.2	1	3.4
13-099	GVS	0	0	1	3.4	0	0	0	0
13-100	GVS	0	0	0	0	0	0	0	0
13-101	GVS	0	0	2	56.6	2	14.4	0	0
13-102	GVS	0	0	2	19.9	0	0	0	0
13-103	GVS	0	0	0	0	1	11.7	1	1
13-104	GVS	0	0	0	0	0	0	0	0
13-105	GVS	0	0	0	0	0	0	2	15.9

13-106	GVS	0	0	5	56.3	0	0	1	2.5
13-107	GVS	0	0	0	0	0	0	1	1.1
13-108	GVS	0	0	3	2.6	0	0	0	0
13-109	GVS	0	0	1	0.4	1	2.6	3	22.5
13-110	SF	0	0	3	5.7	1	3.8	0	0
13-111	SF	0	0	0	0	0	0	0	0
13-113	GVS	2	68.7	3	22.6	1	5.5	2	17.7
13-114	GVS	0	0	1	10.9	0	0	0	0
13-115	GVS	0	0	10	78.6	5	13.1	10	30
13-116	GVS	0	0	3	38.7	0	0	1	1.9
13-117	GVS	0	0	1	8.2	1	3.1	0	0
13-118	GVS	0	0	0	0	0	0	1	4.6
13-119	GVS	1	37.5	2	54	1	3.5	0	0
13-120	GVS	0	0	0	0	1	5.1	2	56.4
14-045	PC	0	0	2	5.7	0	0	0	0
14-117	PC	0	0	12	34.5	4	8.6	0	0
14-001	TFV	0	0	8	15.2	0	0	0	0
14-002	TFV	0	0	0	0	0	0	0	0
14-003	TFV	0	0	5	75.4	0	0	0	0
14-004	TFV	0	0	1	8.8	1	2.6	0	0
14-005	TFV	0	0	8	38.1	0	0	0	0
14-009	TFV	15	306.4	22	163.9	3	45.5	0	0
14-010	TFV	0	0	6	389.2	1	31.4	0	0
14-011	TFV	0	0	38	727.4	3	34	14	145.6
14-012	TFV	0	0	8	150.6	8	84.8	2	11.3
14-013	TFV	0	0	6	44.8	0	0	0	0
14-014	TFV	0	0	14	179.8	1	2.6	0	0
14-015	TFV	0	0	2	15.4	1	4.9	0	0
14-018	TFV	0	0	11	40.1	1	4.3	0	0
14-019	TFV	0	0	6	54	3	11.6	0	0
14-020	TFV	2	50.4	18	420.3	6	40.6	2	21.3
14-021	TFV	0	0	6	32.1	1	3.9	0	0
14-022	TFV	0		11	105.3	4	48.6	0	0
14-023	TFV	0	0	5	25.6	4	31.4	0	0
14-025	TFV	0	0	23	254.8	4	65.6	0	0
14-036	PC	0	0	1	20.3	1	35.6	0	0
14-039	PC	0	0	1	24.8	0	0	0	0
14-040	PC	0	0	3	14.9	1	4.1	0	0
14-041	PC	0	0	4	15.6	1	5.5	0	0
14-042	PC	0	0	3	61.2	0	0	0	0
14-043	PC	0	0	0	0	0	0	0	0

14-044	PC	0	0	1	9	0	0	0	0
14-046	PC	0	0	1	4.5	0	0	1	10.6
14-047	PC	1	12.2	10	152	0	0	0	0
14-048	PC	0	0	3	8.8	1	7.5	0	0
14-052	PC	16	167	0	0	6	32.5	1	2.9
14-053	PC	0	0	5	32.5	1	2.1	0	0
14-054	PC	0	0	2	18.6	0	0	0	0
14-055	PC	0	0	0	0	0	0	1	23.3
14-059	PC	1	7.6	1	36.8	2	61	0	0
14-060	PC	0	0	0	0	0	0	0	0
14-061	PC	0	0	0	0	0	0	0	0
14-065	PC	0	0	24	233.3	4	20.1	4	27.6
14-066	PC	1	5.3	3	17.6	2	11.4	1	1.9
14-068	PC	3	14.7	23	112.5	5	14.4	0	0
14-069	PC	0	0	21	152.7	4	14.9	3	15.6
14-070	PC	0	0	12	105.2	2	3.2	0	0
14-071	PC	0	0	0	0	0	0	0	0
14-071	PC	0	0	32	459.8	3	16.8	3	45.9
14-072	PC	2	49.5	20	183.4	9	78.3	2	32.1
14-078	PC	2	30	23	214.6	2	12.5	0	0
14-079	PC	1	20.7	5	35.2	0	0	0	0
14-082	PC	0	0	10	51.1	2	5.5	2	3.2
14-083	PC	0	0	2	9.4	1	4.1	0	0
14-086	PC	1	30.1	0	0	0	0	0	0
14-108	PC	8	77.3	22	64.9	6	20.7	0	0
14-110	PC	2	21.7	40	248.8	11	63.1	0	0
14-111	PC	1	8.4	17	157.4	3	14.3	3	20.3
14-112	PC	3	108.4	33	251	9	60.5	6	40.5
14-113	PC	1	29.7	9	86.8	1	3.7	3	60.9
14-114	PC	0	0	10	58.4	2	8.8	0	0
14-115	PC	0	0	1	3.8	0	0	0	0
14-118	PC	5	29.5	21	118.3	9	26.9	1	2
14-119	PC	6	83.9	34	160.5	3	11.2	0	0
14-120	PC	5	160.3	19	123	7	24.1	1	0.9
14-121	PC	3	51.7	19	62.6	4	24.2	0	0
14-122	PC	0	0	1	3.5	0	0	0	0
14-123	PC	0	0	1	6.7	0	0		
14-124	PC	0	0	6	17	5	18	1	1.3
14-125	PC	0	0	4	24	0	0	0	0
14-126	PC	0	0	0	0	0	0	0	0
14-035	PC	0	0	0	0	0	0	0	0

12-054	SB 1	6	24.09	27	68.99	7	16.23	0	0.00
14-089	TC	2	9.37	6	46.93	2	3.09	0	0.00
14-090	TC	0	0.00	2	7.87	0	0.00	0	0.00
14-091	TC	0	0.00	4	282.90	0	0.00	0	0.00
14-092	TC	2	31.48	36	198.45	7	16.90	0	0.00
14-093	TC	0	0.00	4	11. 62	0	0.00	0	0.00
14-094	TC	2	14.98	12	40.43	5	15.27	0	0.00
14-095	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-096	TC	4	13.79	33	102.71	7	12.58	0	0.00
14-097	TC	0	0.00	7	30.75	5	13.83	0	0.00
14-098	TC	0	0.00	0	0.00	0	0.00	0	0.00
14-099	TC	15	227.56	81	454.31	23	147.30	0	0.00
14-100	TC	11	86.30	36	194.15	4	20.41	0	0.00
14-101	TC	1	6.37	11	54.37	1	8.97	0	0.00
14-102	TC	2	24.50	6	33.77	0	0.00	0	0.00
14-103	TC	6	45.90	29	185.52	8	24.71	0	0.00
14-104	TC	10	71.82	73	281.87	32	171.65	0	0.00

Appendix E – Faunal Analysis Database

The faunal analysis was conducted at the University of Michigan Museum of Anthropological Archaeology by Jordan Dalton, with assistance from Amy Nicodemus. The samples came from test excavation units at Geoagiu de Sus-*Fântâna Mare* (GFM), Stremț-*Fabrica de Alcool* (SF), Geoagiu de Sus-*Viile Satului* (GVS), Teiuș-*Coastă* (TC), Teiuș-*Fântâna Viilor* (TFV), Pețelca-*Cascadă* (PC), and Stremț-*Berc 1* (SB 1). Taxa include abbreviations such as large mammal (MM), medium mammal (MM), Small mammal (SM), and unidentifiable (UnID).

Table E.1 – Faunal assemblage.

LOT	Time Period	Phase	Ceramic Style	Site	Taxon	SM; MM; LM; River; Bird; UnID	Domest; Wild; UnID	Count	Culture
12-085	LBA	Terminal	Wietenberg C	GFM	rabbit	SM	Wild	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	SM	SM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	cow	LM	Domest.	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	SM	SM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	rabbit	SM	Wild	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	2	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	22	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	3	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	6	Wietenberg

12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	goat	MM	Domest.	2	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-085	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	river mussel	River	Wild	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	cow	LM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	pig	MM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	cow	LM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	cow	LM	Domest.	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	pig	MM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	sheep/ goat	MM	Domest.	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	roe deer	MM	Wild	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	8	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	SM	SM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	3	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	13	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	4	Wietenberg
12-088	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	20	Wietenberg

12-088	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	9	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	red deer	LM	Wild	3	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	red deer	LM	Wild	2	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	6	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	5	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	red deer	LM	Wild	2	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	pig	MM	Domest.	5	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	pig	MM	Domest.	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	4	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	rabbit	SM	Wild	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	8	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	22	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	8	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	3	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	7	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	6	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	2	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-090	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	7	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	pig	MM	Domest.	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	rabbit	SM	Wild	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	2	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	3	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	UnID	UnID	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	2	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	21	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	LM	LM	UnID	5	Wietenberg

12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	2	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	9	Wietenberg
12-093	LBA	Terminal	Wietenberg C	GFM	MM	MM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	rabbit	SM	Wild	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	MM	MM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	MM	MM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	7	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	MM	MM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	MM	MM	UnID	2	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	pig	MM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	bird (duck?)	Bird	Wild	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	pig	MM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	pig	MM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	cow	LM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	19	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	sheep/ goat	MM	Domest.	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	UnID	UnID	UnID	5	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	MM	MM	UnID	14	Wietenberg
12-097	MBA	Formative	Wietenberg A	GFM	UnID	UnID	UnID	2	Wietenberg
12-099	MBA	Formative	Wietenberg A	GFM	rabbit	SM	Wild	1	Wietenberg
12-099	MBA	Formative	Wietenberg A	GFM	LM	LM	UnID	1	Wietenberg
13-037	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	1	LBA
14-009	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-009	LBA	Noua	Noua	TFV	horse	LM	Domest.	1	Noua
14-009	LBA	Noua	Noua	TFV	pig	MM	Domest.	1	Noua
14-009	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-009	LBA	Noua	Noua	TFV	cow	LM	Domest.	1	Noua
14-009	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-009	LBA	Noua	Noua	TFV	LM	LM	UnID	2	Noua
14-009	LBA	Noua	Noua	TFV	LM	LM	UnID	8	Noua

14-009	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-009	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-009	LBA	Noua	Noua	TFV	UnID	UnID	UnID	1	Noua
14-009	LBA	Noua	Noua	TFV	LM	LM	UnID	6	Noua
14-010	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-010	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-010	LBA	Noua	Noua	TFV	horse	LM	Domest.	1	Noua
14-010	LBA	Noua	Noua	TFV	LM	LM	UnID	4	Noua
14-010	LBA	Noua	Noua	TFV	MM	MM	UnID	2	Noua
14-010	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-010	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-010	LBA	Noua	Noua	TFV	pig	MM	Domest.	1	Noua
14-010	LBA	Noua	Noua	TFV	UnID	UnID	UnID	1	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	2	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	3	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	4	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	2	Noua
14-011	LBA	Noua	Noua	TFV	pig	MM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	2	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	river mussel	River	Wild	3	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	3	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	6	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	red deer	LM	Wild	2	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	4	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	2	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	4	Noua
14-011	LBA	Noua	Noua	TFV	sheep/ goat	LM	Domest.	1	Noua
14-011	LBA	Noua	Noua	TFV	UnID	UnID	UnID	5	Noua
14-011	LBA	Noua	Noua	TFV	MM	MM	UnID	2	Noua

14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	5	Noua
14-011	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-012	LBA	Noua	Noua	TFV	cow	LM	Domest.	2	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-012	LBA	Noua	Noua	TFV	MM	MM	UnID	1	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	1	Noua
14-012	LBA	Noua	Noua	TFV	pig	MM	Domest.	1	Noua
14-012	LBA	Noua	Noua	TFV	sheep/ goat	MM	Domest.	1	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	2	Noua
14-012	LBA	Noua	Noua	TFV	cow	LM	Domest.	2	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	2	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	2	Noua
14-012	LBA	Noua	Noua	TFV	UnID	UnID	UnID	1	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	4	Noua
14-012	LBA	Noua	Noua	TFV	LM	LM	UnID	40	Noua
14-012	LBA	Noua	Noua	TFV	UnID	UnID	UnID	6	Noua
14-043	MBA	Classical	Wietenberg C	PC	MM	MM	UnID	1	Wietenberg
14-046	MBA	Classical	Wietenberg C	PC	cow	LM	Domest.	1	Wietenberg
14-046	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-046	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-046	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	2	Wietenberg
14-046	MBA	Classical	Wietenberg C	PC	river mussel	River	Wild	2	Wietenberg
14-047	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-047	MBA	Classical	Wietenberg C	PC	river mussel	River	Wild	1	Wietenberg
14-048	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-048	MBA	Classical	Wietenberg C	PC	river mussel	River	Wild	2	Wietenberg
14-052	MBA	Classical	Wietenberg C	PC	cow	LM	Domest.	1	Wietenberg
14-052	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-052	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-053	MBA	Formative	Wiet Unknown	PC	river mussel	River	Wild	1	Wietenberg
14-055	MBA	Classical	Wietenberg C	PC	cow	LM	Domest.	1	Wietenberg
14-058	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-059	MBA	Classical	Wietenberg C	PC	LM	LM	UnID	1	Wietenberg
14-060	MBA	Classical	Wietenberg C	PC	river mussel	River	Wild	4	Wietenberg
14-061	MBA	Formative	Wiet Unknown	PC	river mussel	River	Wild	6	Wietenberg
14-066	MBA	Classical	Wietenberg C	PC	river mussel	River	Wild	4	Wietenberg

14-069	LBA	Terminal	Wietenberg B	PC	river mussel	River	Wild	3	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	3	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-069	LBA	Terminal	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-070	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	1	Wietenberg
14-070	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-071	LBA	Terminal	Wietenberg B	PC	river mussel	River	Wild	4	Wietenberg
14-071	LBA	Terminal	Wietenberg B	PC	cow	LM	Domest.	3	Wietenberg
14-071	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-071	LBA	Terminal	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-072	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-072	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-072	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-072	MBA	Formative	Wietenberg B	PC	sheep/ goat	MM	Domest.	1	Wietenberg
14-072	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	4	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	4	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	3	Wietenberg
14-078	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-079	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-079	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-079	MBA	Formative	Wietenberg B	PC	red deer	LM	Wild	1	Wietenberg
14-079	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-082	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	river mussel	River	Wild	8	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	sheep/ goat	MM	Domest.	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	9	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	red deer	LM	Wild	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg

14-110	LBA	Terminal	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	sheep/ goat	MM	Domest.	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	sheep/ goat	MM	Domest.	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	red deer	LM	Wild	1	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-110	LBA	Terminal	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-111	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-111	LBA	Terminal	Wietenberg B	PC	horse	LM	Domest.	1	Wietenberg
14-111	LBA	Terminal	Wietenberg B	PC	pig	MM	Domest.	1	Wietenberg
14-111	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	3	Wietenberg
14-111	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-111	LBA	Terminal	Wietneberg B	PC	river mussel	River	Wild	2	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	red deer	LM	Wild	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	sheep/ goat	MM	Domest.	2	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	horse	LM	Domest.	2	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	2	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	4	Wietenberg
14-112	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	19	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	2	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	4	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	3	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	goat	MM	Domest.	1	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-113	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	4	Wietenberg
14-114	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-114	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg

14-114	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	river mussel	River	Wild	2	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	UnID	UnID	UnID	2	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	6	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	UnID	UnID	UnID	1	Wietenberg
14-118	LBA	Terminal	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	cow	LM	Domest.	1	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	9	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	4	Wietenberg
14-119	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	10	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	4	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	pig	MM	Domest.	1	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-120	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	3	Wietenberg
14-121	MBA	Formative	Wietenberg B	PC	sheep/ goat/ roe deer	MM	Domest.	1	Wietenberg
14-121	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	2	Wietenberg
14-121	MBA	Formative	Wietenberg B	PC	pig	MM	Domest.	1	Wietenberg
14-121	MBA	Formative	Wietenberg B	PC	UnID	UnID	UnID	4	Wietenberg
14-121	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
14-124	MBA	Formative	Wietenberg B	PC	river mussel	River	Wild	1	Wietenberg
14-124	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-124	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	9	Wietenberg
14-124	MBA	Formative	Wietenberg B	PC	LM	LM	UnID	1	Wietenberg
14-124	MBA	Formative	Wietenberg B	PC	MM	MM	UnID	1	Wietenberg
13-050	MBA	Classical	Wietenberg C/D	GVS	red deer	LM	Wild	1	Wietenberg
13-050	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg

13-093	MBA	Classical	Wietenberg C/D	GVS	river mussel	River	Wild	1	Wietenberg
13-093	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	1	Wietenberg
13-093	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-056	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-103	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-103	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-114	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-094	MBA	Classical	Wietenberg C/D	GVS	cow	LM	Domest.	1	Wietenberg
13-094	MBA	Classical	Wietenberg C/D	GVS	sheep/ goat or cow	MM	Domest.	1	Wietenberg
13-094	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	2	Wietenberg
13-117	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-074	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	1	Wietenberg
13-087	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	1	Wietenberg
13-087	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	2	Wietenberg
13-090	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-115	MBA	Classical	Wietenberg C/D	GVS	roe deer	MM	Wild	1	Wietenberg
13-115	MBA	Classical	Wietenberg C/D	GVS	pig	MM	Domest.	1	Wietenberg
13-115	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	2	Wietenberg
13-115	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	2	Wietenberg
13-116	MBA	Classical	Wietenberg C/D	GVS	river mussel	River	Wild	1	Wietenberg
13-116	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	pig	MM	Domest.	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-091	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	2	Wietenberg
13-113	MBA	Classical	Wietenberg C/D	GVS	red deer	LM	Wild	1	Wietenberg
13-065	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg

13-065	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-085	MBA	Classical	Wietenberg C/D	GVS	MM	MM	UnID	1	Wietenberg
13-085	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-096	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-105	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-095	MBA	Classical	Wietenberg C/D	GVS	LM	LM	UnID	1	Wietenberg
13-095	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
13-058	MBA	Classical	Wietenberg C/D	GVS	UnID	UnID	UnID	1	Wietenberg
12-062	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
12-057	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
12-018	EBA	II	EBA Soimus	SB 1	cow	LM	Domest.	1	Soimus
12-018	EBA	II	EBA Soimus	SB 1	MM	MM	UnID	1	Soimus
12-018	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	1	Soimus
12-018	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	2	Soimus
12-018	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	3	Soimus
12-018	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	2	Soimus
12-018	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
12-018	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
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12-064	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	2	Soimus
12-064	EBA	II	EBA Soimus	SB 1	horse	LM	Domest.	1	Soimus
12-064	EBA	II	EBA Soimus	SB 1	horse	LM	Domest.	1	Soimus
12-064	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	1	Soimus
12-064	EBA	II	EBA Soimus	SB 1	MM	MM	UnID	1	Soimus
12-064	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	1	Soimus
12-022	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	4	Soimus
12-022	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	2	Soimus
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12-022	EBA	II	EBA Soimus	SB 1	LM	LM	UnID	1	Soimus
12-022	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	2	Soimus
12-022	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
12-022	EBA	II	EBA Soimus	SB 1	UnID	UnID	UnID	1	Soimus
14-099	EBA	II	EBA Soimus	TC	LM	LM	UnID	1	Soimus
14-099	EBA	II	EBA Soimus	TC	LM	LM	UnID	1	Soimus

14-099	EBA	II	EBA Soimus	TC	LM	LM	UnID	1	Soimus
14-099	EBA	II	EBA Soimus	TC	UnID	UnID	UnID	3	Soimus
14-099	EBA	II	EBA Soimus	TC	LM	LM	UnID	8	Soimus
14-099	EBA	II	EBA Soimus	TC	LM	LM	UnID	2	Soimus
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14-094	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-094	EBA	II	EBA Soimus	TC	UnID	UnID	UnID	2	Soimus
14-094	EBA	II	EBA Soimus	TC	MM	MM	UnID	2	Soimus
14-103	EBA	II	EBA Soimus	TC	LM	LM	UnID	1	Soimus
14-103	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-103	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	1	Soimus
14-103	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-103	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-103	EBA	II	EBA Soimus	TC	MM	MM	UnID	3	Soimus
14-099	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	2	Soimus
14-099	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	1	Soimus
14-099	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	3	Soimus
14-092	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-092	EBA	II	EBA Soimus	TC	UnID	UnID	UnID	1	Soimus
14-092	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
13-059	MBA	Classical	Wietenberg C	SF	pig	MM	Domest.	1	Wietenberg
13-059	MBA	Classical	Wietenberg C	SF	pig	MM	Domest.	1	Wietenberg
13-059	MBA	Classical	Wietenberg C	SF	MM	MM	UnID	4	Wietenberg
13-059	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-059	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	2	Wietenberg
14-100	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	1	Soimus
14-100	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	2	Soimus
14-100	EBA	II	EBA Soimus	TC	MM	MM	UnID	2	Soimus
14-100	EBA	II	EBA Soimus	TC	MM	MM	UnID	1	Soimus
14-104	EBA	II	EBA Soimus	TC	LM	LM	UnID	2	Soimus
14-104	EBA	II	EBA Soimus	TC	LM	LM	UnID	2	Soimus
14-104	EBA	II	EBA Soimus	TC	UnID	UnID	UnID	4	Soimus
14-104	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	1	Soimus
14-104	EBA	II	EBA Soimus	TC	sheep/ goat	MM	Domest.	1	Soimus
13-060	MBA	Classical	Wietenberg C	SF	cow	LM	Domest.	1	Wietenberg
13-060	MBA	Classical	Wietenberg C	SF	cow	LM	Domest.	1	Wietenberg
13-060	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg

13-060	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-060	MBA	Classical	Wietenberg C	SF	LM	LM	UnID	1	Wietenberg
13-060	MBA	Classical	Wietenberg C	SF	pig	MM	Domest.	1	Wietenberg
13-060	MBA	Classical	Wietenberg C	SF	pig	MM	Domest.	1	Wietenberg
13-045	LBA	LBA Unknown	LBA Unknown	SF	UnID	UnID	UnID	2	LBA
13-052	MBA	Classical	Wietenberg C	SF	pig	MM	Domest.	2	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	2	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	MM	MM	UnID	3	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	LM	LM	UnID	2	Wietenberg
13-052	MBA	Classical	Wietenberg C	SF	LM	LM	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	LM	LM	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	MM	MM	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	LM	LM	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	MM	MM	UnID	1	Wietenberg
13-057	MBA	Classical	Wietenberg C	SF	sheep/ goat	MM	Domest.	1	Wietenberg
13-051	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	1	LBA
13-051	LBA	LBA Unknown	LBA Unknown	SF	UnID	UnID	UnID	1	LBA
13-030	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	2	Wietenberg
13-030	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	2	Wietenberg
13-032	MBA	Formative	Wietenberg A	SF	cow	LM	Domest.	1	Wietenberg
13-032	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	cow	LM	Domest.	1	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	2	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	2	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	1	Wietenberg
13-033	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-047	LBA	LBA Unknown	LBA Unknown	SF	LM	LM	UnID	4	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	LM	LM	UnID	2	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	7	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	UnID	UnID	UnID	11	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	UnID	UnID	UnID	1	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	2	LBA

13-047	LBA	LBA Unknown	LBA Unknown	SF	sheep/ goat	MM	Domest.	1	LBA
13-047	LBA	LBA Unknown	LBA Unknown	SF	sheep/ goat	MM	Domest.	1	LBA
13-046	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	1	LBA
13-046	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	1	LBA
13-046	LBA	LBA Unknown	LBA Unknown	SF	MM	MM	UnID	4	LBA
13-046	LBA	LBA Unknown	LBA Unknown	SF	UnID	UnID	UnID	3	LBA
13-025	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	2	Wietenberg
13-025	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-025	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg
13-040	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-040	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	3	Wietenberg
13-064	MBA	Classical	Wietenberg C	SF	UnID	UnID	UnID	1	Wietenberg
13-027	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-027	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-027	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg
13-027	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	4	Wietenberg
13-072	MBA	Formative	Wietenberg A	SF	red deer	LM	Wild	1	Wietenberg
13-026	MBA	Formative	Wietenberg A	SF	MM	MM	UnID	1	Wietenberg
13-038	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	1	Wietenberg
13-038	MBA	Formative	Wietenberg A	SF	red deer	LM	Wild	1	Wietenberg
13-038	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg
13-038	MBA	Formative	Wietenberg A	SF	LM	LM	UnID	3	Wietenberg
13-038	MBA	Formative	Wietenberg A	SF	UnID	UnID	UnID	1	Wietenberg

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