Landscape Archaeology in the Eastern Alpine Region: Archaeological, Geochemical, and Historical Approaches to the Past

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*This report summarizes the results of archaeological, geochemical, and historical research in the reconstruction of past landscapes in a small region of southeastern Austria. During field seasons in 2009 and 2010, the author coordinated pedestrian surface collection, soil phosphate survey, and targeted test excavations over c. 4 km^2 area along the Middle Mura river valley in order to identify changes in past settlement and land use from prehistory through historic periods. Diagnostic ceramic materials provide the chronological context for examining the evolution of the human landscape over the past three thousand years and phosphate analysis provides further evidence of long-term land use and field systems. Results indicate a possible correlation between prehistoric and post-medieval use of space, with significant settlement and land use expansion beginning in the 15th century C.E. Overall, the survey was able to effectively trace changes in past human activities beyond what was known through previous excavations of individual sites.**

Introduction

This report summarizes the results of archaeological and geochemical survey in several non-contiguous areas along the Mura River valley, in the southeastern part of Austria. This work was carried out as part of the doctoral dissertation research of the author, and was funded by a Dissertation Improvement Grant from the National Science Foundation. The goals of this project were to (1) identify and investigate areas of past human activity within a small section (~4 km^2) of this river valley through the integration of multiple complementary datasets; (2) to determine the potential and limitations of soil phosphate analysis as a method of archaeological prospection and landscape reconstruction in the Eastern Alpine Region; and (3) to track long-term changes in human settlement and land use through soil chemistry and material culture.

The Mura River (Ger: *Mur*) is a tributary of the Danube that flows from the High Tauern region of the Alps into the Drava River in Croatia. The Middle Mura region runs north to south through the center of the Austrian province of Styria (Ger: *Steiermark*) roughly from the capital city of Graz to the city of Leibniz. This research project is situated along the Middle Mur directly between these two cities, near the town of Wildon (see Figure 1). Although this region has not received as much archaeological attention as other areas of the eastern Alps, recent excavations have convincingly demonstrated its significance in both the distant and recent past. Of primary importance was the extensive archaeological work conducted from 1986 – 1994 on the small hill directly west of the modern city (the *Wildoner Berg*), which revealed traces of occupation from virtually every period from the Late Neolithic through the 18th century C.E., making this site one of the longest continuously occupied places in all of Austria.[1] Today on this site overlooking the confluence of the Mura and Kainach Rivers stand the ruins of a medieval castle (*Wildoner Schlossberg*), generally considered to be the location of a meeting described in the *Annales Fuldenses* between Arnulf of Carinthia, Carolingian King of East Francia, and the Slavic Duke Brazlaw of Sissek in 892 C.E.[2] More recent rescue excavations have recovered further evidence of intensive human activity in this area, particularly during the Late Bronze Age (*Urnenfelderzeit*), Early Iron Age (*Hallstattzeit*), and Early Medieval (*Frühmittelalter*) periods.[3] While these excavations, along with numerous other previously recorded archaeological sites and stray finds, have proven the archaeological significance of this area, no systematic survey of the broader landscape had ever been conducted.

The author sought to address this research lacuna by systematically examining traces of past human activity in the wider landscape along the middle Mura. Based on promising topographic locations and previous archaeological fieldwork, several areas were selected for further investigation. Of primary interest was the small valley (*Rasental*) that lies directly south of the *Wildoner Schlossberg*, where the aforementioned excavations had uncovered evidence of both prehistoric and early medieval activity. On the eastern side of the Mura, fields around the small villages of Afram and Sukdull were also chosen for investigation. While no official archaeological research has even been conducted in these areas, some early medieval stray finds have been documented.[4] Their proximity to the *Schlossberg* and the Mura also merited their inclusion within the project boundaries. Additionally, fields around two villages about 10 km north (Fernitz and Enzelsdorf) of Wildon and one village 7 km south (Göttling) along the Mura River Valley were selected as a representative sample of the broader middle Mura region.[5]

Methodologies for Reconstructing Past Landscapes

Pedestrian Surface Survey

Once areas of interest for the project were selected, the author led teams of American and Austrian students in conducting several complementary survey methodologies over the course of two field seasons (2009-2010). The first technique employed was pedestrian surface collection, an effective and widely utilized method of archaeological survey in which individuals walk in parallel transects over plowed fields and collect artifacts that have been exposed by agricultural activity.[6] Since this project sought to provide high-resolution survey data within a densely settled, highly anthropomorphic landscape, relatively tight 10 m transect spacing was adopted. Surveyors were instructed to keep any materials not obviously modern (rubber, plastic, etc.) and surface materials from each transect were individually bagged to ensure the highest possible quality of spatial data. Survey was conducted in fields where surface visibility was greater than 20%; in total the survey covered about 2.0 – 2.5 km^2. Locations of elevated artifact density identified during survey were recorded and separately bagged. In the laboratory, artifacts were washed, counted, weighed, and labeled. Potentially diagnostic artifacts were grouped into basic typologies and entered into a GIS database for further spatial analyses, the results of which are presented below.

Soil Phosphate Analysis

In addition to pedestrian surface collection, the qualitative analysis of soil phosphorus was also conducted in the project. Soil phosphate analysis works by identifying elevated levels of phosphate ions in soils, which can be a useful indicator of past human activities.[7]Archaeologically significant activities such as agriculture, settlement, ritual, and daily refuse deposition can all cause markedly elevated levels of phosphates in soils. Although phosphate is not the only archaeologically significant chemical compound found in soils, it is particularly useful because the ions become quickly fixed and remain generally immobile at most soil pH levels. While modern agricultural practices such as fertilization can increase phosphate levels in the soil, they generally do so uniformly across broad areas, thereby keeping archaeologically significant areas higher than the background noise. A major advantage of soil survey is that it can be conducted in both plowed fields and other areas (meadows, forests) where poor visibility makes surface collection ineffective. Since much of the project area was not seasonally plowed, this technique proved extremely useful for examining past human activity beyond agricultural fields.

Swedish agronomist Olaf Arrhenius was the first to recognize the significance of soil phosphate as an indicator of past human activity while doing regional agricultural soil survey in the 1930s.[8] This method was quickly adapted to archaeological research in Germany,[9] but was slow to be taken up in the Anglophone world, until the advent of a more scientifically-oriented, processual archaeology in the 1960s, as well as the subsequent development of a rapid field test.[10] Today soil phosphate analysis is generally regarded as a highly valuable archaeological tool and has been used with success in a number of different geographical and environmental contexts.[11] Although soil phosphate testing is most frequently used to identify site boundaries and activity areas during or just prior to excavation, it has also been implemented as a method of prospection and landscape reconstruction;[12] the latter strategy was adopted in this project.

In order to explore phosphate data on a landscape scale, soil cores were taken on a 50 m grid using small (1/4" tip) augers and a mobile GPS device. Soil samples were separately bagged and labeled at 10 cm intervals, most soil cores in this project going 60 – 90 cm deep. In order to identify areas of elevated phosphate against natural background levels, this project employed a type of qualitative analysis known as the "spot" test.[13] In a field laboratory, 1 – 2 g of soil from each 10 cm sample was placed on filter paper and subjected to a fast and relatively weak acid digestion reaction, causing a blue spot with lines radiating outwards through the reaction of soil phosphate with molybdenum blue. After several minutes, the tests were then placed in a salt stop-bath, which halts the reaction and removes the soil from the filter paper. The resulting blue spots were then assessed on a qualitative scale from one to five, based on their size and intensity (one = lowest phosphate, five = highest phosphate). Up to twenty samples can be tested simultaneously, permitting a high volume of tests to be conducted in a short period. Since this relatively simple and inexpensive method of phosphate analysis allows the archaeologist to conduct thousands of tests in the field without the need for highly specialized equipment or expensive laboratory costs, it is certainly the most efficient way to employ phosphate analysis on an inter-site, landscape scale. In this project, approximately 900 soil samples were taken; the thousands of resulting tests were then entered into a GIS database for further analysis.

Test Excavations

While phosphate as a prospection method has been successfully employed around the world, it has several limitations. Perhaps the most significant is a lack of temporal definition for phosphate depositing episodes; in other words, it is not always clear which period produced elevated phosphate levels in soils. Also natural or anthropogenic post-depositional processes that significantly move soils can also limit its effectiveness. Both of these issues must be considered when testing in areas that have a long history of continuous intensive settlement, such as in the middle Mura valley, which today is a combination of urban, suburban, and rural settlement densities. Such problems can often be addressed through the identification of diagnostic artifacts from surface collection or further subsurface investigation. Towards this end, about a dozen 1 x 1 m test excavations were also conducted in areas of elevated phosphate or surface artifact levels, in order to determine the correlation between surface artifacts, soil phosphate levels, and subsurface materials. These small excavations were also useful for establishing the basic soil stratigraphy of the project area.

Historical Documentary Research

Historical records, cartographic sources, and toponymic (place name) studies are also important elements of past landscape reconstruction, particularly for proto-historic and historical periods. While a full discussion of the historical framework of this region is beyond the scope of this article, a brief synopsis will illustrate how more recent textual sources can potentially shed light on earlier, pre- and proto-historic activity.

The first historical accounts of the greater Eastern Alpine Region place it within the "Celtic" polity of Noricum, a Late Iron Age state-level society that controlled much of the Eastern Alpine Region. Noricum was eventually conquered and absorbed into an expanding Roman Empire by 16 B.C.E., subsequently becoming a Roman province of the same name. During the Roman Provincial period (c. 16 B.C.E. – 400 C.E.), the political and economic center of the middle Mura region was the Roman town of Flavia Solva (today outside the city of Leibnitz, 10 km south of the project area). The remains of a small Roman *castrum* were also identified on the *Wildoner Schlossberg*, which may have been abandoned in the early 5th century AD, as Roman military and political control over the region rapidly eroded.[14] The next four centuries are shrouded in mystery, as there are almost no historical or archaeologically recognizable traces of human activity in this part of Austria.[15] Traditional historical narratives place Slavic-speaking peoples in the region beginning around the 7th century C.E., and Germanic-speaking groups are thought to have migrated in from the north and west several centuries later. The first early medieval historical accounts only appear in the late 9th century (the mention of *hengistfeldon* in the *Annales Fuldenses* noted above), and from the 10th – 12th century C.E. the region served as a *march* (borderland) between the Carolingian Empire and rival polities to the east, such the Avars and Magyars.[16]

Both historical written sources and toponymic evidence suggest that a mixture of Slavic and Germanic-speaking populations inhabited the area during the early and high medieval periods. The project area includes villages that are of Germanic (Göttling, Stocking, Afram) and Slavic (Sukdull, Fernitz, Lang) etymology.[17] The derivation of the name *Wildon* is less certain, with some experts suggesting either Slavic or perhaps pre-Slavic origins.[18] Although place name studies are another useful dataset for reconstructing past landscapes, they should not be regarded as unequivocal evidence of ethno-linguistic settlement patterns or interaction. The naming of topographic features or villages reflects single historical events and cannot always be directly correlated with later demographic changes.

Cartographic sources are also useful for examining past settlement and land-use patterns. Other than their obvious utility in identifying the names and locations of early villages and roads, cadastral maps also show changes in property and field boundaries that often can be proxy evidence for settlement histories. For example, long and thin field boundaries (such as those in Afram) probably indicate initial land use in the high medieval period, while the irregularly shaped field systems in Rasental seem to suggest much earlier agricultural activities. The first and most useful cadastral maps in this region were produced during the 1820s under the direction of Habsburg Emperor Franz I (see Figure 2).

Results

Surface collection over 2.0 – 2.5 km^2 produced a large quantity of archaeological material, predominantly consisting of small, heavily weathered ceramic sherds. Most of these ceramics were non-diagnostic body sherds and could therefore only be assessed by their macroscopic fabric composition. Although the ceramic material demonstrated a wide variety of fabric colors and textures, they were initially grouped into two major categories: (1) low-fired, moderately to highly porous fabrics, frequently with large (primarily carbonate) inclusions and (2) higher-fired, less porous fabrics with smaller or entirely without macroscopically visible inclusions. Based on current knowledge of ceramic fabric types in this area, these types can be cautiously classified into two broad categories: the former as prehistoric (predominately from the Late Bronze Age [1000-800 B.C.E.], Iron Age [800-100 B.C.E.], or Early

Medieval [700-1100 C.E.] periods) and the latter as historic (primarily from the Medieval [1100-1500 C.E.] and Early Modern [1500-1800 C.E.], and also Roman Provincial period [16 B.C.E - 400 C.E.]). For the vast majority of sherds without decorations or diagnostic features, more precise identification was often not possible. However there were also many sherds that could be diagnostically identified and chronologically placed by their decoration, rim style, or unique fabric type.

Interpretation

Using these broad categories, it is estimated that approximately 80% (n=5056) of the ceramic material recovered from the surface collection was historic and 20% (n=1316) was prehistoric. It should also be noted that these artifacts exhibited significantly different distributions over the landscape. In most surveyed fields, there was a nearly constant level of background noise of historic ceramic material, probably a result of the common agricultural practice of mixing broken ceramic materials in with fertilizer. Yet the boundaries between areas with low and high densities of historic ceramic material were still relatively sharp, indicating that such farming practices cannot account for the entire distribution of historic ceramics. When considering the prehistoric material, the boundaries between high and low surface concentrations were much more dramatic. For example, one small (roughly 5 x 5 m) area in Afram produced several kilograms of prehistoric ceramic material, with only a few other sherds being recovered from the adjacent transects. This small "site" also indicates that many generations of seasonal plowing did *not* significantly disperse the prehistoric ceramic material, as might be otherwise assumed.

The spatial results from the archaeological and geochemical surveys were entered into a GIS software program for further analysis (see Figure 3). The elevated areas of historic activity, prehistoric activity, and soil phosphate levels revealed some interesting patterns. The first obvious spatial attribute of prehistoric material is its proximity to freshwater sources, a common pattern seen worldwide among societies that do not dig wells. There also appears in many cases to be a strong correlation between elevated prehistoric and historic ceramic surface densities. In other words, the areas with the highest amount of historic materials were frequently, but not always, directly on top of prehistoric activity. Results from several test excavations revealed a similar relationship, with historic and prehistoric materials present together in the plough zone, or prehistoric materials in a layer below the historic materials. Although conclusions with such a small dataset can only be tentative, such direct correlation might indicate a relatively high degree of continuity between prehistoric and historic settlement and land use, which would make sense if these areas were the most desirable locations in the landscape. Overall, human settlement and land use in the middle Mura valley appears to first expand in the Late Bronze and Early Iron Ages (c. 1200 – 800 B.C.E.) before contracting (but not disappearing) in the Late Iron Age through Early Middle Ages. Human activity again increases during the high medieval period (1100 – 1300 C.E.) and then more significantly again in the early modern period (1500 – 1700 C.E.).

When adding the results from the soil phosphate analysis to the surface collection, some additional interesting results emerge. Perhaps contrary to expectations, the areas demonstrating the highest levels of soil phosphate in most cases did *not* directly overlay the areas of highest ceramic surface density. Instead elevated levels of phosphate seem to appear directly adjacent to the high artifact concentrations. Considering that surface artifact data and soil phosphate levels can indicate different types of past human activities, this is an intriguing pattern. Unfortunately, most of the targeted test excavations did not produce unambiguous results that might have revealed the precise nature of the high phosphate areas. Without further excavation, only a few tentative suggestions can be forwarded. First is the possibility that the elevated phosphate areas indicate prehistoric field systems, while the artifact densities are correlated to domestic activities. It is important to note that elevated phosphate areas do not directly correlate with contemporary agricultural fields, so these anomalous phosphate levels cannot be simply the result of modern agricultural activity (i.e. fertilizer). This particular pattern could also be caused by different methods of deposition. In other words, the areas of artifact density would be where the domestic refuse was discarded, while the elevated phosphate could possibly indicate animal bones and other organic waste.

Overall, results of the archaeological and geochemical surveys produced important and interesting data, and provide a much clearer picture of the development of settlement and land use activity from prehistory through historic periods than previous excavation data alone. Future research, perhaps with additional excavation and survey, will hopefully shed even greater light on these important questions in the evolution of past landscapes in the Eastern Alpine Region.

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* Acknowledgments: Fieldwork for this project was made possible by a Dissertation Improvement Grant from the National Science Foundation (USA), Award # 0907747. This project would not have been possible without the generous support from a number of people and institutions. My thanks go out especially to Mag. Christoph Gutjahr and colleagues at Kulturpark Hengist, Univ.-Prof. Dr. Manfred Lehner (Graz), Dr. Bernhard Hebert (BDA Graz), Dr. Gernot P. Obersteiner (Steiermärkisches Landesarchiv), Univ.-Prof Dr. Kevin Francesconi (Graz), as well as Profs. Tina Thurston, Peter Biehl, and S. Milisauskas (SUNY Buffalo). Thanks also to Patrick Singer (Amt der Steirmärkischen Landesregirung) and Raymond Whitlow (SUNY Buffalo) for help with the GIS analysis, and to UB Archaeological Survey for the use of laboratory space. I am also indebted to the students from SUNY Buffalo and the University of Graz who helped make the surveys possible, as well as the cooperation of numerous landowners in the survey areas. Finally, special thanks are also extended to the Leitinger family for their incredible hospitality over many field seasons.

[1] See contributions in Pickl 1989.
[2] Kramer 1992, 50; see also Schaffler 1978.
[3] Gutjahr and Roscher 2002; Gutjahr 2004, 2007, 2008, Roscher 2005.
[4] Modrijan 1963, 45.
[5] See Gutjahr 2002, 2003.
[6] For an overview of the methodology and literature on pedestrian surface collection, see Banning 2002, Fish and Kowalewski 1990.
[7] For an overview of phosphate analysis in archaeology, see Holliday and Gartner 2007, Bethell and Máté 1989.
[8] e.g. Arrhenius 1934.
[9] Lorch 1940, Grundlach 1961.
[10] Some early uses of archaeological phosphorus in the U.S. include Dauncey 1952, Dietz 1957, Cruxent 1962.
[11] For example, see Sinclair and Petrén 2002, Taylor 2000, Thurston 2001.
[12] For some examples of soil phosphate as a method of archaeological prospection, see Provan 1971, Keeley 1981, Crowther 1997, Rypkema et al 2007.
[13] This project used a modified version of the method outlined in Eidt 1973; see also Thurston 2001.
[14] Lotter 2003.
[15] Roth 1989.
[16] Bowlus 1995, Baltl 2004.
[17] Hüttenbach 2004, Zahn 1896.
[18] Hausner 1989.