

The Neolithic Settlement Landscape of the Southeastern Swabian Alb (Germany)

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Abstract

This paper presents goals, methods, and preliminary results of a collaborative project investigating Neolithic settlement and land use of the southeastern Swabian Alb limestone plateau region in southwestern Germany. The project combines systematic surveys of plowed fields and analysis of large private collections to investigate site distributions on the plateau, which is largely poor in surface water but a source of regionally important chert raw material. GIS based comparisons of site locations in terms of soil type and their agricultural potential, distance to water, and distance to chert sources show that numerous sites from the Bandkeramik to the younger Neolithic are associated with either chert sources or high-quality settlement locations.

A number of extensive private collections provide a rich foundation to investigate functional and chronological differences among site locations. Preliminary results of lithics and ceramics analyses of nine sites indicate chronological variability as well as dissimilar characteristics in blade core technology and abundance and types of retouched tools between chert-extraction sites and settlements.

Introduction

Neolithic sites⁴ on the Swabian Alb provide a rich, untapped source of information on early farming settlement in an environmentally varied region. The southeastern Swabian Alb (Southern Germany) is a rich archaeological landscape best known for stratigraphic excavations of Paleolithic and Mesolithic cave sites in the deeply incised river valleys (Conard 2002). Less well known is the dense record of Neolithic activities on the plateau surface immediately above these valleys. Lithic scatters and features which have been documented by avocational archaeologists give evidence for occupation starting in the Early Linear-bandkeramik (LBK) or possibly in the Mesolithic. These include probable settlements located in fertile agricultural areas of the southeastern Swabian Alb and also dense lithic scatters associated with chert raw material sources higher on the Alb. These sites have not been investigated by professional archaeologists or integrated into regional understandings of the Neolithic. Investigation of these Younger Stone Age sites on the Swabian Alb has the potential to contribute to long-standing questions about the Neolithic settlement of Central Europe (Fig. 1).

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⁴ This paper includes the slightly revised texts and graphs of two poster presentations given at the 70th Annual Meeting of the Society for American Archaeology, Salt Lake City, Utah, March 30–April 3, 2005 (Fisher et al. 2005; Harris et al. 2005).

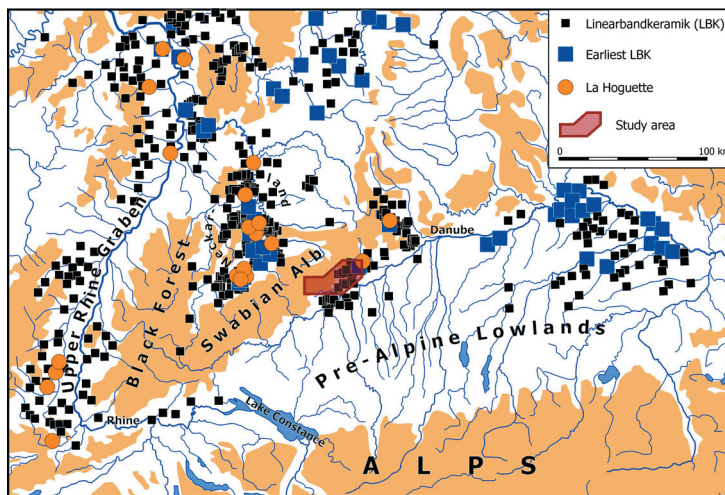
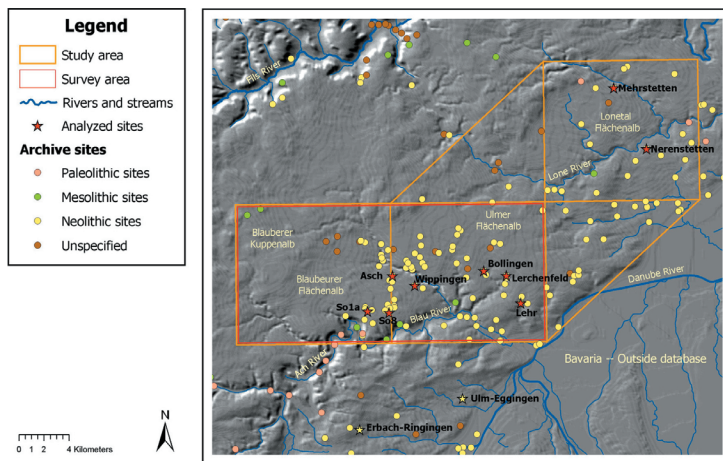


Fig 1: Location of the study area and distribution of Early Neolithic (LBK and La Hoguette) sites in Southern Germany. Major settlement regions include the Neckarland, the Upper Rhine Graben, the Main area, the Danube valley in Lower Bavaria, and parts of our study area.

Abb. 1: Lage des Arbeitsgebiets und Verbreitung frühneolithischer Fundstellen (LBK und La Hoguette) in Süddeutschland. Haupt-siedelgebiete sind das Neckarland, der Oberrheingraben, das Maingebiet, das Donautal in Niederbayern sowie Teile unseres Arbeitsgebiets.

Archaeological literature on the LBK emphasizes homogeneity over large regions of Central Europe. Distinctive LBK sites are commonly located on fertile, easily tilled loess soils near water sources. Most archaeologists have assumed that there was little variation in the economic activities of LBK settlements. However, some evidence calls this impression of homogeneity into question. For example, recent investigations of upland sites show that Neolithic activities took place in a wider variety of habitats, including upland and lowland locations likely to have seen quite different economic use (e.g., Valde-Nowak/Kienlin 2002; Price et al. 2003). LBK research has so far focused on excavations of single settlements, material culture, and chronology. Studies of early Neolithic land use are still in their beginnings (Bogucki 1988; Zimmermann 2002). This project seeks to contribute to this new direction by exploring the density, distribution, and character of Neolithic settlement and land use on the chert-rich limestone upland of the eastern Swabian Alb. We explore LBK land use on the plateau as well as possible economic changes in the Middle and Younger Neolithic.

The study area extends from the upper Danube and Blau rivers (Blaubeuren/Ulm area) to the Lone valley (Fig. 2). Much of this area is a karst plateau with little or no surface water, which forms a strong contrast with the well-watered valley locations typically associated with early Neolithic settlement in Central Europe. Landscapes across the study area vary in their agricultural potential, access to stone raw materials, and proximity to surface water. This environmental variation forms the background for the research presented here. The project combines systematic field survey, a database of known sites, and analysis of well-documented private collections to compile a large comparative database of lithic and ceramic collections from environmentally contrasting zones within the study area. This paper presents geographic analysis of Neolithic site locations and preliminary analysis of ceramic and lithic finds from nine selected Neolithic sites. These initial comparisons suggest that the completed database (projected for 2005) will offer insights into the chronological and functional diversity of early agricultural sites in Southern Germany (Fisher/Knipper 2003).



Chronological Framework

The study area is a rich archaeological landscape including sites from the Middle Paleolithic through Historic times. This study focuses on the Neolithic era, which is further subdivided into the following chronological units (Fig. 3).

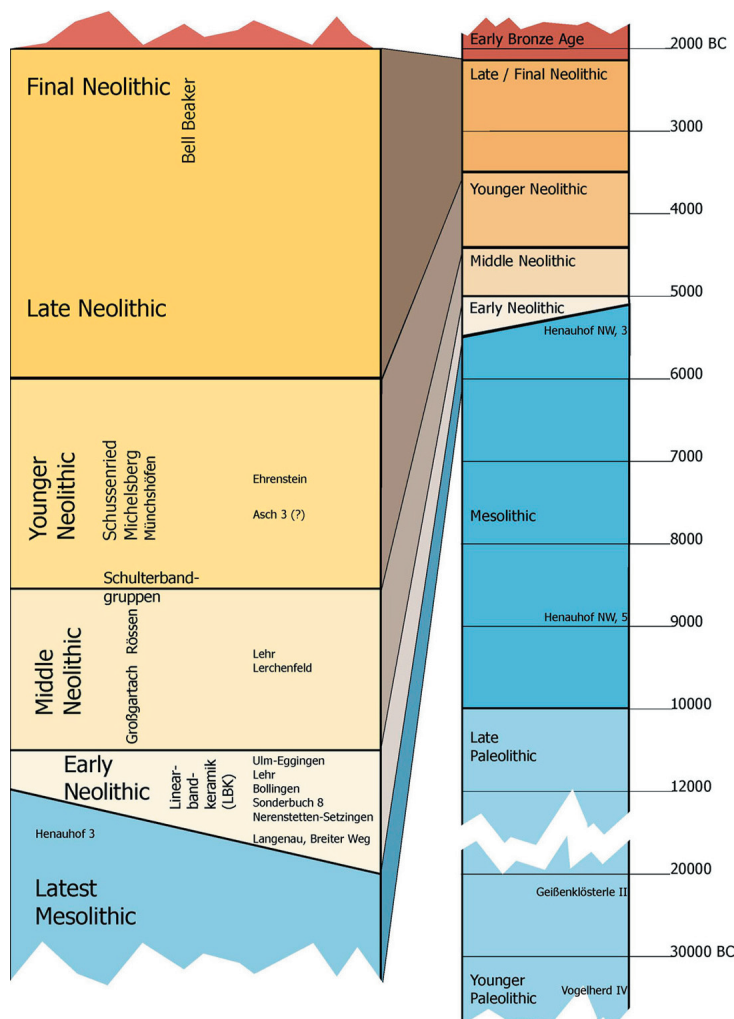


Fig. 2: Archaeological sites on the South-eastern Swabian Alb. Paleolithic deposits are almost exclusively known from cave sites in the Ach, Blau, and Lone river valleys. A few Mesolithic sites are known from either valley locations or small surface artifact scatters on the Alb plateau. The rich Neolithic archaeological record is dominated by surface artifact scatters in Flächenalb upland locations.

The extensions of the study and survey areas are defined by local topographical maps. This map and fig. 6 and 11 include sites from the literature and LDA archives with exact enough location information to allow mapping. Coverage outside our research area is not complete.

Abb. 2: Archäologische Fundstellen auf der südöstlichen Schwäbischen Alb. Paläolithische Ablagerungen sind ausschließlich aus Höhlenfundstellen im Ach-, Blau- und Lonetal bekannt. Die wenigen mesolithischen Fundstellen liegen entweder ebenfalls in den Flusstälern oder auch auf der Albhochfläche. Die reiche neolithische Fundüberlieferung wird von Oberflächenfundstreuungen auf der Flächenalb bestimmt. Die Ausdehnung des Untersuchungs- und Begehungsgebiets orientiert sich an topographischen Karten (TK25). Diese Karte und Abb. 6 und 11 zeigen Fundstellen aus der Literatur und den Ortsakten des Landesdenkmalamtes, deren Lokalitäten genau genug bekannt sind. Die Kartierung außerhalb des eigentlichen Arbeitsgebietes ist nicht vollständig.

Fig. 3: Chronological framework. Our study focuses on the Neolithic era, which lasted from the 6th to the 3rd Millennium B.C.

Abb. 3: Chronologietabelle. Die hier vorgestellte Studie konzentriert sich auf das Neolithikum (6. bis 3. Jt. v. Chr.)

The Early Neolithic is represented by the Linearbandkeramik (LBK) and dates from 5600 to 4900 B.C. LBK subsistence strategies were based on agriculture and stock breeding. People lived in permanent settlements distributed from Hungary in the East to the Paris Basin (France) in the West. Their layout and architecture is known through many extensive excavations. Due to its distinctive pottery decoration style, the LBK is easily recognizable in the archaeological record. Sites in the study area that yielded LBK finds include Sonderbuch 8, Bollingen, Lerchenfeld, Lehr, and Nerenstetten-Setzingen.

The LBK is succeeded by the Middle Neolithic (4900–4400 B.C.), whose material culture is significantly more varied in time and space. The major Middle Neolithic groups in south and southwestern Germany were defined based on their very complex ceramic decoration styles and include Hinkelstein, Großgartach, Rössen, Stichbandkeramik (Stroke ornamented pottery culture) and the “Schulterbandgruppen”. Our analysis includes Middle Neolithic finds from the settlement of Lehr and possibly also other lithic assemblages that lack distinctive ceramic finds.

The Younger Neolithic (4400–3500 B.C.) includes the archaeological cultures of Schussenried and Michelsberg. Younger Neolithic sites in the study area are known from the river valleys in which wooden finds are sometimes preserved (Ehrenstein in the Blau valley (Paret 1955; Lüning et al 1997)) and hilltops (Biel 1987). Although our surface sites lack distinctive younger Neolithic ceramics, lithic tools from some sites suggest occupation during that time period (Asch 3). For the Younger Neolithic, significant economic changes have been proposed, known as the “secondary products revolution” (Sherratt 1981). The use of secondary products like milk, wool, and animal traction may have caused differing land use strategies. On the Swabian Alb, sherds dating to the later half of the Middle Neolithic from various caves (Biel 1974) or hilltop settlements primarily at the northern and southern rims of the Alb (e.g. Ehrenstein, Donzdorf, Goldberg) (Schröter 1975; Biel 1987) clearly indicate important changes during that time.

History of Neolithic Research in the Study Area

Well into the 1950s Neolithic sites in the Swabian Alb were largely unknown (Rieth 1938) as research focused largely on the famous Paleolithic cave sites. Albert Kley (1907–2000) contributed substantially to an improvement of this situation. He studied prehistory in the 1920s and remained interested in the subject, although he worked as a teacher afterwards. He amassed a large private collection including hundreds of sites dating from the Paleolithic to Historic times. In the 1930s and 40s his main interest was in Mesolithic sites on the Swabian Alb. His excavations in the Schuntershöhle became an important element of the southwest German Mesolithic chronology established by Wolfgang Taute in 1967 (Taute 1975). Kley started systematic surveys in the region of Geislingen, where he was able to identify several Mesolithic sites (Kley/Schreg 1992). When he extended his activities in the 1950s to the region of Langenau, Ulm and Blaubeuren he discovered a number of Neolithic sites including the settlements of Bollingen

(unpublished) and Ehrenstein (Paret 1955; Lüning et al. 1997). Already in 1957, he noted differences in the artifact spectra of different Neolithic sites. Some of them, including Mehrstetten, he considered to be raw material extraction locations (Kley 1957). Material from this collection is an important source in this study.

Kley's work stimulated other avocational archaeologists whose efforts also contributed greatly to an expansion of the archaeological record in the study area, which is – except for a small number of excavated sites – largely dominated by surface finds (Kreutle 1994). One of the most important Early Neolithic settlement excavations in the study area was conducted by A. Kley at Bollingen just before the site was destroyed by military building activities in 1968/9. In the 1980s Hermann Huber excavated some small test trenches at Langenau (Huber 1982) and Nerenstetten-Setzingen which gave evidence for settlement remains including postholes and larger pits. Regionally important excavations outside the study area include the sites of Ulm-Eggingen and Erbach-Ringing (Kind 1989; 1990). They are situated on the Hochsträß (the next ridge to the south of our study area), and serve as important reference materials.

When Jörg Biel summed up the state of Neolithic research in the early 1970s (Biel 1974), it seemed clear that Early Neolithic settlements were restricted to the more fertile regions of the southern Swabian Alb. Neolithic sites in the middle and northern Alb, by contrast, contained no LBK, but produced late Middle (Schulterbandgruppen) and Younger Neolithic sherds. Biel concluded that a change in settlement and economy was responsible for the expansion of occupied territory. Evidence presented here indicates that LBK sites are somewhat more widespread on the plateau, and invites reconsideration of LBK settlement patterns.

The possible role of chert raw material has only been briefly discussed in previous work, except for the sites of Mehrstetten and Asch which were mentioned in the literature several times (Weissgerber 1981). More recently there have been a few small investigations at raw material sites east of the study area (Weniger 1984).

Questions Guiding this Research

Chronology

Neolithic chronological assessments are based on decorated ceramics, while formal attributes of lithic artifacts have received far less attention. Many of the Neolithic sites documented by amateur archaeologists in the study area have been difficult to place within regional chronological sequences because ceramics are lacking (e.g., Wischenbarth 1995). A major focus of this research is to combine lithic and ceramic analysis to explore the extent to which lithic artifact forms can be attributed to different phases of the Neolithic. Investigation of the Neolithic settlement landscape begins with a focus on chronology.

- How and when were Neolithic settlements established on the Swabian Alb?
- Which sites can be regarded as roughly contemporaneous?

Exploitation of natural sources of Jurassic chert

Natural chert sources are an important environmental attribute in the study area and amateur archaeologists have documented dense Neolithic lithic scatters on or near them. Most of these have produced few or no prehistoric ceramics, and are located in areas with relatively poor agricultural potential. The lack of ceramics on these sites may simply be due to poor preservation, but could also result from a narrower range of activities carried out on raw material extraction sites.

- Do lithic scatters close to chert sources represent raw material extraction sites and/or settlements?
- Did the proposed raw material extraction involve systematic mining?

Settlement and land use in areas with contrasting environmental conditions

Neolithic site locations documented by amateur archaeologists are concentrated on the lower eastern slopes of the Swabian Alb. None are located west of the Miocene shoreline dividing the more level plain of the eastern Alb ("Flächenalb") from the hillier western Alb ("Kuppenalb"). These broad geographic zones offer contrasting environmental conditions including agricultural potential and chert raw material availability.

- How did Neolithic settlement develop across these contrasting environmental zones?
- Did settlements located in areas with high and low agricultural productivity focus on different economic activities?
- Does the absence of known sites on the Kuppenalb represent the absence of Neolithic settlement, or concentration of collecting activities on the Flächenalb?

Exploration of functional diversity among Neolithic sites

The archaeological record in the study area is highly variable, ranging from isolated surface finds to large Neolithic settlements with several houses.

- How were those variable sites integrated into Neolithic settlement and land use systems?
- Is there any evidence for functional specialization or specific activities carried out at certain sites, and is there any relation to similar or contrasting environmental conditions?
- Is there any evidence for land use outside of the supposedly permanently occupied settlements and activities that might have occurred there?

Integration of the study area into regional communication and exchange networks

The naturally occurring Jurassic chert might have been exchanged with other regions that lacked local raw material sources and possibly encouraged contacts to neighboring areas. Regular communication is indeed confirmed by broad similarities in ceramic decoration styles between Ulm-Eggingen and LBK settlements in the Neckar valley (Strien 2000; Kind 1989).

- What kind of evidence suggests contact and exchange with neighboring areas?
- What are possible import and export goods?
- Is it possible to define routes of communication?

This collaborative project builds on the long-term interest of Schreg and Knipper in the archaeological collections of Albert Kley (Knipper/Schreg, in press) and a regional survey project aimed at documenting the distribution of Stone Age sites (Fisher/Knipper 2003; Jochim et al. 1998). We combine fieldwork and collections analysis with information collected from published literature and archival records of the Baden-Württemberg Office for Historical Monuments (former Landesdenkmalamt, or LDA).

The LDA has worked intensively with an active community of avocational archaeologists to build up an extensive archive of site locations (Kreutle 1994). We draw on this archive and published information to collect information on Stone Age sites in the study area. These data are integrated into a Geographic Information System (GIS).

Albert Kley's collections include lithics and ceramics from systematic surface survey and excavation from dozens of Neolithic sites, with a focus on the central and eastern parts of the study area. Materials from four surface sites and one excavated assemblage are included in this study. Surface Neolithic sites in the western part of the study area were primarily documented by Helmut Mollenkopf. Four Neolithic sites from his extensive collections have already been investigated. Analysis of several additional Neolithic sites in the Kley, Mollenkopf, and other collections is in progress.

To assess the distribution of Stone Age finds across a landscape surveyed by different collectors, a systematic survey of plowed fields was undertaken in a portion of the study area. This new survey provided a means to control for the differences in survey methods used by different collectors in the past. Teams of 2 to 9 surveyors walked 10 meters apart, flagging lithics and ceramics. A follow-up intensive search around flags was used to identify concentrations. Materials were mapped using a hand-held GPS receiver. Observations on field conditions and distribution of chert raw materials were recorded.

Finally, to determine whether subsurface features are present at lithic scatters associated with chert sources, geomagnetic surveys were carried out at two locations by Arno Patzelt (Terrana Geophysics). Positive results suggest that this method will be useful in assessing the size and character of buried features associated with documented surface sites (Fig. 4).

Analysis of site locations

Environmental Attributes of the Study Area

The study area on the southeastern Swabian Alb covers four broad geographic regions with varying environmental con-

Fig. 4: The methods applied in this study include artifact analysis from private collections, systematic plowzone survey, and geomagnetic prospection.



Abb. 4: Die in dieser Studie angewandten Methoden umfassen die Analyse von Fundmaterial aus Privatsammlungen, systematische Feldbegehungen und geomagnetische Prospektionen.

ditions. These are, from west to east: Blaubeurer Kuppenalb (Blaubeuren Hilly Alb), Blaubeurer Flächenalb (Blaubeuren Alb Plain), Ulmer Flächenalb (Ulm Alb Plain) and Lonetal-Flächenalb (Lone Valley Plain). Environmental conditions vary between the hilly “Kuppenalb” to the northwest and the southeastern “Flächenalb” which was leveled by a Tertiary marine incursion. The terms “Blaubeurer” and “Ulmer” refer to nearby towns.

To investigate the environmental context of Neolithic sites in the study area, selected environmental attributes are presented at two spatial scales. First, at the level of the whole study area, predominant conditions within the four contrasting geographic regions are compared (Fig. 5). Environmental attributes presented include elevation, surface water, slopes, temperature, soils, agricultural potential, and availability of chert raw material. Environmental data are derived from 1:25,000 topographic maps, a Digital Landscape Ecology Atlas (IAF 1996), and a Water-Soil-Atlas for Baden-Württemberg (Ministerium für Umwelt und Verkehr 2001). Data on availability of chert raw material is derived from Burkert 2001.

Second, we used ArcMap GIS to investigate the same environmental attributes in the area surrounding nine selected Neolithic sites (Fig. 5). Buffer zones of 500, 1000, and 2500 meter diameter were used to illustrate the range of environmental conditions that may have comprised a habitual use zone in the immediate vicinity of each site. The nine Neolithic sites are either surface scatters or (partly) excavated settlement sites investigated by amateur archaeologists, located in three of the four geographic zones. No sites are known from the Blaubeu-

Fig. 5: Environmental conditions in geographic areas and habitat use zones of nine selected Neolithic sites.

Abb. 5: Naturräumliche Bedingungen in den Teillandschaften des Arbeitsgebiets und potentiellen Einzugsbereichen von neun ausgewählten Fundstellen.

	Blaubeurer Kuppenalb	Blaubeurer Flächenalb				Ulmer Flächenalb			Lonetal-Flächenalb		Legend
	No archeological sites analyzed	Sonderbuch 1a settlement/ raw material extraction?	Sonderbuch 8 settlement	Asch 3 settlement	Wipplingen 1 raw material extraction settlement?	Bollingen settlement	Lerchenfeld settlement	Lehr settlement	Mehrstetten raw material extraction	Nerenstetten settlement	
Elevation m a.s.l.	740 - 800	665	674	630-700 649	651	550-660 577	577	558	520-600 558	515	
Distance to running water and springs	No running surface water	No running surface water. Deeply incised river valleys 1260 m 1490 m 2820 m 1640 m 530 m? (Bucher Hülle, artificial?) 1950 m (Lauter spring) 650 m (Kleine Lauter)				No running surface water. Deeply incised river valleys 2500 m 4090 m 2910 m 300 m? (2 water holes, artificial?) on site? (Rappenbad spring) 300-800 m? (Several springs?)			Very little running surface water 510 m 670 m		
Slope	Slightly rolling landscape without deeply incised river valleys	Nearly flat with deeply incised river valleys				Nearly flat with deeply incised river valleys			Nearly flat, except Lone valley		
Temperature (numbers are annual means in °C)	Moderately cold (6.0-6.5°C)	Cool (6.5-7.0°C)				Cool to moderately warm (6.5-8.5°C)			Moderately cool to moderate (7.0-8.0°C)		
Soils	Predominantly stony & thin	Predominantly stony and (moderately) deep				Predominantly (moderately) deep with few or no stones			Predominantly (moderately) deep with few or no stones		
Agricultural potential	Very low to low	Low				Moderate			Moderate to high		
Chert raw material	Some	Highly abundant < 1 km < 1 km < 1 km on site				Little 5-10 km 5-10 km 5-10 km			Few concentrations on site 5-10 km		
Archaeological record	No Neolithic sites known	- Many LBK to later Neolithic rich surface lithic scatters - Few sites with subsurface features				- Many LBK to later Neolithic rich surface lithic scatters - Some (settlement) sites with subsurface features			- Many LBK and Middle Neolithic surface scatters and sites with subsurface features		
Hypothesized use / importance in the Neolithic	No known evidence OUTLAND USE? PASTURE?	CHERT RAW MATERIAL EXTRACTION SETTLEMENTS?				AGRICULTURE / SETTLEMENTS			AGRICULTURE / SETTLEMENTS & CHERT RAW MATERIAL EXTRACTION		

rer Kuppenalb. Preliminary results of ceramic and lithic analysis from these nine sites are presented below. Important factors affecting Neolithic settlement locations include: agricultural potential, availability of chert raw material, and proximity of the study area to the Danube.

Agricultural Potential

On the Swabian Alb, temperature levels do not fall below the minimum necessary for agriculture. However, agricultural potential in the higher altitudes of the Kuppenalb is limited because this area is cooler with predominantly shallow, stony soils. The estimate of agricultural potential presented here is based on modern criteria and involves a number of attributes, including temperature, humidity, natural soil fertility, slopes, types and thicknesses of soils and danger of floods and land-slides (IAF 1996). It increases from the west to the east and southeast parts of the study area (Ulmer and Lonetal-Flächenalb), which offer higher temperatures, a flatter landscape, and better, deeper soils (Fig. 6). Elevation and distance to the nearest reliable water source probably also played a role in settlement location choice.

Chert Raw Material

An important resource in the study area is white Jurassic chert, a raw material highly valued for stone artifact production. Observations made during survey indicate that chert is most abundant and widely available on the Blaubeurer Flächenalb. Previous researchers have documented a decline in availability of chert as one moves to the east across the study area. Several localized chert sources are known from the Lonetal-Flächenalb (Fig. 7). Raw material sources in the region are discussed in greater detail below (see Results of Lithic Analysis).

Proximity to the Danube

Settlement in the study area might also have been encouraged by its geographical position close to the Danube, an important East-West corridor. Here, the Danube valley narrows and is no

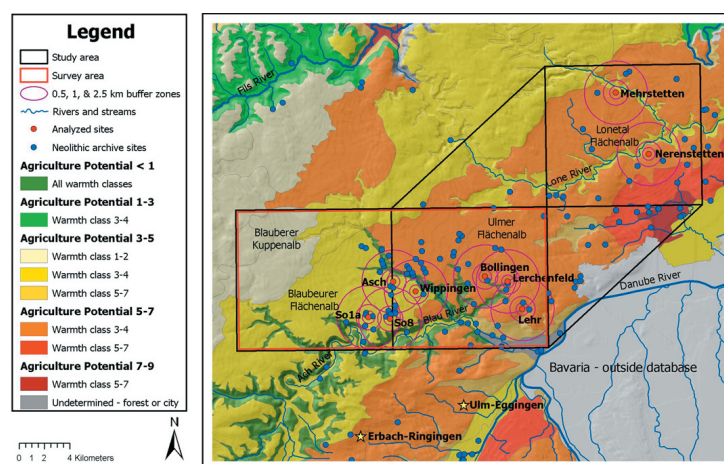


Fig. 6: Agricultural potential within habitual resource zones for the analyzed sites. Lower numbers refer to lower agricultural potential and temperatures. Natural agricultural productivity increases gradually from the Blaubeurer Kuppenalb to the Lonetal-Flächenalb.

Abb. 6: Natürliche Eignung für Ackerbau in den potentiellen Einzugsbereichen der untersuchten Fundstellen. Höhere Zahlen stehen für bessere Eignung und höhere Temperaturen. Die natürlichen Bedingungen für Ackerbau verbessern sich kontinuierlich von der Blaubeurer Kuppenalb in Richtung Lonetal-Flächenalb.

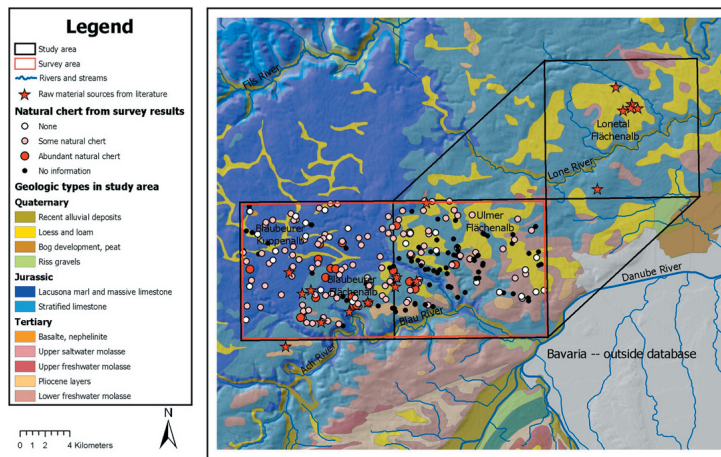


Fig. 7: Natural chert sources known from plowzone survey and published sources. Jurassic chert is most abundant on the Blauburger Flächenalb.

Abb. 7: Natürliche Hornsteinvorkommen: Ergebnisse der Feldbegehungen und publizierte Vorkommen. Jurahornsteinvorkommen konzentrieren sich vor allem auf der Blauburger Flächenalb.

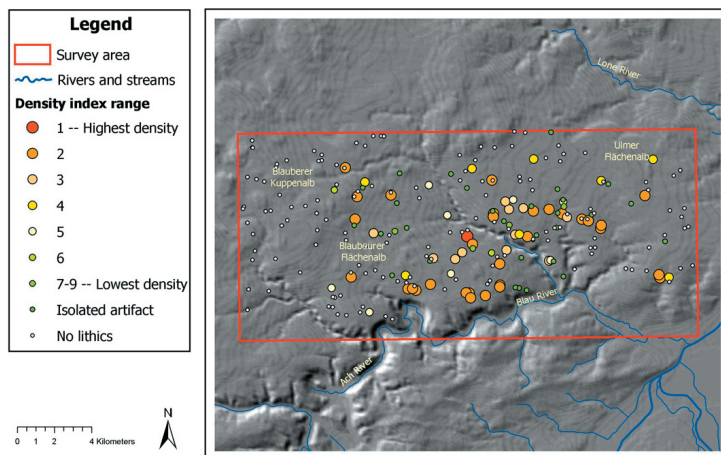


Fig. 8: Survey results: Density of prehistoric lithics. The index of surface find density (after Drafeh et al. 2003) is calculated as field size in hectares divided by number of prehistoric lithics per survey pass.

Abb. 8: Ergebnisse der Feldbegehungen: Funddichte von Steinartefakten. Der Funddichteindex (nach Drafeh et al. 2003) berechnet sich aus der Feldgröße in Hektar / Anzahl der Steinartefakte pro Begehung.

longer suitable as a major route of communication. The region offers a passage across the Swabian Alb to the Neckar region and access to the upper Rhine valley at Lake Constance.

The Archaeological Record

Field surveys as well as information available from the site archive and amateur archaeologists suggest regional differences in site distributions and function within the study area.

Survey Results

A total of 388 hectares was surveyed. Because survey was dependent on finding open fields with adequate surface visibility, we were unable to use a formal sampling strategy (see Jochim et al. 1998). However, to maximize evenness across different environmental zones, the survey area was divided into 80 sampling squares with fields chosen from each area. Prehistoric chipped stone artifacts were found on 95 out of the 240 fields walked (39.6 %). The number of artifacts found per field ranged from 1 to 2046.

Density of surface finds is presented using an index of find density (field size in hectares divided by number of prehistoric lithics per survey pass) (Fig. 8). Lower values indicate greater

densities of prehistoric lithics (Drafehn et al. 2003). Find densities were highest in the central and eastern parts of the survey area, where raw materials are abundant (Blaubeurer Flächenalb) or where agricultural potential is moderate to high (Ulmer Flächenalb). Very little evidence of prehistoric activities was found on the higher Kuppenalb, though stone raw material is also available in this area.

The survey finds are dominated by artifact types characteristic of the Neolithic (Fig. 9). The most common modified tools found were scrapers and borers. Four pieces with sickle polish were recovered in survey, including unretouched and retouched blades and one Neolithic microlith. Regular blades and cores also point towards a Neolithic age. Other time periods are difficult to identify conclusively among these materials. Several very small flake/bladelet cores made of tempered chert indicate a possible Early Mesolithic component, but no Mesolithic microliths or microburins were found.

At two locations, bifacially flaked forms were collected in survey (Fig. 10). These have presented problems of identification,

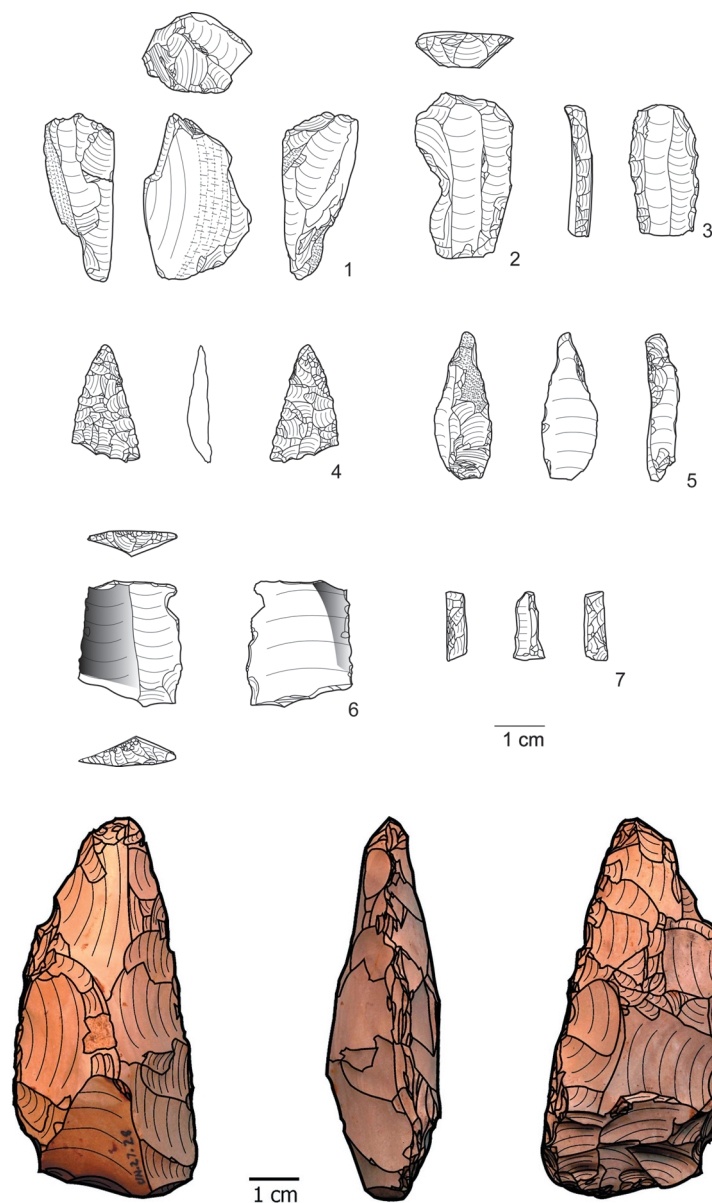


Fig. 9: Survey finds: Neolithic and possible Mesolithic artifact forms: 1 possibly Mesolithic core, 2 scraper, 3 lateral retouch, 4 surface retouched projectile point, 5 borer, 6 Neolithic microlith with sickle polish, 7 borer tip.

Abb. 9: Surveyfunde: Neolithische und möglicherweise mesolithische Steinartefakte: 1 möglicherweise mesolithischer Kern, 2 Kratzer, 3 Lateralretusche, 4 flächenretuschierte Pfeilspitze, 5 Bohrer, 6 Neolithischer Mikrolith mit Sichelglanz, 7 Bohrerspitze.

Fig. 10: Bifacially flaked tool form, Survey 2002.

Abb. 10: Bifazial retuschiertes Werkzeug, Feldbegehung 2002.

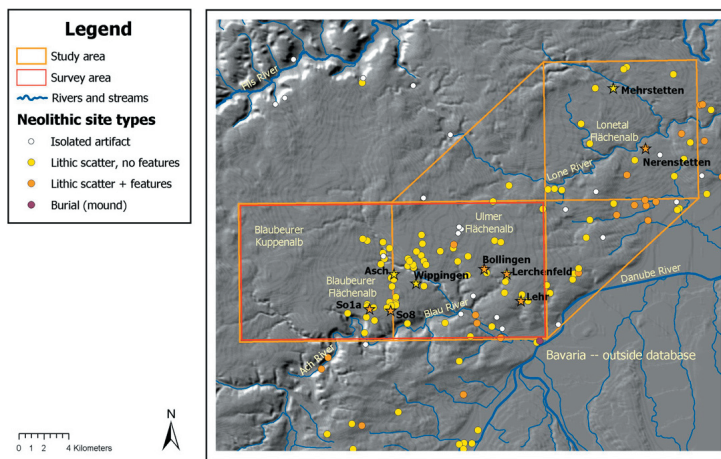


Fig. 11: Neolithic sites in the study area. The Blaubeurer and Ulmer Flächenalb are dominated by surface scatters while more sites with subsoil features are known from the Lonetal Flächenalb.

Abb. 11: Neolithische Fundstellen im Arbeitsgebiet. Während von der Blaubeurer und Ulmer Flächenalb hauptsächlich Oberflächenfundstellen bekannt sind, konnten auf der Lonetal-Flächenalb mehr Fundstellen mit Bodenbefunden nachgewiesen werden.

since broadly similar forms were produced in this region during the Middle Paleolithic and the Late Neolithic. Comparative work to identify the probable age of bifacial forms and evaluate the significance of earlier and later time periods is on-going.

Neolithic Sites in the Study Area

A search of published literature and Landesdenkmalamt site archives produced a total of 134 Neolithic sites or isolated finds within the study area (Fig. 11). Most are surface collections documented by amateur archaeologists. Two are rockshelters or caves and the remainder are open-air localities. Available records indicate that features such as plowed-up pits are relatively common in the eastern portion of the study area but rare to the west (Blaubeurer Flächenalb), where most reported sites are lithic scatters without features, and often without ceramics. Because the methods and amount of detail associated with these reports are highly varied, these patterns can serve only as a starting point for further inquiry. Excavations and reported features give evidence for a number of settlements on the Ulmer and Lonetal-Flächenalb, while sites on the Blaubeurer Alb are harder to assess. Land use and settlement on the Blaubeurer Alb are the subject of our on-going research.

Nine Neolithic sites were selected for detailed environmental and artifact analysis (indicated by stars on Fig. 11, Fig. 5). These were chosen so as to include sites located in different environmental settings and at varying distances from raw material sources. Four of them are located in the Blaubeurer Flächenalb (Asch, Sonderbuch 1a, Sonderbuch 8, Wipplingen 1). These are dense lithic scatters located on or near chert raw material sources; ceramic preservation in this area is poor. Three sites in the lower-lying Ulmer Flächenalb have also been analyzed (Bollingen, Lehr, Lerchenfeld); lithic and ceramic finds as well as features have been documented at these three locations. Finally, two sites in the Lonetal-Flächenalb were included in this analysis: one lithic/ceramic scatter with a partially excavated LBK house (Nerenstetten-Setzingen), and one dense lithic scatter associated with a localized chert source (Mehrstetten)⁵.

⁵ The official site names are: Asch 3 „Mairinger, Brennerhöhle“, Stadt Blaubeuren; Sonderbuch 1a „Grund“, Stadt Blaubeuren; Sonderbuch 8 „Widemen“, Stadt Blaubeuren; Wipplingen 1 „Höfermahd“, Gde. Blaustein; Bollingen „Waisenjauchert“, Gde. Dornstadt; Mähringen „Lerchenfeld“, Stadt Ulm; Lehr „Brunnensteige“, Stadt Ulm; Mehrstetten „Sansenhau“, Gde. Ballendorf; „Nerenstetter Feldle“, Gde. Nerenstetten und Setzingen. All Alb-Donau-Kreis, Baden-Württemberg.

A central issue for any study of the Neolithic settlement landscape is to be able to distinguish permanently occupied settlements from sites that were only visited occasionally and might have had a special function, such as the sites near raw material sources on the Blaubeurer Flächenalb (Asch, Wipplingen, Sonderbuch 1a and 8) and in the Lonetal-Flächenalb (Mehrstetten).

The most reliable evidence for permanent settlements is given by features in the ground, especially post holes that allow reconstruction of houses, and trash pits with ceramic sherds, lithic tools, wattle and daub and animal bones. On the Ulmer and Lonetal-Flächenalb a few LBK settlements have been identified by excavation. The Bollingen site, located on the Ulmer Alb, is the best known LBK settlement in the study area (Fig. 12). Albert Kley documented and partly excavated subsurface features in a 200x200 m area when the site was destroyed by construction work. Kley's carefully drawn plan provides evidence for at least 17 LBK houses.

Furthermore, at Nerenstetten-Setzingen two small test trenches gave evidence for an LBK house with postholes and long pits parallel to the supposed walls.

Another piece of evidence for settlement sites are features visible as dark stains in the plowzone. These have been documented at a number of sites in the eastern part of the study area, i.e. Lehr on which we report here. Sites on the Blaubeurer Flächenalb are hard to assess because there is very little ev-

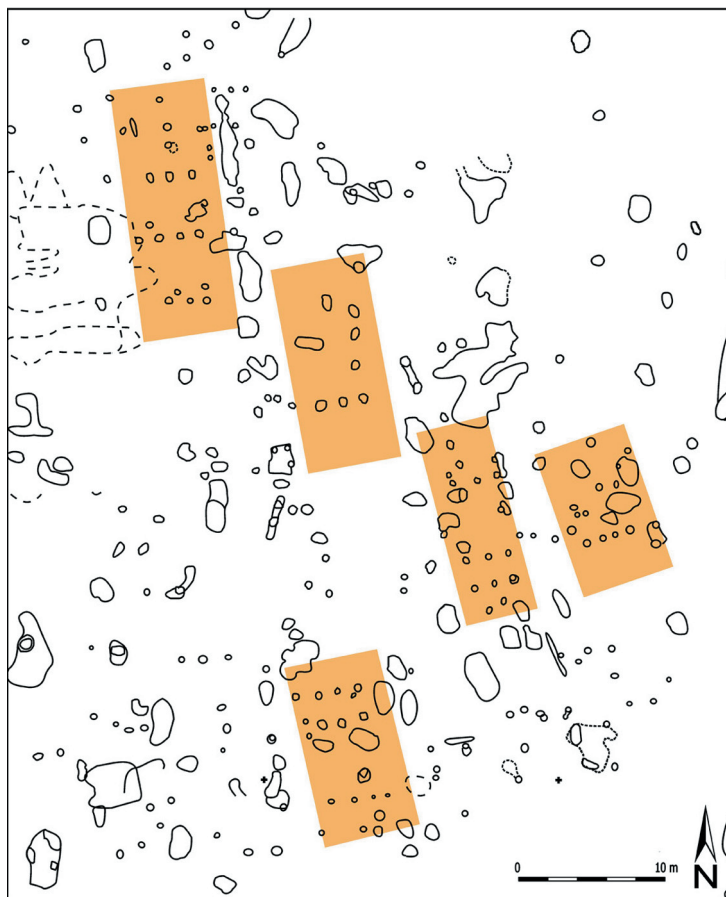


Fig. 12: Bollingen: Section of the LBK settlement. The arrangement of post holes suggests at least five LBK houses in the selected area.

Abb. 12: Bollingen: Ausschnitt des Grabungsplans. Die Anordnung der Pfostenlöcher läßt auf mindestens fünf bandkeramische Häuser im abgebildeten Areal schließen.

idence for subsurface features. However, a geomagnetic test survey suggests preservation of features at Sonderbuch 8 (Fig. 13). In the SW corner of the test area a roughly rectangle structure is visible, which might be a part of a prehistoric house.

However, most of our sites have to be judged solely on the basis of surface finds. The strongest indications for settlements are abundant ceramics and wattle and daub, which is preserved if houses with clay walls are destroyed by fire. Among the lithic artifacts, sickle blades with their typical shiny surface suggest that agriculture was practiced close to a site and people may have lived there permanently (Fig. 14).

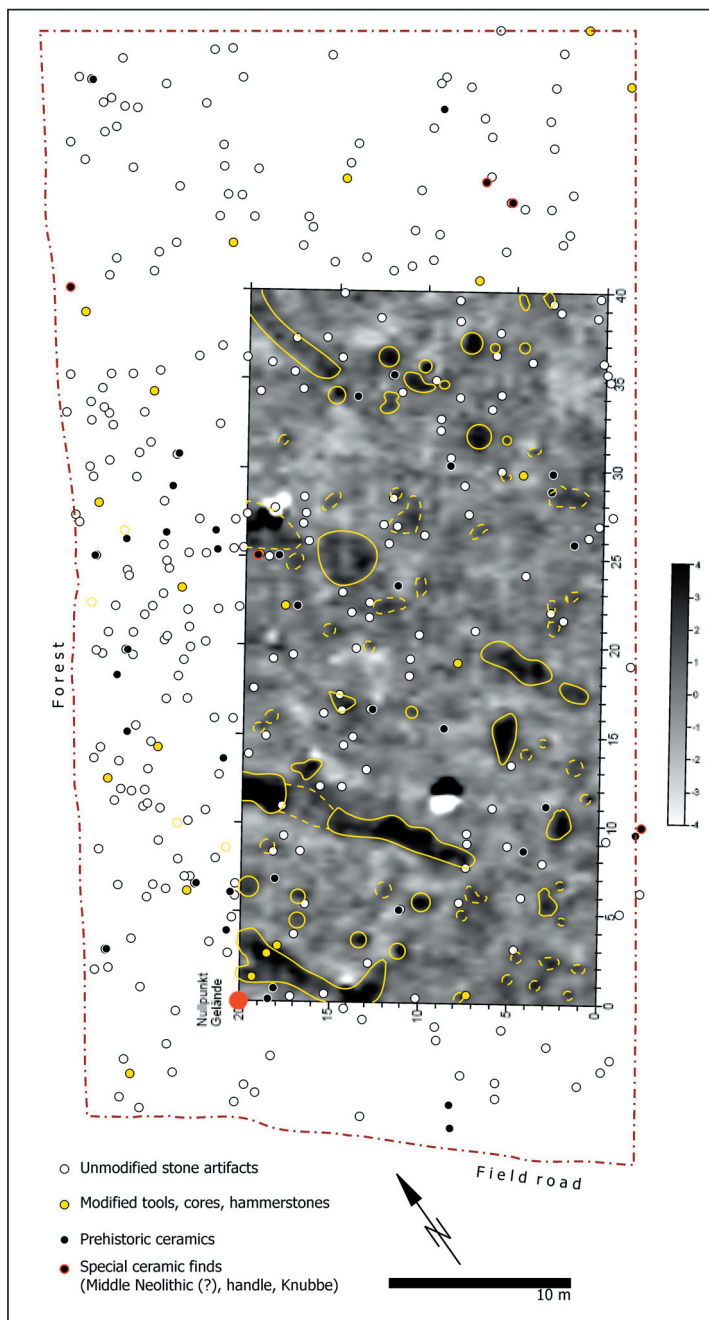


Fig. 13: Sonderbuch 8b: Geomagnetic prospection and 2004 survey finds. The dark anomalies in the SW corner indicate subsoil features that might have been part of a prehistoric house.

Abb. 13: Sonderbuch 8b: Ergebnis der geomagnetischen Prospektion und Oberflächenfunde von 2004. Die rechteckigen, dunklen Anomalien in der SW-Ecke legen nahe, dass sich Bodenbefunde erhalten haben, die möglicherweise Teil eines Hauses sind.

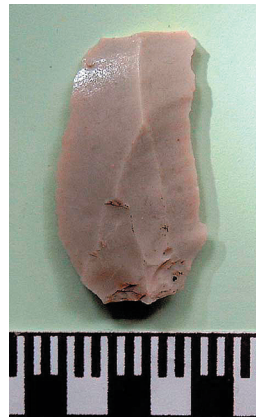


Fig. 14: Example of sickle polish from Sonderbuch 8.

Abb. 14: Artefakt mit Sichelglanz von Sonderbuch 8.

Results of Spatial Analysis of Site Distribution

Blaubeurer Kuppenalb

Although thoroughly covered in our surveys and not neglected while researching other sources, the Kuppenalb portion in the NW of the study area lacks known Stone Age sites (comp. Klein 2003). This is not surprising, given the colder temperatures, higher precipitation rates, shallower soils and large distances to running surface water. Natural chert, which occurs frequently in some quantity, does not seem to have encouraged Neolithic settlers to visit this landscape regularly. Nevertheless, it is likely that this landscape was part of the Neolithic settlement system and used for activities such as pasture, which leaves a more ephemeral archaeological record that is likely to be missed in field surveys. Furthermore, this area has never been of major interest to local avocational archaeologists which may also explain the paucity of artifacts.

Blaubeurer Flächenalb

Although it does not contain highly favorable soils and is characterized by relatively low agricultural potential and cool temperatures, many extensive Neolithic surface lithic scatters are known from the Blaubeurer Flächenalb. The analyzed site Sonderbuch 8, for instance, is part of a lithic scatter covering an area of more than 0.5 km². It is very likely that the natural white Jura chert attracted Neolithic people to this area. Whether it was mined systematically or not is unknown and a subject of our on-going research. The inference that agricultural use of this area was of subordinate importance is strengthened by the comparatively few sickle blades among our survey finds and analyzed collection material. Up to now there is little evidence for subsurface features. However, the geomagnetic test survey previously discussed at Sonderbuch 8 shows anomalies that are likely to be caused by archaeological features.

Ceramic preservation is poor in the Blaubeurer Flächenalb. A single decorated sherd from Sonderbuch 8, however, suggests that occupation started in the LBK (Fig. 15). Preliminary analysis of formal characteristics of lithic tools implies occupation through the Middle and Late Neolithic.

The present state of research indicates that the chert on the Blaubeurer Flächenalb was exploited. Wipplingen 1, for example, is located 100 m from a known chert source and may have been involved in raw material procurement and lithic reduction



Fig. 15: LBK sherd from Sonderbuch 8.

Abb. 15: Bandkeramische Scherbe von Sonderbuch 8.

activities. A high percentage of retouched tools and late stage tool manufacture debris were observed in the assemblage. To what extent people settled permanently at Wipplingen and other sites in this area remains unknown, although it is at least likely for Sonderbuch 8. Below, we examine artifact assemblages to explore the possibility that sites near raw material sources show a narrower range of activities than settlement sites.

Ulmer Flächenalb

The high frequency of Neolithic surface lithic scatters continues on the Ulmer Flächenalb, even though no major chert raw material sources are known from this area. Slightly higher temperatures and deeper and more fertile soils suggest that this region was more favorable for agriculture.

The present state of research suggests highly variable use during the Neolithic. This area includes three of our analyzed sites. Bollingen and Lehr are LBK and LBK/Middle Neolithic settlements, respectively. In both sites, sickle blades are common and suggest that agriculture was important to at least some extent. The third site, Lerchenfeld, in contrast, is neither associated with a raw material source nor does it have a high frequency of sickle blades (8 in total; 0.2 % of total, 2.3 % of modified). Its role in the Neolithic settlement system remains unknown.

Lonetal-Flächenalb

Numerous sites known from private collections and published sources suggest a dense Neolithic occupation of the Lonetal-Flächenalb. This region is the most agriculturally favorable part of the study area including milder temperatures, more fertile soils and closer distances to surface water. Archaeological features at a number of sites suggest that permanent settlements dating to the earliest and later LBK phases had been

established in this area (i.e. Nerenstetten on which we report here). Another attraction was probably the naturally occurring Jurassic chert, which is known to have been exploited at the site of Mehrstetten (Fig. 15).

Analysis of selected lithic and ceramic assemblages

Materials

Lithic and ceramic finds from nine Neolithic sites situated in the three contrasting areas Blaubeurer Flächenalb (Sonderbuch 1a, Sonderbuch 8, Asch 3, Wippingen 1), Ulmer Flächenalb (Bollingen, Lerchenfeld, Lehr), and Lonetal Flächenalb (Mehrstetten, Nerenstetten) are included in a preliminary comparison (Fig. 16). They are either settlements with features known from excavations, plowed up pits, or geomagnetic survey, or they are surface scatters of unknown character that are either assumed to be occasionally visited raw material extraction sites, permanently occupied settlements, or possibly both.

Datable ceramics suggest an LBK component for some of the sites. Other chronological estimates are based on lithics, which indicate occupation at a number of sites well into the Middle and Late Neolithic.

Altogether, over 38,000 lithics and 20,500 ceramics were analyzed during the summers of 2002, 2003, and 2004. All materials are the products of surface site collection and excavation conducted by two avocational archaeologists. Albert Kley and Helmut Mollenkopf each dedicated many years to archaeological work in the region, resulting in well-documented collections far more extensive than any research project could have produced (Fisher/Knipper 2003; Knipper/Schreg in press).

The Comparative Lithic Database

In order to allow comparability among all lithic artifact assemblages, a coding system has been established to collect information about exactly the same attributes for all collections. For all sites, the collected materials were too numerous to fully analyze every artifact. The project was designed to focus on questions of Neolithic settlement, raw material availability and use, and site function and chronology. Therefore, detailed and short systems of analysis were developed to maximize the amount of data geared towards answering these questions, while not ignoring other possible research directions. The short analysis coded artifacts in groups with the same attributes, instead of single entries for each item, and gathered information on raw material type, raw material color, blank type, weight, and cortex. The detailed analysis collected information for single artifacts. It contained all of the same codes used in the short form, but also added analysis of technical attributes such as platform preparation, blade regularity, and scars on the dorsal face. For each site we aimed to collect a detailed sample of 500-1000 pieces, and all others were coded using the short analysis scheme. All tools and cores were given full analysis including information about the shaping of cores and modification.

Samples to analyze in detail for each site were chosen based upon the available information for the specific sites, and the manner in which each was originally collected. The detailed samples for the Mollenkopf collection sites included what he collected during a single year, while for the Kley collection sites one or two spatial subdivisions or finds from excavated pit features (Bollingen) were selected.

Ceramic Analysis: Chronology of Neolithic Settlement on the Alb

LBK ceramics are characterized by a distinct decoration style that mainly consists of incised lines which form wide bands that can either be left plain or filled with ornaments of incised lines and dots. Band decoration types changed through time and can therefore be used for relative dating. LBK ceramics from a number of excavated sites have been classified by decoration types, for which a relative chronological sequence has been established. Although band types can be widely comparable, no common classification system has been published yet.

Methods

To allow relative dating of LBK ceramics from the study area, a decoration catalog was compiled based on classification systems established at other sites in the vicinity (Kind 1989; Kind 1990; Kneipp 1998; Neth 1999; Strien 2000). Decoration elements were grouped by position on the vessel (rim or body), main types (i.e. band fillings, endings, or undetermined fragments) and were numbered by group. Ceramic analysis referred to this catalog and collected information on positions of sherds on the vessel, decoration types and position, a preliminary chronological estimate, and written comments on color, temper, and special characteristics. Middle Neolithic and later ceramics could not be grouped into predefined classes and were described in the comments field. All decorated sherds were photographed. Simple statistical analyses and comparisons to other better dated sites allow one to estimate the chronological position and duration of a site along with its internal differentiation. Our ceramic analysis was mainly aimed at chronological issues.

Chronology

In the study area, ceramic preservation was variable ranging from no ceramics at all to thousands of fragments. Unfortunately, even where ceramics were relatively abundant, they were heavily fragmented and their surfaces badly abraded. This poor preservation complicated classification by band types and chronological estimation. Six of the nine sites that are included in our study yielded ceramics in varying quantities. Sonderbuch 8 (LBK), Mehrstetten (LBK?), and Lerchenfeld (Middle Neolithic) contained only single or very few decorated sherds as evidence for specific occupation periods. By contrast, Bollingen, Lehr, and Nerenstetten provided large ceramic collections with hundreds of decorated sherds. Chronological estimations pre-

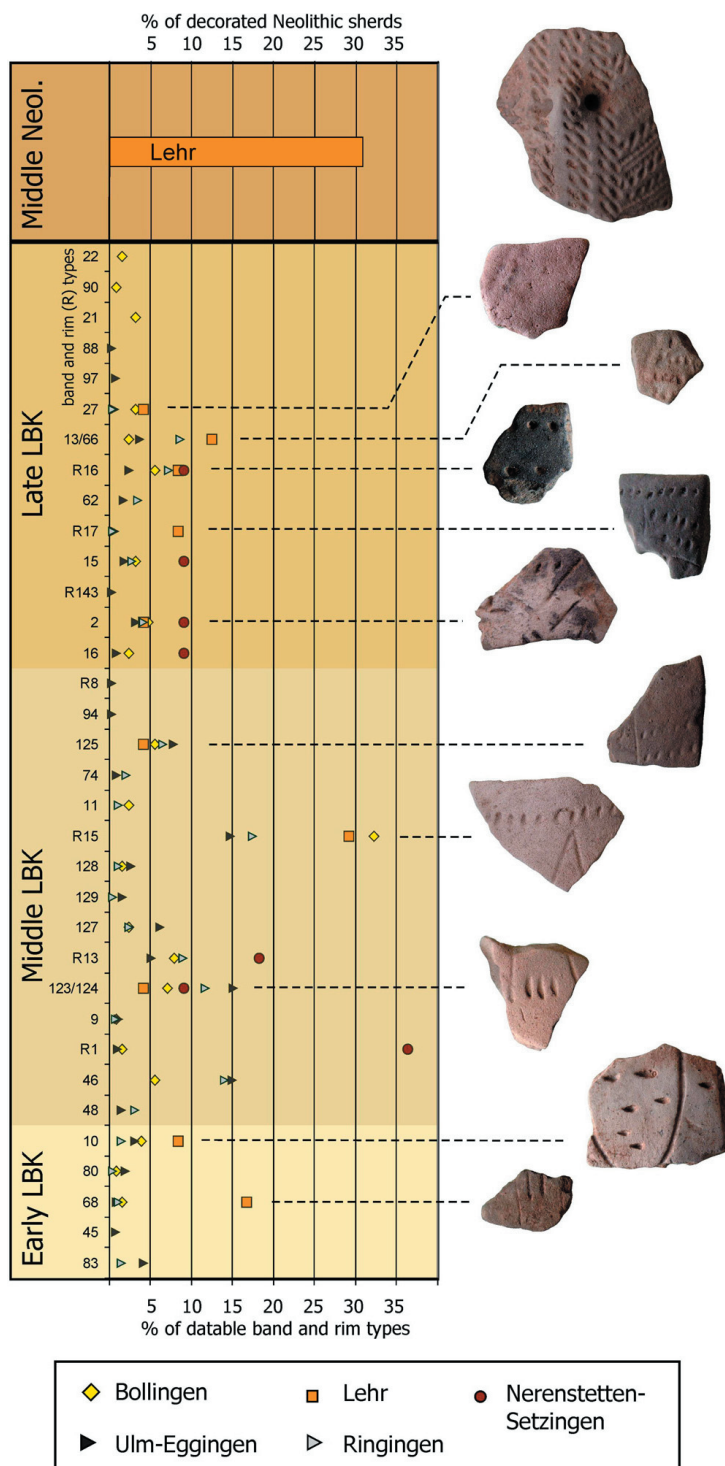


Fig. 17: Frequencies of LBK band and rim types in Bollingen, Lehr, and Nerenstetten-Setzungen in comparison to Ulm-Eggingen and Erbach-Ringing. The numbers of decoration elements are taken from our ceramic catalogue. Their chronological order corresponds to Kind 1990, Abb. 27.

Abb. 17: Häufigkeiten von bandkeramischen Band- und Randverzierungen in Bollingen, Lehr und Nerenstetten-Setzungen im Vergleich zu Ulm-Eggingen und Erbach-Ringing. Die Nummerierung entspricht unserem unpublizierten Keramikatalog, die zeitliche Abfolge orientiert sich an Kind 1990, Abb. 27.

sented here are based on comparison with excavated material from the nearby settlements of Ulm-Eggingen and Erbach-Ringing (Fig. 17) (Kind 1989; Kind 1990).

Earliest LBK ceramics are known from a few sites in the Lonetal-Flächenalb (i.e. Klein 1990), but were not among the material under closer analysis here. The oldest finds from Bollingen and Lehr dated to the late earlier LBK (late Flomborn phase). Nerenstetten seems to have been settled somewhat later in the Middle LBK, although the data might be biased due to a smaller sample size. Middle and late LBK types were well represented at all three sites, which strongly suggests contempo-

aneous existence. Bollingen and Nerenstetten may have been abandoned during the late LBK, while Lehr persisted into the Middle Neolithic and perhaps beyond.

Differentiation within the Lehr Surface Collections

Ceramic Chronology

Find provenience within the Lehr site (Kley 1957) was documented very consistently by Albert Kley, which allowed chronological differences to be observed. In the north and northeast areas of the site, decorated sherds dated almost exclusively to the LBK, while in the middle and northwest areas both LBK and Middle Neolithic decorated sherds were found. The southwest had few LBK sherds and was clearly dominated by the Middle Neolithic. The southern portion of the site contained hardly any distinct LBK and Middle Neolithic material and was dominated by undecorated handmade ceramics that can only be generally dated into prehistoric times, and suggest occupation beyond the Middle Neolithic (Fig. 18). Such chronological differences within a site are useful not only to judge the duration of its occupation, but also to distinguish chronological and functional differences within the surface lithic finds.

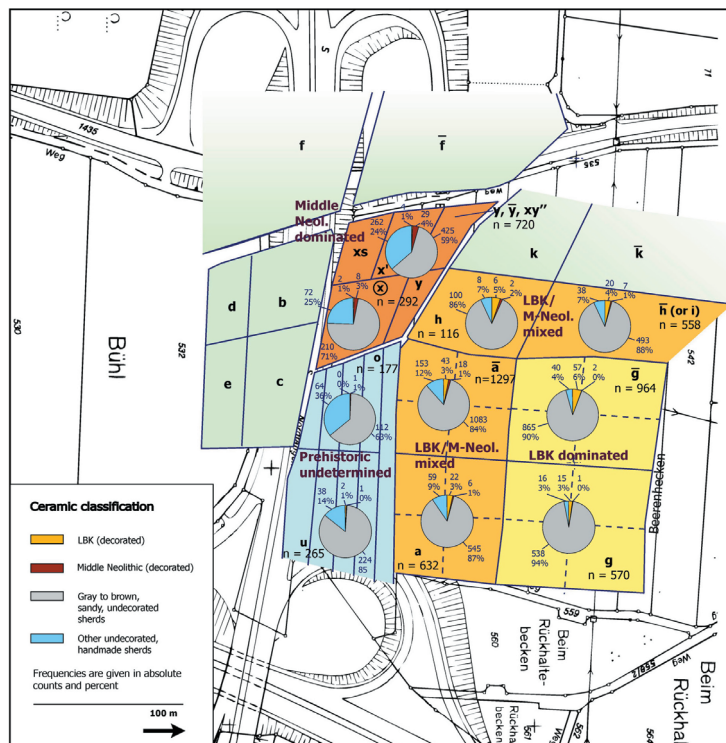


Fig. 18: Spatial differentiation of ceramics within the Lehr site. Decoration styles suggest predominantly LBK occupation in the north and Middle Neolithic settlement in the southwest. Note: The map is based on the original documentation by the investigator and is not N-S oriented.

Abb. 18: Räumliche Differenzierung der Keramik in Lehr. Die Verzierungsstile legen eine vorrangig LBK-zeitliche Besiedlung im Norden nahe, während im Südwesten mittelneolithische Funde vorherrschen. Man beachte: Die Karte geht auf die Originaldokumentation des Sammlers zurück und ist nicht genordet.

Differentiation in Lithic Assemblages

Lithic artifacts could also be assigned to specific spatial units within the site. This allows investigation of intra-site differences. Spatial units were combined according to chronological assessments based on the ceramic analysis. Intra-site comparison shows

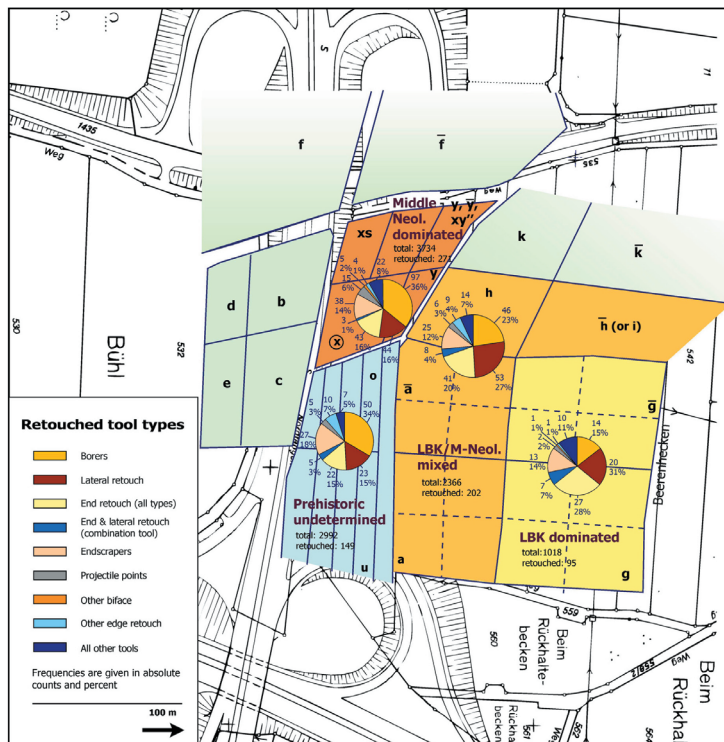


Fig. 19: Spatial differentiation of frequencies of the most common retouched lithic tool types within the Lehr site. Lateral and end retouched pieces were the most common tools in the LBK-dominated areas, while borers dominated the Middle Neolithic portions of the site.

Abb. 19: Räumliche Unterschiede in der Häufigkeit der häufigsten Werkzeugtypen in Lehr. Während lateral- und endretuschierte Stücke in den LBK-dominierten Bereichen überwogen, waren Bohrer die häufigsten Werkzeuge in den zumeist mittneolithischen Teilen der Fundstelle.

patterns that may be related to chronological differences within the site. In the LBK-dominated area, lateral and end retouched pieces (combined, 59 %) are the most frequent tool forms, while borers are less common (15 %). The Middle Neolithic areas, on the other hand, are dominated by borers (36 %), while end and lateral retouched pieces together comprise only 32 %. Projectile points and other bifaces are rare overall, but most of these derive from the Middle Neolithic dominated areas (Fig. 19).

In addition to frequency analysis, investigations of formal differences of tool types within the site are possible due to the detailed provenience information available. For example, borers are more variable in the Middle Neolithic dominated areas, and include forms that are not known from the LBK-dominated portion, such as borers with a long blade body and very long points. Overall, the middle Neolithic areas seem to include more clearly shouldered borers and more slender forms (Fig. 20).

In summary, preliminary comparisons suggest that intra- and inter-site comparisons will prove useful in untangling aspects of chronological variation in the lithic assemblages.

Results of Lithic Analysis

Analysis of the lithic comparative database of the nine sites is on-going, and several additional assemblages will be added to the project during 2005, the final season of data collection.

Some selected attributes of our preliminary lithic comparison are discussed below and summarized in Fig. 21.



Fig. 20: Lehr: Examples of varied borer forms for the LBK-dominated area "g" and the Middle Neolithic dominated areas "x" and "y". Middle Neolithic borers are more variable and include forms that are not known from the LBK-dominated portion of the site, i.e. borers with a long blade body.

Abb. 20: Lehr: Beispiele für unterschiedliche Bohrerformen aus der LBK-dominierten Ableseseinheit "g" und den vom Mittelneolithikum dominierten Einheiten „x“ und „y“. Mittelneolithische Bohrer sind variantenreicher und umfassen Formen, die in den bandkeramischen Teilen des Fundplatzes nicht vorkommen, wie z.B. Bohrer mit langem Klingenkörper.

	Blaubeurer Flächenalb				Ulmer Flächenalb			Lonetel-Flächenalb		Legend
	Sonderbuch 1a settlement/ raw material extraction?	Sonderbuch 8 settlement	Asch 3 settlement	Wipplingen 1 raw material extraction settlement?	Bollingen settlement	Lerchenfeld settlement	Lehr settlement	Mehrstetten raw material extraction	Nerenstetten settlement	
Time periods	LBK Middle Neol. Late Neol. ?	LBK Middle Neol. Late Neol. ?	Middle/Late Neol.	LBK? Middle Neol.? Late Neol.?	LBK	Middle Neolithic LBK (?)	LBK Middle Neol.	LBK (?) Middle/Late Neol. (?)	LBK	
Distance to chert raw material	< 1 km	< 1 km	< 1 km	on site	5-10 km	5-10 km	5-10 km	on site	5-10 km	
Raw material (color)										<div> <div>White to light gray</div> <div>Medium to dark gray</div> <div>Yellow-gray</div> <div>Yellow-brown & brown/beige</div> <div>Pink</div> <div>Other color</div> </div>
Cores (% of total)	6.8%	14.4%	13.6%	14.0%	4.0%	5.0%	2.2%	6.7%	4.4%	
Core forms										<div> <div>Regular forms</div> <div>Irregular forms</div> <div>(Semi) cylindrical flaking in 1 direction from 1 platform</div> <div>(Semi) conical flaking in 1 direction from 1 platform</div> <div>(Semi) cylindrical 2 platforms opposed</div> <div>2 platforms, turned 2 platforms, other</div> <div>3 or more platforms</div> <div>Discoid, radial</div> <div>Other form</div> <div>Amorphous core</div> <div>Core on flake</div> </div>
Hammerstones (% of modified)	9.3%	19.7%	18.9%	14.2%	9.0%	12.0%	14.6%	8.8%	19.1%	
Sickle polish (% of modified)	1.2%	8.8%	0.0%	0.0%	21.0%	2.6%	6.8%	1.25 %	41.5 %	
Retouched tool types										<div> <div>Borers</div> <div>Lateral retouch</div> <div>End retouch (all types)</div> <div>End & lateral retouch (combination tool)</div> <div>End scrapers</div> <div>Projectile points</div> <div>Other biface</div> <div>Other edge retouch</div> <div>All other tools</div> </div>

Fig. 21: Comparison of selected lithic attributes.

Abb. 21: Ausgewählte Eigenschaften der neun Steinartefaktinventare im Vergleich.

Nodular cherts are found in weathering deposits derived from Jurassic limestones. Chert varies in abundance and color across the study area. White to light gray chert is abundant in widespread surface deposits on the Blaubeurer Flächenalb, but rare on the Ulmer Flächenalb. Farther east in the Lonetal Flächenalb, more localized occurrences of chert are known. In this area, white to light gray chert occurs together with yellow-brown and brown weathered chert varieties. One such localized occurrence is associated with the Mehrstetten site (Burkert 2001).

98–99 % of all items in the analyzed collections were made from locally available Jurassic cherts. Variations in the frequency of white to light-gray versus brown or yellow-brown chert among the study sites, as well as the presence of some rare varieties, suggest that Neolithic people in the study area relied primarily on the closest available raw materials, but also had access to materials from distant sources. For example, white to light gray chert dominates all assemblages on the Blaubeurer Flächenalb. On the Lonetal Flächenalb, by contrast, locally available brown chert makes up 20–25 % of the analyzed assemblages. Raw material varieties in the Ulmer Flächenalb present a more diverse picture, though white and light-gray cherts make up 50 % or more of each assemblage. The few other materials present include a small number of pieces of Bavarian tabular chert transported from up to 160 km to the east. Tabular chert is most abundant at Lehr and Lerchenfeld, where it makes up 1 % of each collection. Other rare materials include radiolarite, quartzite, and a black alpine quartzite, all available on Riß-age terraces immediately south of the study area, within 4–12 km (Burkert 2001, 189). A few pieces of possible Rijckholt flint come from the Maas region, about 400 km to the NW of the study area (Fig. 22).

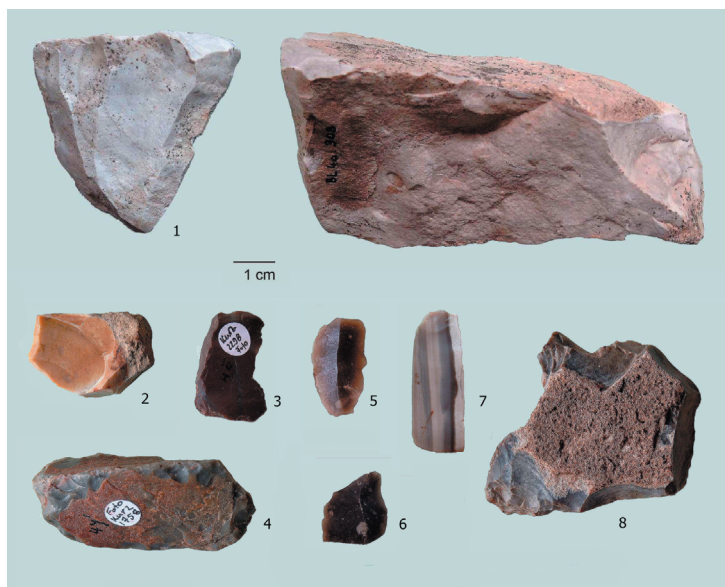


Fig. 22: Examples of raw material types found among the analyzed assemblages. White Jura chert (1) is by far the most common raw material, followed by brown or yellow-brown variants (2). Rare raw material types include red and green radiolarite (3 and 4), Baltic and possible Rijckholt flint (5 and 6) and Bavarian tabular chert (7 and 8).

Abb. 22: Rohmaterialarten der untersuchten Fundkomplexe. Weißer Jurahornstein (1) ist mit Abstand am häufigsten, gefolgt von braunen und gelb-braunen Hornsteinvarianten (2). Seltene Rohmaterialien sind roter und grüner Radiolarit (3 und 4), Baltischer und möglicherweise Rijckholt Feuerstein (5 und 6) sowie Bayerischer Plattenhornstein (7 und 8).

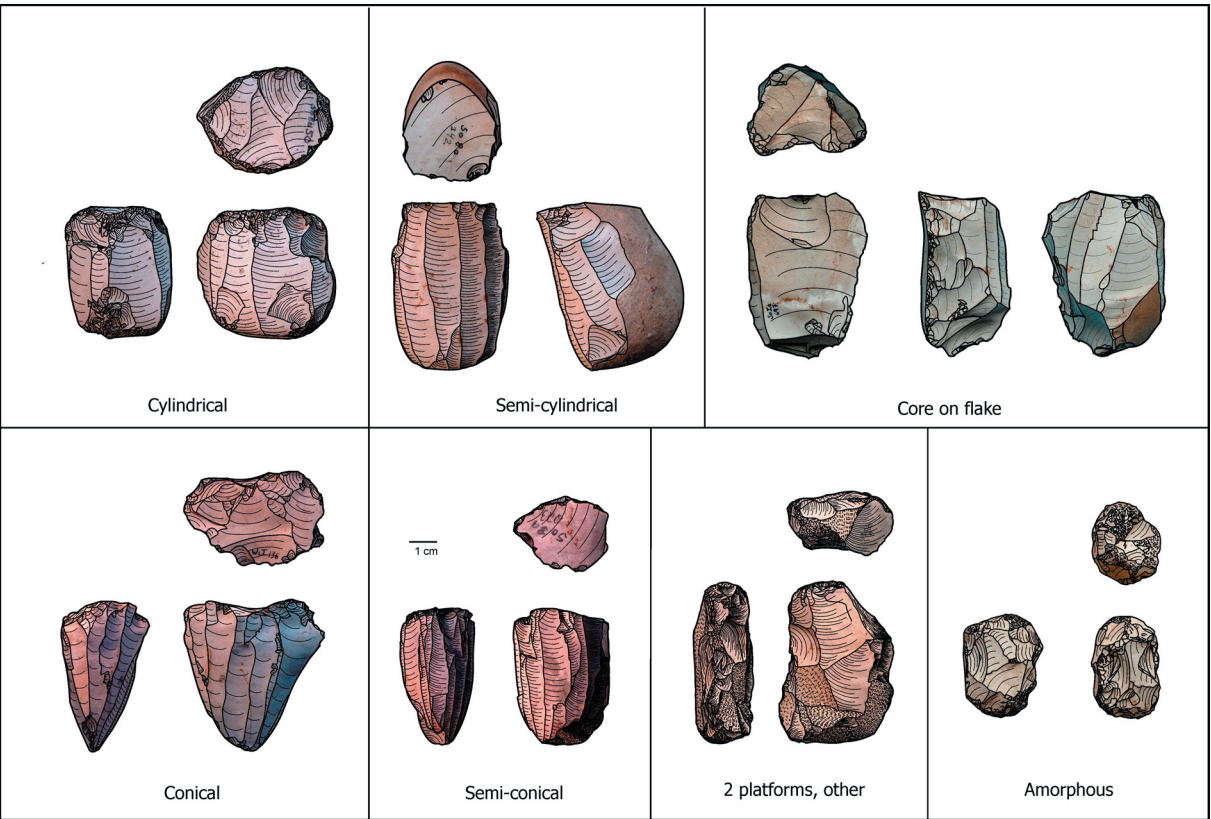
In order to assess possible functional differences among the nine analyzed sites, selected attributes from the total database are presented here. The form, weight, and frequency of cores and the frequency of chert hammerstones are compared in order to explore patterns of lithic raw material reduction. The frequency of sickle polish in assemblages serves as an index of the importance of agriculture at the site, and as an indication of permanent settlement. Finally, we begin to explore the spectrum of retouched tools in order to gain insights about the range of activities carried out at each site, possible indications of specialized activities, and chronological patterns.

Cores are present at all analyzed sites and suggest that early stages of lithic raw material reduction took place at all of them. However, sites closer to available raw materials contain relatively higher proportions of cores. At all of the sites from the Blaubeurer Flächenalb, along with Mehrstetten on the Lonetal Flächenalb, where the closest raw material source is less than 1 kilometer away, cores make up more than 5 % of the assemblage. For sites on the Ulmer Flächenalb and Nerenstetten raw material is 5 to 10 kilometers away. The percentages of cores at these sites are all 5 % or lower.

Regular core forms including cylindrical and conical cores are common at all sites. Irregular core forms, including cores worked in several directions, are most common at Asch and the three sites on the Ulmer Flächenalb (Fig. 23). Core forms may reflect a number of different sources of variation, including chronological and functional variation as well as distance to raw materials.

Fig. 23: Range of variation of core forms among analyzed lithic collections.

Abb. 23: Variationsbreite der Kernformen in den untersuchten Fundkomplexen.



Mean core weights (Fig. 24) are slightly higher at the sites on the Blaubeurer Flächenalb and Mehrstetten than on the Ulmer Flächenalb and at Nerenstetten, where the nearest chert sources are 5–10 km away. Sites with higher average core weights probably included more early stage raw material reduction activities, which is expected for sites near or directly on chert sources.

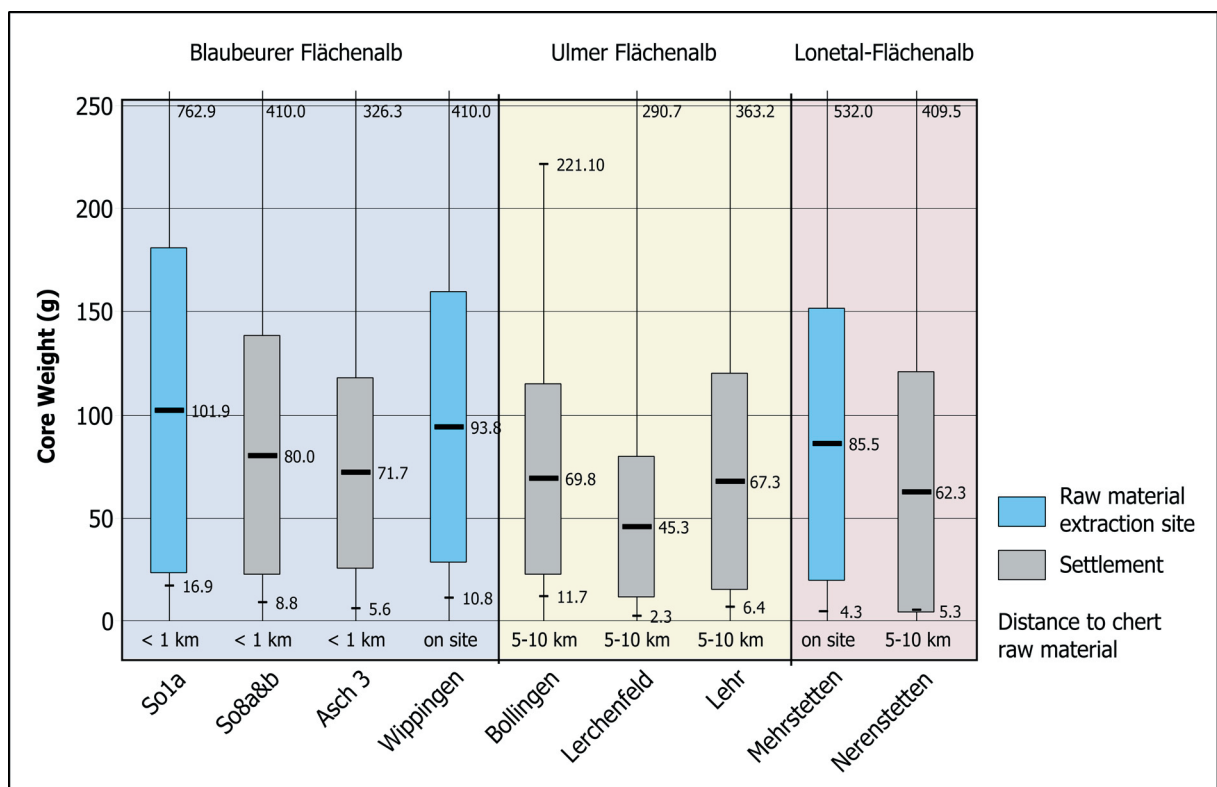
Chert hammerstones represented a significant proportion of modified tools at all sites. Variation in frequency of hammerstones shows no strong tendencies according to geographic area or supposed site function. It is clear that lithic reduction did occur at all of the sites, regardless of function.

Sickle polish from use of chert tools in processing plant materials provides direct evidence for agricultural activities that most likely go along with permanent, year-round occupation. Predictably, sickle polish shows a stronger patterning by site function. Sickle polish is most common at sites with supporting evidence showing they are settlement sites, though frequencies are highly variable. Among sites thought to be settlements, but without independent supporting evidence, the amount of sickle polish among modified artifacts is much lower. Raw material sites reveal consistently low percentages of sickle polish. This might indicate that agricultural practices played a rather minor role at these locations, if practiced at all. It is likely that these sites were occasionally visited, rather than permanently settled.

All collections yielded a broad spectrum of retouched tool forms. This suggests that activities were not restricted to raw material extraction and early stages of its reduction at any of our analyzed sites. The composition of tool spectra is highly variable and was likely influenced not only by function, but also by chro-

Fig. 24: Average, standard deviation, minimum and maximum core weights by geographic area and site type.

Abb. 24: Mittelwerte, Standardabweichungen, Minima und Maxima der Kerngewichte geordnet nach Teillandschaften und Art der Fundstellen.



nology and collection strategies and conditions. The most common tool types in the analyzed assemblages are borers, lateral and end retouched artifacts, endscrapers, projectile points and other bifaces (Fig. 25).

Although the pattern is very complex and further investigation is needed, some variation can probably be related to chronology. At the LBK settlements of Bollingen and Nerenstetten, and in the LBK dominated area within Lehr, tool assemblages are dominated by lateral and end retouched pieces, while borers are less common. Lehr (entire site), Lerchenfeld, Sonderbuch 1a and Sonderbuch 8 all show higher percentages of borers (>20 %) and fewer end and laterally retouched pieces. Based on the within-site analysis of Lehr lithics, we suggest that this may relate to an admixture of LBK and Middle Neolithic components. The range of borer forms at Lehr, Sonderbuch 1a and Sonderbuch 8 supports this. Wipplingen, Asch, and Mehrstetten each show unique patterns of tool forms, which may reflect collection strategies, presence of Late Neolithic activities at Asch, and other factors.

Conclusions of Preliminary Artifact Analysis

The very complex patterning in the lithic attributes discussed suggests that variation among the analyzed sites is influenced

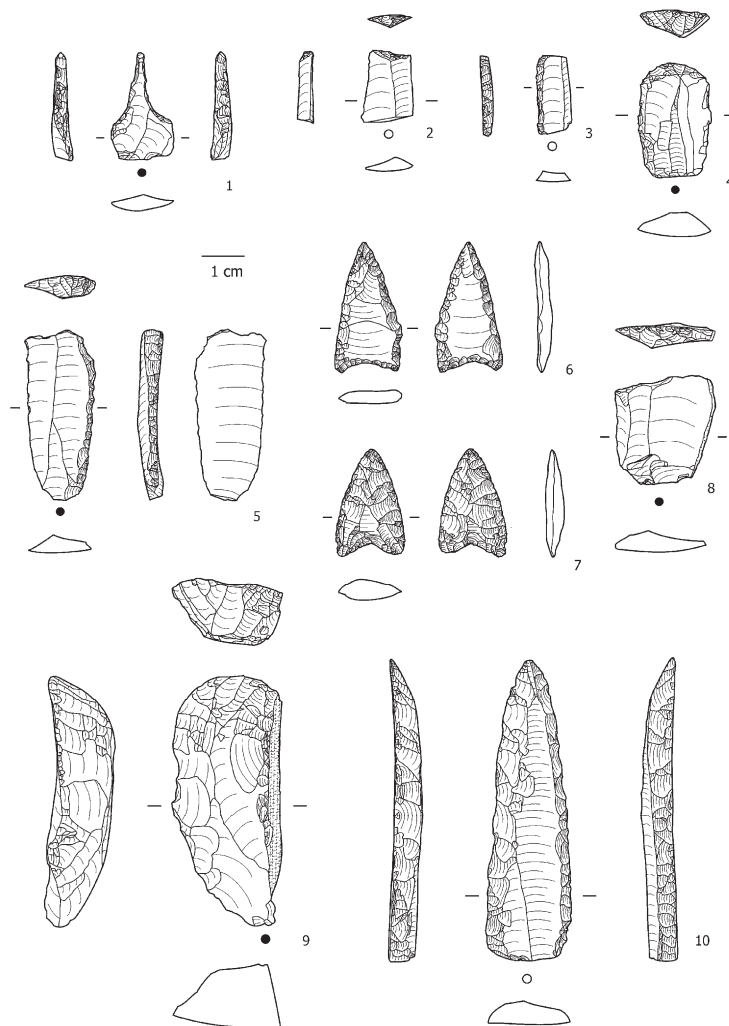


Fig. 25: Examples for the most common Neolithic retouched tool types in the study area: 1 borer, 2 end retouch, 3 lateral retouch, 4 scraper, 5 end and lateral retouch combination tool with sickle polish, 6 edge retouched projectile point, 7 surface retouched projectile point, 8 end retouch, 9 scraper with lateral retouch, 10 pointed knife with lateral retouches on both sides.

Abb. 25: Beispiele für die häufigsten neolithischen Werkzeugformen im Untersuchungsgebiet: 1 Bohrer, 2 Endretusche, 3 Lateralretusche, 4 Kratzer, 5 End- und Lateralretusche (Kombinationswerkzeug) mit Sichelglanz, 6 kantenretuschierte Pfeilspitze, 7 flächenretuschierte Pfeilspitze, 8 Endretusche, 9 Kratzer mit Lateralretusche, 10 Lateralretuschiertes Messer.

by a number of factors concurrently. Clearly differences in chronology (both within and between sites), activities performed at the sites, and collection strategies employed by amateur archaeologists all played a role in producing the assemblages discussed here. Therefore, it is often difficult to reach conclusions about how much effect any single factor might have had on a site. Some preliminary results hint at answers to the questions asked in this paper, while others simply raise more questions.

Chronology

Ceramics allow the best chronological estimate, while lithic tools are less variable, or their chronological variability is less well understood. For a number of sites, ceramic finds either give evidence for occupation in the LBK (Bollingen and Nerenstetten) or an extension into the Middle Neolithic (Lehr). At Lehr, ceramic finds suggest chronological differences among certain spatial units, which go along with differences in retouched tool type frequencies (i.e. borers, lateral and end-retouched artifacts) and formal variation of certain tool types (borers). Where ceramic preservation is poor, chronological estimates have to be based on comparison of lithics to finds from well documented stratified contexts. Further investigation of formal criteria is the subject of our on-going research. Initial results suggest that many of our sites are most likely multi-component and indicate occupation into the Late Neolithic (Asch 3).

Function

The analyzed large lithic collections are very likely to represent multifunctional sites. Abundant cores and hammerstones as well as retouched tool types give evidence for core reduction as well as tool production and use, plus a great variety of other activities. The highly variable tool spectra are especially hard to judge in their chronological versus functional significance. The most apparent patterning in the lithic analysis is in the percentage of artifacts with sickle polish, which occurs most frequently at settlement sites with features (Sonderbuch 8, Bollingen, Lehr, and Nerenstetten). The proposed raw material extraction sites show significantly lower frequencies of sickle polish, which suggests that agriculture was of subordinate importance. Raw material for tool production was most likely derived from local sources, as indicated by color differences that reflect the variation in natural chert in the immediate vicinity of the sites.

Altogether, the patterns in lithic and ceramic analysis reveal the high potential for greater understanding of Neolithic culture that can come from this project focusing on multiple sources of evidence. Further analysis of these and other sites in the region will enhance our abilities to work out the complex patterns revealed by our analysis so far.

Future Directions

At this point, our analysis of the already coded materials has concentrated on frequency tendencies of various lithic attributes. Our extensive photographic documentation will allow

a thorough classification of formal variants of tool and core types and help to better distinguish among chronological and functional aspects in lithic assemblages.

The extensive private collections that we have started to investigate still contain a lot of material to incorporate into our comparative database. Careful selection of materials from either well documented contexts (excavations), single-component sites (based on preliminary ceramic analysis) or under-represented areas will strengthen the statistical significance of the slight chronological and functional differences we have begun to see so far. Inclusion of more sites of different sizes from a variety of sources will help us to further explore functional differences among sites by looking at a greater segment of the Neolithic settlement system.

Surface scatters without known features are difficult to interpret. Further geomagnetic surveys and test excavations at selected sites are planned to document features that may have originated from either settlement and/or raw material extraction activities.

Although not all of the sites investigated so far are associated with naturally occurring chert, lithic raw material is highly abundant in the study area. However, in many other regions this is not the case. Further investigation will explore how our study area related to LBK settlement areas in surrounding regions where Jurassic chert was used for tool production, but was not naturally available. Were the sites in our area integrated in a possible trade or exchange system?

In summary, basic research is still needed to help better understand the Neolithic settlement system in the study area in all its complexity. Research in this region has the potential to contribute substantially to our knowledge of Neolithic economy and land use in Central Europe.

Zusammenfassung

Dieser Artikel stellt Ziele, Methoden und erste Ergebnisse eines gemeinsamen Forschungsprojekts zur neolithischen Besiedlung und Landnutzung der südöstlichen Schwäbischen Alb vor. Das Vorhaben verbindet systematische Feldbegehungen mit der Aufarbeitung umfangreicher Privatsammlungen, um die Verteilung von Fundstellen auf der Albhochfläche, die arm an Oberflächenwasser aber reich an natürlichen Hornsteinvorkommen ist, zu untersuchen. Die GIS-basierte Analyse der Lage der Fundplätze in Bezug auf Bodenarten und deren natürliche Eignung für Ackerbau, Abstand zum Wasser und Hornsteinvorkommen zeigt, dass viele bandkeramische bis jungneolithische Fundstellen entweder mit Hornsteinvorkommen oder fruchtbaren Böden vergesellschaftet sind.

Die umfangreichen Privatsammlungen bilden die Grundlage für die Untersuchung von funktionalen und chronologischen Unterschieden zwischen den Fundstellen. Erste Ergebnisse der Auswertung von Silex- und Keramikfunden von neun Plätzen zeigen Unterschiede in der Belegungszeit, der Rohmaterialnutzung, der Klingenkerntechnologie und dem Spektrum an modifizierten Artefakten zwischen wahrscheinlichen Rohmaterialgewinnungsstellen und Siedlungsplätzen.

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www.jungsteinSITE.de

Corina Knipper et al. –
*The Neolithic Settlement Landscape of the
Southeastern Swabian Alb (Germany)*
Article from May 25th, 2005
Page 31

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Corina Knipper et al. –
*The Neolithic Settlement Landscape of the
Southeastern Swabian Alb (Germany)*
Article from May 25th, 2005
Page 33

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