Settlement, Economy, and Cultural Change at the End of the European Iron Age


by

Peter S. Wells

with special reports by

Carl Blair, Pam J. Crabtree, Michael N. Geselowitz, Hansjörg Küster, Susan Malin-Boyce, Matthew L. Murray, Bernhard Overbeck, and Frederick Suppe
Chapter 15
by
Matthew L. Murray

Introduction

The large fortified settlements (oppida) that appeared during the second century B.C. in temperate Europe are often cloaked in an aura of mystery that pervades discussion of their social and spatial contexts (Collis 1984b, 149). This apparent inexplicability is related to poorly defined perceptions of the archaeological landscapes from which the Late Iron Age settlements emerged and to which they belonged. Late Iron Age oppida are interpreted broadly as “towns” or “cities” that were home to thousands of inhabitants, busy places of industry and commerce which commanded large hinterlands (Collis 1984a; Wells 1984). However, these hinterlands are rarely the focus of archaeological research.

This report details the rationale, methods, and preliminary results of a research project designed to collect data concerning the archaeological landscape of a massive Late Iron Age oppidum on the Danube River at Kelheim, Lower Bavaria, in southern Germany. The project combines a literature and archival search with archaeological field survey.

Work was undertaken as part of an interdisciplinary research effort to investigate the Late Iron Age settlement at Kelheim and its physical, cultural, and social context (Wells 1987, 1988b, 1991). It is part of a doctoral dissertation exploring the archaeological landscape of the final millennium B.C., a period of significant social change that culminated in the emergence of a Celtic civilization across western and central Europe. The study stresses the interplay of archaeological place and social discourse over time that incited, encoded, and was manipulated to create the Late Iron Age landscape.

Kelheim and its Physical Landscape

The city of Kelheim is situated in the southern German state of Bavaria within the department of Lower Bavaria (Niederbayern). A small center of industry and trade today, the city on the Danube River is located between the larger cities of Nuremberg and Munich. The Late Iron Age settlement at Kelheim was built around the Michelsberg, a massive limestone spur above the confluence of the Altmühl and Danube Rivers (Figure 15.1). Earthen and stone walls enclosed part of the spur and river terraces in the Altmühl Valley below.

The Michelsberg above Kelheim overlooks an important trade and travel nexus. Passing through Kelheim, the Altmühl River flows from the Central German Uplands into the Danube, which threads through the central European landscape to bind Western and Eastern Europe. The Altmühl meanders in the confines of its narrow valley (now part of a major new canal connecting the Rhine with the Danube) past numerous caverns and rock shelters. Before reaching Kelheim, the Danube lazily flows past rich agricultural fields and moors near Neustadt and Hienheim, and then rolls through a scenic gorge carved out by the river over 200,000 years ago. Beyond the confluence of the two waterways, the river valley opens into a broad basin. The Kelheim Basin expands to about three kilometers at its widest point, before narrowing as the combined energies of the Altmühl and Danube pass once again between dramatic sedimentary cliffs.

Kelheim occupies a special geomorphological position astride three very different landforms (Figure 15.1). These landforms endow the region with a variety of resources, such as iron, limestone, flint, timber, and major waterways, all plentiful and accessible within a short distance of Kelheim. In contrast, access to good arable land is limited in the narrow, steeply-sloped river valleys and on the sandy floodplains. The best tillable soils overlie deposits of loess between 4–7 km south and east of the oppidum.

Every region is a mosaic of local environments and conditions. The landscape around Kelheim can be conveniently divided into three primary land-
forms: 1) the Jurassic Upland plateau north of the Danube, 2) the Tertiary Hills south of the Danube, and 3) the broad Kelheim Basin between the plateau and the hills. This description simplifies what is in actuality a very complex situation (Rutte 1990). The Jurassic Upland also extends south of the Danube at Saal and in the vicinity of Weltenburg, where the Danube races between massive limestone cliffs. Characteristics of the Tertiary Hills, such as extensive loess deposits, are found north of the Danube on the Jura between Marching and Hienheim, where some of the richest agricultural land of the region is situated. Southwest of Kelheim the Abens River meanders slowly through bog and marsh before joining the Danube in the extensive fens of the Donaumoos.

The Jurassic Upland at Kelheim is the southern extremity of the Central German Upland. It is a karstic landscape based predominantly on sedimentary deposits from the Jurassic geologic period. Upland topography is characterized by high relief with rolling plateaus dissected by steep and narrow valleys. Near Kelheim elevations range from 400 m in valleys to over 500 m on the plateau. Soils of the area tend to be poor clays and clay loams, although there are scattered thin “islands” of loess along the edge of the Danube Valley. A large percentage of the Jura is forested, including much of the Fränkische Alb west of Regensburg and the Bavarian Woods to the east.

The Tertiary Hills of southern Germany were created by the crumpling of the Alpine Foreland as a result of tectonic instability during the early Tertiary geologic period. In the ensuing Miocene epoch, great deposits of alluvial sediment washed into the area and later were sculpted by numerous rivers. Late Pleistocene loess deposits and sand dunes accumulated along southern slopes and drainages, completing the gently rolling landscape of the present day. Relief is fairly consistent in the hills, and elevations near Kelheim range from 380 to 420 m. Near Kelheim south of the Danube there are Jurassic outcrops in the hills. Soils are fair to excellent, particularly those developed on thick loess deposits. Much of the area is currently under the plow. South of Kelheim at Abensberg begin the famous hops gardens of the Hallertau region.

The Kelheim Basin is a natural and historic focus of settlement in the region. The basin comprises alluvial deposits, sand, and gravel terraces, enclosed by Jurassic formations. Elevations range from about 340 m at the Danube surface to over 460 m. The southern slopes of the basin between Kelheim and Saal bear the imprint of two major abandoned waterways: the Altabens, which emptied into the Danube west of Saal, and the Urdonau, which flowed in a sharp meander around the present location of Saal (Rutte 1990). Loess deposits and aeolian sands partly overlie old Danube terraces along the northeastern slopes of the basin. Soils in the basin vary from sands to sandy clay loams and loams. They range from poor to good quality. Although heavily modified in the west and south by the city of Kelheim and neighboring town of Saal, the basin still supports many farmers, particularly in the river bottoms and along the terraces north of the Danube.

Aspects of the prehistoric landscape of Kelheim may have differed significantly from the present day, particularly the local vegetation, soil, topography, and weather conditions. Palynological tests undertaken during excavation of Neolithic settlements at Hienheim produced data for an environmental reconstruction of early farming communities in the Kelheim landscape (Bakels 1978). This reconstruction also focused on changes in microtopography which are relevant for much of the landscape around Kelheim. Studies of climatological change and prehistoric cultural modifications to the landscape elsewhere in southern Germany provide a basis for interpolation for later prehistoric periods (e.g. Küster 1986a, 1986b, 1988a, 1988b, 1988c).

**Landscape Archaeology and Socio-Spatial Dynamics**

The Kelheim field survey was designed to unite two different, but complementary, theoretical approaches to the archaeological landscape. The two approaches are based on different theoretical constructions about the “landscape” and the role of spatial structures in human settlement and social life. The first approach is the study of the immediate hinterland or “catchment area” of a large Late Iron Age settlement. In southern Germany, studies of Late Iron Age settlement systems have traditionally focused on the relations between larger population aggregates and commercial centers which are often separated by distances of 50–100 km or more. Too little attention has been paid to the landscapes around the oppida themselves, so that we lack adequate information about the size and character of rural populations, the exploitation of local resources, and changing patterns of land-use associated with oppida development. By using a diachronic approach to the study of the landscape around Kelheim, I hope to elucidate
Figure 15.1. Location of Kelheim at the confluence of the Altmühl and Danube Rivers in the southern Bavarian department of Niederbayern. This is the arbitrary area selected as the "region" for a records search to collect data on prehistoric cultural resources. The three major geomorphic units of the Kelheim "region" are indicated. The Jurassic Upland is characterized by limestone, chalk, dolomite and heavy, loamy Albüberdeckung. Large loess fields are located in the vicinity of Marching and Hienheim. The Tertiary Hills are characterized by loess and Miocene sands and gravels. The Kelheim Basin is composed mainly of alluvial sediments with areas of loess and aeolian sands. The extensive fens at the confluence of the Abens and Danube rivers (Donaumoos) is also indicated. Political boundaries of neighboring departments of Oberpfalz (north) and Oberbayern (west) are indicated with a dashed line. These areas were not included in the records search.
general historical trends associated with the evolution of Iron Age societies. This approach will use the methods of traditional site catchment analysis and will employ a primarily ecological and processual approach to the landscape, in which the Late Bronze and Iron Age communities are visualized as conscious participants in a dynamic relationship with their physical surroundings. The landscape is an ecological backdrop providing the material basis for social development but also creating physical constraints on those developments.

The second approach explores Late Bronze and Iron Age landscapes in the context of new directions in critical social and spatial theory. Recent critical social theory revolves around the central concepts of "practice" and "discourse." Practice refers to a cognitive system through which human groups represent their social relations, in effect creating their own versions of social reality (Bourdieu 1977, 21). When contradiction between these constructions exists, people engage in discourse, a form of mediation in which participants reflect on, interpret, and represent their particular social conditions (Leppert and Lincoln 1989, 7). Discourse can be either reproductive, reaffirming existing dominant structures (Lincoln 1989, 73-74), or revolutionary, challenging dominant structures and acknowledging rival versions of social reality (Kertzer 1988, 40).

Discourse has a material and spatial dimension which makes social practice palpable and opens the process of social reproduction to critical analysis. The current reaffirmation of the spatial dimension of critical social theory was spearheaded by French scholars in the 1970s, such as Henri Lefebvre (1976) and Manuel Castells (1977), and has been further developed by, among others, British sociologists Anthony Giddens (1984) and John Urry (1984), and by American geographer Edward Soja (1989). According to Soja, socially created spaces possess an ideological content that provides a material form and expression to society. Space, therefore, is the concrete manifestation of practice; places and their relationships are laden with meaning and cultural value and become the material structures of social realities. These spatial relations in turn structure society, producing what Soja (1980) terms the "socio-spatial dialectic."

Some prehistorians have developed arguments to link the spatially-informed notions of practice and discourse with the material residues of past societies (e.g. Hodder 1986; Barrett 1988). The material resources of discourse are situated in space and time and these temporal spaces are places rich in social meaning. Landscapes are mosaics of places and are the ideal venue to explore long-term changes in places and their associated human dramas. This argument has been developed differently in provocative new studies, such as Hodder's (1990) analysis of Neolithic domestic structures and the sublime examination of the Cranborne Chase landscape (Barrett et al. 1991). Cranborne Chase, we learn, is a series of places in which people routinely engaged in social discourse, during which they transmitted knowledge, reinforced authority structures, or negotiated alternative social strategies through the manipulation of the ideological content of everyday materials. The landscape was routinely "read" during the cycles of agricultural reproduction which established social relations, based on age, gender, and inheritance structures (Barrett et al. 1991, 223). All forms of settlement, cemetery, cultivated plots, and non-habitation sites are the material representations of biological reproduction (Barrett et al. 1991, 236) and were the stages for social discourse, both reproductive and contentious. Therefore, cemeteries establish a topography of the dead as a social road map for the living, and internal ordering of settlements, processing and consumption of food, consumption of metalwork, and even presence of human remains in informal burial contexts were all means of social discourse (Barrett et al. 1991, 236-240). The prehistoric landscape and the monuments that are the focus of archaeological research today were active participants in the structuring of prehistoric social conditions (Barrett et al. 1991, 6-8). The landscape is an important social resource; it operates as a frame of reference for social behavior and, therefore, as a force of and participant in historical event.

The socio-spatial dialectic informs us that through time social and spatial structures are continually negotiated and reproduced or transformed. This provides a new theoretical framework within which to investigate the changing landscape of the final millennium B.C. in southern Germany. Through the study of different socio-spatial contexts through time, the discourses that comprise social relations may become apparent and open avenues of interpretation and discussion on the nature of prehistoric social relations. The changing structure of different social contexts through time is the essence of social landscape archaeology. When these contexts, such as ritual, are examined over the longue durée, they help to underscore the contradictions that fuel social discourse and make these contradictions visible at the levels
of geographic and social time (Bradley 1991). This has already been illustrated for changes in burial ritual and mortuary spaces from the Late Bronze Age to the Late Iron Age in southern Germany (Murray 1992).

The goal of the Kelheim survey project is the construction of long-term history for the Kelheim region. The study incorporates two approaches that operate within different theoretical spheres and ask different questions about the role of the landscape. A traditional approach in landscape archaeology studies different land-use patterns over time, the distribution of site types and functions across the landscape, and the changing relationships between sites. The second approach explores the landscape as a force of social history, as a social resource, and as a dialectic rather than as a static source of material resources and physical constraints. According to Pred (1990), the fundamental purpose of landscape history is the study of the local transformations of social practice and power relations. I suggest that both approaches are valid and that a multifaceted landscape analysis can yield data to serve both approaches.

**Literature and Archival Research**

Examination of the Kelheim landscape began with a study of the physical surroundings. The initial step was to gather environmental information about the Kelheim area, including mapped geological, soil, and vegetation data. These data largely reflect modern analytical criteria, and their use should be tempered by existing data on the prehistoric environment. Information on pre-modern conditions is available from palynological data and through a consideration of site formation and post-deposition dynamics. This involves consideration of post-depositional modification to the prehistoric landscape, especially via intensive modern agriculture, managed forestry, flood control, settlement, warfare, soil erosion and accumulation. The second step involves the recording of known prehistoric find spots through a search of various sources for published and unpublished reports, including excavation protocols, find notices, aerial photographs, field collections, and cultural resource inventories of communities within the search area.

**Rationale and Method**

Prior to the literature and archival search, four issues were considered that affect the process and results of data collection: 1) selection of an appropriate study region, 2) determination of the scale of analysis, 3) choice of data criteria, and 4) determination of temporal analytical units.

Archaeological concepts of region have been the focus of recent critical dialogue (Marquardt and Crumley 1987). Archaeological regions often have more to do with our research goals and methodological limitations than prehistoric realities. What size landscape is sufficient to treat the proposed research questions? In the absence of a clearly delimited natural region at Kelheim or any evidence that natural boundaries and social or cultural boundaries overlap, a choice was made to combine research interests with pragmatic considerations.

The oppidum at Kelheim is located conveniently at the center of the official 1:50,000 topographic map (Figure 15.1). This map covers nearly 550 km² in Lower Bavaria, Upper Bavaria (Oberbayern) and Upper Palatinate (Oberpfalz). It includes several significant geomorphological areas. It was decided to limit the collection of reported data to the area on this map, in effect, to make this map the arbitrary "region" around the site of Kelheim. To further streamline data collection, only data within the borders of Lower Bavaria would be collected, comprising 453 km². Terrain belonging to Upper Bavaria (west-southwest of Kelheim) and Upper Palatinate (north and northeast) involves mainly Jurassic Upland landscapes similar to those found north of the Danube at Kelheim, so the exclusion of this territory from study does not remove unique or otherwise significant terrain from consideration.

The selected region should not be confused with a bounded prehistoric reality. However, it offers certain advantages to the study of long-term landscape history around Kelheim. The region contains land up to 17 km from the Michelsberg, an area whose inhabitants would have been in close contact with the oppidum during the Late Iron Age. Within this hinterland we can assume that the oppidum inhabitants obtained their daily bread and other necessities, as well as raw materials for production and trade, such as iron, stone, and clay. The region extends over 15 km up the Danube River from Kelheim, incorporating nearly one-half the territory between Kelheim and the oppidum at Manching, which is situated 36 km to the southwest. The selection of this region also will allow the study of local landscape history prior to oppidum construction and occupation.

The scale of analysis is determined by the se-
lected region and the proposed research questions. Since the project goal is to construct a local cultural and social history of the landscape around Kelheim, the analytical scale has to be at a detailed local level. The selected scale determines the kinds and quality of data to be collected. During archival and literature review, all known remains of prehistoric activity in the landscape were noted, including the results of unsystematic investigations, surface collections, and even isolated finds. Details of recovered materials, extant features, and other data pertinent to the recognition of prehistoric behavior were collected from available records. Information concerning discovery contexts is important to the critical appraisal of the data and also was noted. A variety of environmental data was determined for each location recorded during the search. Geomorphological data were studied on two levels: 1) the local situation and 2) the surroundings within a one-kilometer radius of the locale. Data included the geological substratum, topography, soil type and quality, vegetation, and modern land-use. Additional data recorded for each locale included elevation, slope, aspect, water source(s), and location within nested natural regions and sub-regions based on German government land divisions.

The final issue was the selection of temporal units of analysis. Although the project is intended to focus on events of the final millennium B.C. (Late Bronze to Late Iron Age), the locations and descriptions of Neolithic and Early–Middle Bronze Age sites were also recorded, since these would be encountered during field survey. Important Palaeolithic and Mesolithic remains are known in the study region, primarily from caves and abris below river bluffs and along river terraces. Their locations were noted but are not included in this report.

Neolithic remains from the study region comprise a detailed sequence of archaeological cultures and regional type groups, from the Early Neolithic (Linearbandkeramik) through the Middle Neolithic (Stichbandkeramik, Oberlauterbach group, Münchshöfen) to Late Neolithic and Eneolithic cultures (Michelsberg, Altheim, Cham group, and the Schnurkeramik–Glockenbecher facies). For the purposes of this report, these remains have been generalized as "Neolithic," although specific cultural affiliations were recorded during data collection. In future work it may prove fruitful to examine data for discrete Neolithic archaeological cultures and groups for the Kelheim region. The Neolithic sequence in southern Germany spanned about four millennia, from 5800–1800 B.C. Bronze Age remains belong to the Early (A–B1 horizons) and Middle (B2–C horizons) Bronze Age periods following the south German chronology established by Reinecke and modified by several generations of German prehistorians. The Early and Middle Bronze Ages lasted approximately 500 years, from 1800–1300 B.C.

At the end of the Bronze Age and the beginning of the Iron Age there are two chronological groups: the Late Bronze Age (Bronze Age D horizon) and the early Hallstatt period (Hallstatt A–B horizons), commonly referred to as the "Urnenfeld" Bronze Age culture. These two groups are combined under the term "Late Bronze Age" because of the similarities in material culture, especially ceramic forms, that make their separation difficult and because of the establishment of flat cemeteries and cremation rites in the Bronze Age D horizon which become a hallmark of the subsequent Urnfield culture. The Late Bronze Age spanned about 550 years, from 1300–750 B.C.

Traditionally the Early Iron Age in Central Europe begins with the later Hallstatt horizons (Hallstatt C–D). These assemblages are associated with changes in the mortuary and settlement behavior of the Late Bronze Age which are related to important social, political, and economic developments. In spite of the appearance of a new art style during the Early La Tène (A–B1 horizons), there is an unmistakable continuity in burial and settlement pattern during the Late Hallstatt and Early La Tène. In the Kelheim region, this continuity is illustrated by excavations in the Altmühl River Valley which recovered several pottery assemblages with mixed Late Hallstatt and Early La Tène attributes (Rind 1988), allowing the identification of a "transitional" period during which established Late Hallstatt populations absorbed new La Tène cultural innovations. For these reasons, Hallstatt Iron Age and Early La Tène are identified as "Early Iron Age," which lasted about 400 years, from 750–350 B.C.

At the start of the Middle La Tène period (B2–C1 horizons) in southern Germany there is a break in burial patterns and settlement occupation. This period marks the end of mound burial and the establishment of flat inhumation cemeteries. Burial changes correspond with the abandonment of most habitation sites of the Early Iron Age. The ensuing Late La Tène period (C2–D2 horizons) marks the appearance of the oppida and the virtual disappearance of organized burial places in southern Germany. There are relatively few Middle La Tène
cemeteries in southern Germany and settlements are almost non-existent. The apparent lack of archaeological material is usually explained by reference to the historical migration of Celtic peoples south of the Alps and eastward as far as Asia Minor. But this is not a very satisfactory explanation, since it fails to explain how very large, complex fortifications were established at the end of the Middle La Tène and beginning of the Late La Tène if the territory had been so heavily depopulated. The lack of Middle La Tène settlement remains is more likely related to weaknesses within established pottery chronologies. Not until the Late La Tène are typologically important metal objects (such as fibulae) common finds within habitation sites, so that ceramics remain the primary basis for establishing cultural affiliation. The general absence of pottery in cemeteries of this period, with their associations of jewelry and weapons, constrain the relative ceramic chronologies. Middle La Tène domestic pottery can rarely be separated from Early, or more importantly, Late La Tène assemblages, so that extant Middle La Tène sites are probably not identified and are therefore under-represented. For these reasons, Middle and Late La Tène assemblages are combined under the term “Late Iron Age,” which spanned nearly 350 years, from 350–15 B.C. Data collection ends with the final La Tène phase (La Tène D2) prior to Roman occupation at the end of the first century B.C.

Sources

After the consideration of methodological issues, data collection began with literary sources and archival records. Regional studies in prehistoric archaeology long have been popular in southern Germany, although the regional approach there has a somewhat different connotation from that in Anglo-American circles. German regional studies tend to have a strong culture-historical philosophy and are often painstakingly detailed discussions of the typology and chronology for a particular area (e.g. Kossack 1959; Torbrügge 1979). Until recently, regional studies largely have been based on archival data collection (Schmotz 1989; Schier 1990), and extensive systematic field survey is not as common as it is in American or British archaeology.

One result of this tradition in German regional archaeology is the compilation of excellent culture resource inventories for selected areas. Some volumes are catalogs of known monuments and sites of all periods in a particular region (e.g. Pätzold 1983), while others specialize on a particular period (e.g. Hochstetter 1980). For the Kelheim region there exist numerous catalog sources useful to this investigation, including works by Torbrügge (1959), Stroh (1975), Stork (1983), and Bayerlein (1985).

Archaeological field work in and around Kelheim is reported in a variety of professional journals, both local (e.g. Vorträge der Niederbayerischen Archäologentages, Archäologische Denkmalpflege in Niederbayern) and international (e.g. Archäologisches Korrespondenzblatt, Das archäologische Jahr in Bayern, Bayerische Vorgeschichtsblätter, Bericht der Bayerischen Bodendenkmalpflege, Germania), as well as in other journals, monographs, and unpublished theses.

 Literary sources were consulted at Widener and Tozzer libraries in Cambridge, Massachusetts; Wilson Library in Minneapolis, Minnesota; the Bayerisches Landesamt für Denkmalpflege in Landshut and Kelheim; and the Archäologisches Museum in Kelheim. The majority of the archival research was conducted during the summer of 1990 at the Lower Bavarian repository of archaeological site records at the Landesamt für Denkmalpflege in Landshut. Follow-up research was conducted during the spring of 1991 prior to field work. The repository contains site files, aerial photographs, and cultural resource inventories of the Kelheim area. Additional information about local collectors, private collections, and Rhein-Main-Donau Canal excavations in the Altmühl River Valley was obtained at the Bayerisches Landesamt für Denkmalpflege and the Archäologisches Museum in Kelheim.

Results

Literary and archival sources reveal the rich cultural tapestry of the landscape around Kelheim (Figure 15.2). The data represent nearly 6000 years of continuous settlement from the earliest farmers of central Europe to the pre-Roman Celtic peoples. They also reflect a long history of amateur and professional interest in prehistoric monuments and other remains in the area beginning early in the 19th century.

A total of 490 prehistoric locales1 are known within the 453 km² of archival search area (Table 15.1). This is an average of more than one locale per square kilometer, but the average is slightly distorted by the fact that some locations of prehistoric activity have produced remains from more than one chronological period. Unconfirmed reports
of prehistoric remains are not included. The total also does not include 10 locations within the Danube Gorge that were frequented by a private collector for many years (Rind 1991b). These materials are curated at the Landesamt für Denkmalpflege in Kelheim and were not available for analysis. They are from a mix of primary and secondary contexts along the river banks and document prehistoric activity in the gorge from the Palaeolithic to the Middle Ages.

Each locale represents a single archaeological component; some are components of multi-function occupations, such as a habitation with coeval burial remains, or of multi-component occupations, such as a location producing artifacts from several distinct chronological periods. For example, a place known to contain Late Bronze Age burials and yielding coeval domestic pottery, as well as producing Early Iron Age domestic debris from pits, is counted as three locales: a Late Bronze Age cemetery, a Late Bronze Age ceramic scatter, and an Early Iron Age settlement.

Three particular qualities of the archival and literary data are explored below: 1) distribution of remains from different archaeological periods, 2) distribution of different kinds of prehistoric remains and associated behavior through time, and 3) contexts of discovery for different kinds of remains and archaeological periods. Italicized terms refer to categories presented in the respective figures.

The occurrences of known prehistoric finds are summarized in Figure 15.3. Locales that could not be affiliated with any specific chronological unit (such as locales with generic "prehistoric" or "latènoid" artifacts) have been removed from the sample. There are 120 reported Neolithic locales, representing the entire Neolithic sequence for southern Germany. Highpoints in locale occurrence are the Bronze Age with 86 locales and the Early Iron Age with 78 locales. There are 58 known locales of Late Bronze Age remains and considerably fewer Late Iron Age find spots (only 43) around the oppidum at Kelheim. The large number of Neolithic locales is striking when compared to the occurrences of later prehistoric cultures, but this is a distortion caused by the greater span of time represented by Neolithic remains. When time is factored into the total locale occurrence for each chronological period (Figure 15.4), the Neolithic data emerge as a significantly smaller set.

Prehistoric locales can be divided into 10 rudimentary categories with formal and functional characteristics (Table 15.2). The categorization of each locale is based on associated materials, features, and the context of discovery.

Settlements are associations of domestic, industrial, and architectural residues with subsurface features, such as ditches, pits, hearths or furnaces, and postholes. These features may be recorded during excavation or noted as soil stains in plowed fields, construction sites, or quarries. A "settlement" usually connotes domestic behavior, but evidence of industrial activities, such as iron smelting, has also been included in this category. Settlements account for only 14% of the prehistoric locales.

Cemeteries include locations of funerary monuments, burials, or materials characteristic of funerary contexts. Unexcavated tumuli are included in this category. Cemeteries account for nearly one quarter (23%) of the known locales.

Ceramic scatters are finds of pottery sometimes with varying quantities of flint and metal. These locales are not associated with features. They may be surface collections from plowed fields, salvaged remains from construction sites, or stray finds made during the excavation of a locale from a different cultural context. For example, stray Late Iron Age sherds collected during the clearing of a Late Neolithic enclosure are identified here as a ceramic scatter. Ceramic scatters are the most numerous recorded prehistoric locale (32%).

Flint scatters consist entirely of worked lithic debris without other cultural remains. Like ceramic scatters, they may derive from surface collection, construction, or excavation. Scatters of flint account for 4% of the recorded locales.

Many cave and rock shelter sites in the Kelheim region have yielded cultural resources. This category also includes cliff top or cliff base deposits. Some mixed materials date to excavations at the turn of the century or earlier and can be related only to a group of neighboring caves, such as artifacts from the Schulerloch series in the Altmühltal Valley or the Franzöhle group in the Danube Gorge. Each of these series is counted here as a single locale. Caves total 9% of the known prehistoric locales.

Earthworks are monuments such as defensive walls and enclosures. Existing earthworks on the Michelsberg, Frauenberg, and Ringberg are included in this category, as are eight characteristic Late Iron Age rectilinear enclosures, Viereckschanken, that are scattered across the landscape (Schwarz 1959). Trenches cut into earthworks on the Michelsberg (Herrmann 1973) and Frauenberg (Sage 1975) have revealed the ages of some monu-
Figure 15.2. Distribution of post-Mesolithic prehistoric remains in the Kelheim region, based on a literature and archival search. All 490 recorded prehistoric locales are indicated, representing about 6000 years of landscape history. Some locales have more than one cultural or functional component. Areas with crop or soil marks identified in aerial photographs are also indicated.
Table 15.1. Reported prehistoric locales in the Kelheim region.

<table>
<thead>
<tr>
<th>Locale Type</th>
<th>“Prehistoric”</th>
<th>Neolithic</th>
<th>Bronze Age</th>
<th>Late Bronze Age</th>
<th>Early Iron Age</th>
<th>Late Iron Age</th>
<th>“La Tène”</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settlement</td>
<td>2</td>
<td>13</td>
<td>14</td>
<td>17</td>
<td>18</td>
<td>6</td>
<td>0</td>
<td>70</td>
<td>14</td>
</tr>
<tr>
<td>Cemetery</td>
<td>50</td>
<td>3</td>
<td>17</td>
<td>11</td>
<td>26</td>
<td>5</td>
<td>0</td>
<td>112</td>
<td>23</td>
</tr>
<tr>
<td>Ceramic Scatter</td>
<td>6</td>
<td>67</td>
<td>22</td>
<td>16</td>
<td>25</td>
<td>13</td>
<td>9</td>
<td>158</td>
<td>32</td>
</tr>
<tr>
<td>Flint Scatter</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Cave</td>
<td>0</td>
<td>13</td>
<td>14</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>Earthwork</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Hoard</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Isolate</td>
<td>2</td>
<td>18</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>4</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Flint Mine</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>120</td>
<td>86</td>
<td>58</td>
<td>78</td>
<td>43</td>
<td>18</td>
<td>490</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 15.2. Discovery contexts of reported prehistoric locales in the Kelheim region.

<table>
<thead>
<tr>
<th>Find Context</th>
<th>“Prehistoric”</th>
<th>Neolithic</th>
<th>Bronze Age</th>
<th>Late Bronze Age</th>
<th>Early Iron Age</th>
<th>Late Iron Age</th>
<th>“La Tène”</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>1</td>
<td>17</td>
<td>20</td>
<td>22</td>
<td>33</td>
<td>17</td>
<td>1</td>
<td>111</td>
<td>23</td>
</tr>
<tr>
<td>Salvage</td>
<td>0</td>
<td>11</td>
<td>28</td>
<td>7</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>68</td>
<td>14</td>
</tr>
<tr>
<td>Agriculture</td>
<td>21</td>
<td>78</td>
<td>19</td>
<td>16</td>
<td>20</td>
<td>7</td>
<td>9</td>
<td>170</td>
<td>35</td>
</tr>
<tr>
<td>Construction</td>
<td>5</td>
<td>9</td>
<td>15</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>56</td>
<td>11</td>
</tr>
<tr>
<td>Visible</td>
<td>58</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>66</td>
<td>13</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>120</td>
<td>86</td>
<td>58</td>
<td>78</td>
<td>43</td>
<td>18</td>
<td>490</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 15.3. Counts of reported prehistoric locales in the Kelheim region for each chronological period. The graph does not include 87 "prehistoric" and 18 "La Tène" find spots. The "prehistoric" locales consist of material of unknown pre-Roman cultural affiliation; "La Tène" finds may belong to the Early or Late Iron Age.

Figure 15.4. Relative numbers of locales in the Kelheim region corrected for the temporal duration of each chronological period (ratio of number of locales to years). Taken as a crude measure of the intensity of prehistoric activity, the data suggest a significant increase in intensity during the Bronze Age, a slight decline in the Late Bronze Age, and another marked rise in the Early Iron Age. Density of activity declined again during the time of oppidum construction and occupation in the Late Iron Age.
ments, but other remnant walls and enclosures in the region are not securely dated. Earthworks account for 3% of the known locales. Two kinds of monument have been omitted from the discussion because of difficulties posed by the identification and dating of the remains. These remains are open-pit iron mines and slag heaps that are known to dot the Jurassic landscape around Kelheim and probably date to the Late Iron Age and medieval periods (Schwarz et al. 1966; Burger and Geisler 1983). Only a few pits and heaps have been investigated. From the surface, the mines easily can be confused with natural karstic features. In the absence of archaeological tests to establish their nature and date, most mines and slag heaps remain dubious cultural resources.

**Hoards** are closely associated materials in contexts that may indicate intentional deposition, such as in cliff fissures, bogs, and pits (Stein 1976). Often the contents of the find are a clue, such as broken metal objects and scrap characteristic of a “founder’s hoard.” The find context is crucial in the interpretation of this locale category, but context information is not always available in archival records. Isolates or materials interpreted as domestic (settlements or ceramic scatters) actually may be hoards, so this category could be underrepresented. Finds that are interpreted as hoards comprise 2% of the total locales.

**Isolates** are the reported discoveries of single objects. This category encompasses a broad variety of materials, from individual sherds to a coin, bronze axe, or single iron sword. Isolates make up 9% of the total locales.

A small number of locales cannot be categorized. Their locations and contexts are recorded but details of the cultural resources are unknown. Information about these locales comes from vague notes in the archives, for example a brief notice concerning the unearthing of unspecified Early Iron Age finds in a turnip garden. These materials were often found many years ago and are now missing. Only 2% of the locales are unknown.

There are two known prehistoric **flint mines** in the record search area. The mines account for fewer than 1% of the total reported archaeological locales.

Figure 15.5 summarizes the occurrence of specific locale categories across all archaeological periods. Eighteen find spots with “laténoïd” pottery have been excluded from the graph because the ceramic may belong to the Early or Late Iron Age. Settlements make up a fairly even proportion of locales from the Neolithic to the Early Iron Age, but are less common for the Late Iron Age. Neolithic and Late Iron Age cemeteries are rare, but burial materials are plentiful from other periods. The largest single category for nearly every period is surface scatter. Flint scatters are by definition “prehistoric,” because of the lack of diagnostic material in a scatter of lithic debris. Cultural deposition in caves apparently was significant during the Neolithic, Bronze, and Early Iron Ages, but declined markedly in the Late Iron Age. Earthworks are either “prehistoric,” i.e. they are unexplored but appear to be pre-Roman, or date from the Late Iron Age (the **Viereckschanzen**). Earthen monuments that are probably Roman or medieval have been eliminated from the study. Hoards are known from the Early and Late Bronze Age.

The large number of burial mounds and cave sites around Kelheim attracted an early curiosity in the archaeological landscape. Amateur explorations began as early as 1800, when a certain **Forstmeister** Schmid hacked holes into wooded tumuli. In recent years, the area has witnessed numerous large-scale professional excavations and salvage operations as archaeologists struggle to recover the past before it is destroyed by modern development (Engelhardt 1987; Rind 1988). A strong local amateur interest remains, and numerous collectors visit their favorite hunting grounds to gather surface materials. Most individuals report these finds to the archaeologists, and the locations are then documented in the archives.

Fewer than one quarter (23%) of the known locales were discovered by professional excavation (Table 15.2). Find contexts of these excavations are secure, and records are published or preserved in the state archives. About 14% of the locales were explored during salvage operations, which are typically abbreviated. Reported materials and contexts are secure, but records are often inadequate. This category also includes older, amateur excavations, of which records have been lost or are incomplete. More than one third (35%) of the locales stem from surface collections. Construction accounts for the recovery of 11%, and a further 13% of the locales are visible monuments that have never been investigated. The discovery contexts of 4% are unknown.

Figure 15.6 summarizes the discovery contexts for each archaeological period (excluding “La Tène” locales). The graphs reveal several patterns with important implications for the interpretation of archival data. The high number of “prehistoric” monuments visible on the surface reflects the inclusion of 50 uninvestigated tumulus groups in this
Figure 15.5. Area graph showing numbers of reported prehistoric locales in the Kelheim region plotted against locale category. The graph presents a comparison of the varying numbers and proportions of locale categories through time. A few patterns deserve brief comment. The large number of "prehistoric" cemeteries reflects the presence of many uninvestigated groups of tumuli in the region (at least 50 known groups). Cemeteries from the Neolithic and Late Iron Age are poorly represented, but burial grounds are more common during the Bronze, Late Bronze, and Early Iron Ages. Ceramic scatters without associated features are the most numerous category and constitute the largest single category for nearly every period. Cultural residues in caves are common during the Neolithic and Bronze Age, and occur also in the Late Bronze and Early Iron Ages, but are rare during the Late Iron Age. With the exception of several undated "prehistoric" earthworks, most monuments date to the Late Iron Age (the Viereckschanzen and oppidum fortifications). Eighteen "La Tène" find spots are not included in the graph.
Figure 15.6. Summary of discovery contexts for reported prehistoric locales in the Kelheim region according to their chronological period. Values are presented as percentages of the total for each period. The graphs exhibit certain patterns with intriguing implications for the interpretation of archival data. A majority of locales affiliated with early prehistoric periods (top) have been discovered through agriculture and salvage (including old and amateur excavations). The fact that 65% of all Neolithic locales stem from surface collections in plowed fields may indicate a preference for good land that continues to be cultivated today. The discovery of one third (33%) of Bronze Age locales through salvage reflects early amateur interest in the numerous tumulus cemeteries of the Kelheim region, many of which have produced Middle Bronze Age burial materials. In contrast, locales of later prehistoric periods (bottom) have been recovered mainly through professional excavation. Thirty-eight percent of Late Bronze Age finds, 42% of Early Iron Age locales, and 40% of Late Iron Age locales are the results of excavation. This pattern suggests concentrated later prehistoric activity in river valleys, where recent professional excavations have been conducted.
context category. A large percentage of Neolithic locales has been found through surface collection in cultivated fields. Perhaps this is related to a prehistoric preference for good soils, such as loess, that are still cultivated today. Similarly, numerous Late Bronze and Early Iron Age locales are discovered as a result of modern agricultural activity. The predominant role of salvage and amateur excavations in the creation of the Bronze Age assemblage is a factor of the early local interest in tumulus cemeteries, many of which contain Middle Bronze Age remains. The set of locales from the Late Bronze to the Late Iron Age is mainly the product of professional excavations. This pattern of discovery is very different from earlier prehistoric periods and suggests differences between the nature of earlier (Neolithic, Bronze Age) and later (Late Bronze to Late Iron Age) prehistoric remains in the region. Were later prehistoric activities most intense in areas currently targeted for excavation (such as river valleys), or do the nature of the remains and the site formation processes peculiar to later prehistoric cultural resources possess some quality that makes them more likely to be discovered through excavation rather than surface collection? It is not clear if this pattern results from prehistoric cultural choice or archaeological bias; it is probably a combination of both factors.

Since the late 1970s, the Bavarian State archaeologists have closely scrutinized much of Bavaria from the air (Christlein and Braasch 1982). The Landesamt für Denkmalpflege in Landshut houses several thousand photographs of the Kelheim region. Aerial photo reconnaissance during the past 12 years has identified traces of over 200 possible prehistoric or historic occupations within the archival search area around Kelheim. These signatures consist of crop marks and soil stains. They range from positive images of ditched enclosures or post-built structures in ripe wheat fields, to negative images of stone-built burial tumuli in maize stands. Earthworks and mounds are also revealed through shadow in oblique light or snow cover.

Caution must be exercised in the interpretation of aerial photographs, particularly in a karstic and cultivated region such as Kelheim. Sink holes, underground springs, and filled drainages often mimic the aerial signatures of buried cultural remains. Aerial reconnaissance fails to provide adequate information about cultural affiliation, although attempts often are made to relate the particular forms of remains (such as a ditched enclosure) to specific functions and time periods. Aerial photos are effective only for cultivated land, meadow, or construction sites and therefore are biased toward currently open terrain. For the present research project, aerial signatures were used only as a reference for field walking. Attempts during fieldwork to identify surface remains that could be related satisfactorily to aerial signatures yielded little success.

While the known archaeological material around Kelheim reveals a prehistoric landscape of considerable diversity and density, the data are largely the result of accidental discovery. Large-scale organized archaeological reconnaissances in the area have been rare and have focused on salvage work or the study of specific local areas. Rhein- Main-Donau Canal construction along the Altmühl River in the 1970s and 1980s led to archaeological prospecting and numerous large clearing operations in the valley between Kelheim and Riedenburg (Rind 1988; Engelhardt 1989a). A small-scale pedestrian survey of loess fields along the Danube’s northern bluff south of the Michelsberg was undertaken in 1974 in conjunction with the excavation of Neolithic settlements at Hienheim (Modderman 1977, 1986). Particular fields often are visited by amateurs and professionals for surface collection, but these efforts usually are guided by knowledge gained from non-rigorous methods of detection.

Archival data comprise an archaeological sample as valid as any other (Schier 1990), but it is a sample that must be reconstructed through methods of source criticism. It is not a sample that the investigator can influence, beyond the initial steps of selecting a search area and collection criteria. In order to improve the reliability of available data concerning the prehistoric landscape around Kelheim, I designed and implemented a modest scheme of rigorous extensive and intensive field survey.

Field Survey

The Kelheim Survey Project was intended to balance work efficiency, economy, and effectiveness. Although so-called “full coverage” surveys recently have been proposed as the best approach to regional archaeological studies (Fish and Kowalewski 1990), their great expense still relegates them to ideals that have been only partly realized through long-term projects in some parts of the world. The realities of archaeological fieldwork usually demand less grand designs to produce meaningful results within existing financial
Rationale and Sampling Method

The Kelheim survey was bounded by certain practicalities. It was conceived as an exploratory project, combining a wealth of existing data with small field samples, to prepare a reasonable database for constructing a long-term history of social and spatial dynamics for a selected region. During design of the survey it was imperative to create an efficient research program for maximum economy, i.e. to maximize the production of meaningful data at a minimum of cost.

The specific goals of the field survey were to supplement previously recorded information, address questions raised by that information, and explore particular areas close to the oppidum at Kelheim. There were two important limitations to fieldwork: 1) data gathering was restricted to surface collection because of the considerable expense of systematic subsurface testing, and 2) work was to be performed by a single individual during two months in the spring of 1990.

Since field work was restricted to surface collection, a survey would be feasible only in terrain where surface visibility was adequate. About 60% of the landscape surrounding Kelheim and the Michelsberg presently is forested (Figure 15.1). To address this problem, field survey was preceded by an experiment in forest visibility.

The forest experiment was designed to determine the relative economy of a pedestrian survey in the managed forests of Bavaria. In heavily populated Germany, timber resources and woodland fauna are carefully monitored. State forest agencies constantly maintain woodlands, keeping paths cleared, regularly harvesting uprooted trees, and repairing disturbances to the forest floor. Many forests around Kelheim consist of tall, straight stands of conifers, planted in regular rows as a quick crop to replace harvested hardwoods. Forest canopies are dense, and undergrowth is inhibited, but a thick layer of leaf mold and vegetal detritus completely obscures the undisturbed forest floor and inhibits or hides the work of burrowing animals.

In the carefully maintained German woods, few opportunities exist for a visual evaluation of the forest floor and subsurface. Numerous forest paths are frequented by many hikers and local pedestrians, but the paths are old and established, and tend to be covered with the same detritus as elsewhere. Surface visibility is afforded only in occasional low-lying rutted areas or along isolated cut banks. A violent storm in the spring of 1989 caused extensive damage throughout Lower Bavaria, uprooting hundreds of trees and disturbing the forest floors. By the following year, clean-up efforts by forest workers and farmers had already removed most of the tree falls.

Because of regular recreational and economic activity in the forests, the long tradition of German map-making, and an established history of local interest in prehistoric mounds and earthworks preserved in the forests of Kelheim, it is doubtful that a systematic pedestrian survey of the woodlands would produce any significant unreported prehistoric surface features. The intensive mapping of iron mines may be an exception to this, but it would prove very difficult to distinguish between natural (i.e. sink holes) and cultural features without some form of subsurface prospecting. The utility of a modern investigation in the forests would lie primarily in the discovery of subsurface cultural deposits. This goal was beyond the modest scope of the present survey design.

Although preliminary assessment suggested that forest evaluation would not prove successful, fieldwork began with a test of forest versus field survey economy. This test was designed to compare the efficiency and expense of surface evaluation in forested and open field conditions. Two adjacent one-quarter-square kilometer parcels were selected as survey areas at the interface between the Tertiary Hills and Jurassic Upland. One parcel was located entirely in crop conifer forest. The second parcel was situated in open, agricultural terrain. The two parcels were selected because of their geomorphic and topographic similarity. Both are situated on reasonably good loess soil, and they share a similar aspect and elevation.

In addition, the forested parcel contains a large pre-Roman earthwork (a Celtic Viereckschanze) and lies between an extensive Bronze Age tumulus cemetery and the remains of a Roman fortification, so there is a potential for buried cultural resources on the parcel. The test was based on the assumption that if the forest offered acceptable opportunities to view surface and subsurface cultural deposits, then materials would be recorded during a pedestrian survey.

Both parcels were investigated on the same day, to avoid any significant differences in weather conditions. Field walking was conducted along parallel 10 meter intervals in each parcel; direction varied depending upon the terrain (this close
interval was expanded to 15 meters during later field investigations to increase efficiency). Cultivated fields within the open parcel provided excellent surface visibility, allowing an unobstructed view of 75–100% of the surface, weathered and washed by winter rains and snow. Fields in the open parcel yielded prehistoric and modern artifacts, but no subsurface features were evident. Prehistoric artifacts were even collected from animal burrows in a meadow. Visibility in the forested parcel was limited to rutted tracks and about a dozen tree throws. All were negative, including several uprooted trees within 50 meters of the Viereckshansze.

The forest economy test results showed clearly that pedestrian survey in the woods around Kelheim would be a slow, unproductive job, and would probably not increase our knowledge of prehistoric activity in the region. It also indicated that surface conditions in the cultivated fields were generally excellent and that burrowing animal activity allowed the location of buried prehistoric remains in meadows. Survey in the forests was not a productive or economical approach for the proposed fieldwork, so investigation was further restricted to open lands, including cultivated fields and meadows.

Time and personnel limitations meant that fieldwork had to be conducted at a modest level. Information on known sites was collected for an area of over 450 square kilometers around the oppidum (Figure 15.1). This area was clearly too large for a small-scale archaeological field survey. Therefore, an adequate sample of the area had to be determined that would address the research goals but conform to available time and support. The basis for sample selection was the desire to systematically investigate portions of all three geomorphological units at Kelheim. These units were chosen as sample strata, and survey areas were established on open parts of the Jurassic Upland, Tertiary Hills, and almost the entire Kelheim Basin (Figure 15.7).

The body of literature dealing with sampling issues in archaeology, and in archaeological survey in particular, is extensive (e.g. Mueller 1975; Plog 1976; Cherry et al. 1978). Sampling priorities for the Kelheim project were 1) the investigation of different landforms (sample strata) to provide a basis for comparison, 2) systematic data collection to ensure complete and representative coverage of varying local conditions within each stratum, and 3) the addition of a randomizing element to reduce selection bias and help overcome possible period-

city in the data. The present field work was inspired by Shennan's (1985) archaeological survey in East Hampshire, Britain. Shennan stresses the utility of transect survey in the exploration of an environmentally varied, archaeologically poorly known landscape. In addition, the transect method poses fewer managerial problems in a landscape divided into small agricultural fields such as at Kelheim, in contrast to quadrant or other approaches.

Each survey area was first divided in half and then further separated into parallel transects one-half kilometer wide and varying in length depending upon area dimensions (Figure 15.7). A random systematic transect sample was chosen for each survey stratum. A sample size of 50% was selected for maximal coverage while maintaining a manageable scale. The starting point of each systematic series was determined randomly. This series then was offset in the other half of each area to partly overcome any periodicity in the archaeological remains. This method does not possess much randomizing "power," however, it does have the advantage of ensuring optimal coverage of each area. This coverage was desired because of the absence of such systematic work in the formation of the known data base.

Field Walking and Surface Collection

Within each selected transect all open (i.e. accessible) fields were investigated, including plowed, harrowed, and seeded plots, as well as meadows where the labors of burrowing animals allowed some visibility. Fields were walked at regular intervals along parallel transects. Prehistoric surface materials were collected and recorded; surface features, such as soil stains or artifact concentrations, were mapped, and associated artifacts were collected separately.

The first several days of fieldwork were used to experiment with different techniques to "fine tune" the survey to local conditions. During this period, issues of surface collection and coverage intensity were addressed. Surface collection techniques involve total or sample (controlled) collection of present cultural resources. Sample techniques are appropriate for the investigation of large sites with extensive amounts of surface debris (Redman 1987). However, they are poorly suited to a project involving the discovery and identification of new sites, particularly in an area such as Kelheim. Total surface collection was used in the Kelheim project.
Figure 15.7. Archaeological field survey areas at Kelheim. Sample strata in the Jurassic Upland, Tertiary Hills, and Kelheim Basin are shown. Numerals identify actual transects investigated in each stratum.

for two reasons: 1) the relatively small average number of artifacts encountered per survey parcel, and 2) the importance of recovering diagnostic materials. Diagnostic materials, such as decorated sherds, are not immediately obvious among surface debris. Often, crucial artifacts are not identified until after washing in the laboratory. Under these conditions, total collection effectively speeds survey by avoiding the field search for diagnostics or the time-consuming process of gridding out features for partial collection. Surface features were mapped and intensively collected; larger features were collected along one- or two-meter transects.

In agricultural fields throughout Germany centuries of plowing have eroded many soils, destroying ancient living surfaces and leaving intact only features excavated into the subsoil. The presence of subsurface features, such as large postholes, pits, and ditches, may be revealed when plowing disturbs buried feature fill. Subsurface features were located by two means during field survey. Under damp, cloudy conditions the organic fill of disturbed subsurface features is easily visible on the surface. Dark feature fill contrasts with the light-colored sandy and loamy soils that predominate in the survey area, and under appropriate conditions the fill can be observed from a distance of several hundred meters. These soil stains usually are associated with a discrete concentration of artifacts on the surface, often including burned clay, bone, and charcoal. When strong sunlight or dry soils prohibit the observation of features, the
artifact concentrations still mark their location. This method of locating buried features is made possible by surface erosion and regular subsurface disturbance, processes that are active on cultivated hilltops and slopes. In situations where alluvial or colluvial deposition occurs, such as in floodplains or at the base of slopes, prehistoric features and living floors may be deeply buried and untouched even by modern chisel plows. These features cannot be located without subsurface testing.

Coverage intensity is related to transect orientation and the distance between transects. Once established, these practices were kept consistent during fieldwork. Enhanced visibility was afforded by a field walking technique parallel to plow furrows and conforming to the local topography, so that survey orientation varied depending upon the field. Transects were parallel to maintain horizontal control during collection. Paced intervals of 10 to 20 m between transects were tried in the field. Visibility in a typical field (plowed and weathered) was excellent within a 5–10 m radius of the walker, depending upon furrow depth, and soil and light conditions. Within this radius most surface cultural material was easily visible. At a distance of 10 m and beyond, the ability to recognize surface artifacts dropped off sharply. A 15 m interval was established as the most economical alternative, balancing survey speed with acceptable coverage.

Field collection around Kelheim was conducted by the author between March 11 and April 28, 1991. German law protects the public right of access to private land, so permission from each private landowner was not necessary to perform the survey. While field walking, the author had the opportunity to interview many owners and tenants in their fields about archaeological remains on the properties, land history, and farming schedules and techniques. Artifacts collected during field work were cleaned and analyzed in the Archäologisches Museum in Kelheim.

Surface visibility was generally excellent during the first two weeks of survey. Winter snows had melted in the warmer spring rains and sun. Fields plowed after the autumn harvest were cleansed by months of inclement weather. Some fields planted in winter cereals already sported greening crops and were closed to investigation. By the end of March, dry, sunny weather predominated, inhibiting visibility and slowing field investigation. The friendly conditions prompted farmers to begin preparation and seeding of their fields one to two weeks earlier than usual. This activity reduced the number of fields open for collection, but experimentation proved that cultural deposits in freshly seeded or raked plots were still visible, and field walking continued. Survey was halted in late April, when all cultivated plots were either prepared or planted, and the spring sugar beet crop began to sprout.

Detailed records were kept of soil, light, and weather conditions, as well as the time of day, farming activities, and other factors that influence surface visibility and investigator performance. These data will allow a critical evaluation of the survey's effectiveness under varying field conditions. Conducting field survey alone is not always ideal, although it suited the project's scale and economy. A significant advantage of the solitary approach is that it limits investigator bias during collection to a single individual.

Results

Results of the fieldwork are summarized in Table 15.3. A total of 256 survey parcels, incorporating 541 individual fields, were walked in all three survey strata: Kelheim Basin, Jurassic Upland, and Tertiary Hills. This amounted to approximately 4,000,000 m² or four km² of area. The mean proportion of land walked in all three strata was 10%. More than 87% of the parcels were plowed and the remaining 13% were meadow or pasture. Most of the meadow and pasture was located on the floodplain of the Danube River within the Kelheim Basin.

Prehistoric remains, mainly scattered pottery fragments and worked stone debris, were discovered on 158 parcels. Features or associated cultural material concentrations were observed on 29 parcels. Observation of soil stains became a casualty of the arid weather that presided over the latter part of the survey. Soil stains could be identified on only two parcels; 27 parcels yielded discrete concentrations of artifacts that probably mark the location of subsurface features.

A total of 1566 prehistoric sherds and a fragment of a fired clay spindle whorl were collected from survey parcels. A small proportion of the pottery, 251 sherds, is potentially diagnostic, including decorated pieces, rims and near rims, basal fragments and body sherds with graphitic pastes, which are typical of specific archaeological periods or cultures. Preliminary ceramic analyses suggest that over 69 ceramic locales may be related to specific archaeological periods, from the Early Neolithic Linear Pottery culture (Linearbandkeramik), through the Early Bronze Age, to the Iron Age.
Hallstatt and La Tène periods.

Lithic debris was recovered from most plowed parcels and a few meadows. Over 23.5 kg of lithic debitage, cores, hammerstones, tools, and utilized pieces were collected. Of the 59 assorted tools and utilized pieces in the assemblage, at least six specimens are representative of particular Neolithic or Early Bronze Age periods. In most instances, flint debris was clearly foreign to parcels and appeared culturally modified. However, flint nodules occasionally occur in fluvial gravel deposits or chalk bedrock outcrops in the region. Fractured flint from parcels on these deposits should be treated with skepticism. Suspect materials have been removed from the assemblage discussed here.

Survey results show that a blanket of flint debris covers the landscape around Kelheim. Two important prehistoric flint mines are situated in the project area at Baiersdorf above the Altmühl Valley (Binsteiner 1987) and Arnhofen near Abensberg (Binsteiner and Engelhardt 1987), as well as at four other known sites (Reisch 1974; Engelhardt 1983). Lithic remains indicate a considerable and widespread exploitation of flint that was not evident from archival data. Since every piece of debitage observed was collected, the survey results will allow the flint content of each field to be compared, enabling relative frequencies of lithic debris in different areas to be assessed.

The survey produced only a few metal or glass objects of established prehistoric origin. These include an incised bronze ring from the Early Iron Age (see below, Figure 15.12, 6), and a small translucent blue glass bead with parallels from Late Iron Age settlements in Bavaria. The majority of the iron and bronze items collected are unidentifiable fragments and cannot be ascribed to specific archaeological cultures.

Large amounts of medieval, recent, or unknown detritus were also collected during the course of the survey, including ceramics, glass, brick, slag, ore, and various metal objects.

**Kelheim Basin**

The survey area in the Kelheim Basin was sited to incorporate a variety of landforms within the broad river valley. It measured 6.5 by 3 km, and involved 19.5 km². The survey area was divided into 26 transects measuring 0.5 km wide and 1.5 km long.

In recent years, the Kelheim economy has boomed, attracting new inhabitants, industries and transportation facilities along the Danube. This growth is most evident on the face of the river bottoms and pleasant terraces east of the city. Currently about 15% of the basin within the survey area has been modified by construction. These areas were closed to the present field survey. In some western and southern transects, the amount of

---

**Table 15.3. Preliminary results of archaeological field survey at Kelheim.**

<table>
<thead>
<tr>
<th></th>
<th>Kelheim Basin</th>
<th>Jurassic Upland</th>
<th>Tertiary Hills</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area (km²)</td>
<td>19.5</td>
<td>6.25</td>
<td>12</td>
<td>37.75</td>
</tr>
<tr>
<td>Total survey transects</td>
<td>26</td>
<td>10</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>Transects surveyed</td>
<td>13</td>
<td>5</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Sample size</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50% (mean)</td>
</tr>
<tr>
<td>Survey parcels</td>
<td>165</td>
<td>19</td>
<td>72</td>
<td>256</td>
</tr>
<tr>
<td>Fields</td>
<td>431</td>
<td>35</td>
<td>75</td>
<td>541</td>
</tr>
<tr>
<td>Area surveyed (km²)</td>
<td>1.81</td>
<td>0.36</td>
<td>1.79</td>
<td>3.96</td>
</tr>
<tr>
<td>Portion of total area surveyed</td>
<td>9.28%</td>
<td>5.76%</td>
<td>14.92%</td>
<td>10% (mean)</td>
</tr>
<tr>
<td>Identified locales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Prehistoric&quot;</td>
<td>53</td>
<td>5</td>
<td>36</td>
<td>94</td>
</tr>
<tr>
<td>Neolithic</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Bronze Age</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Late Bronze Age</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Early Iron Age</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Late Iron Age</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>&quot;La Tène&quot;</td>
<td>22</td>
<td>0</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>Prehistoric sherds (qty.)</td>
<td>238</td>
<td>1</td>
<td>1327</td>
<td>1566</td>
</tr>
<tr>
<td>Lithic debitage (kg)</td>
<td>5.505</td>
<td>0.098</td>
<td>17.946</td>
<td>23.549</td>
</tr>
</tbody>
</table>

115
modified terrain approaches 80%. Destruction of cultural resources through urban expansion is continuing at a rapid rate, despite Herculean salvage efforts by local archaeologists. Forest covers less than 10% of the basin survey area, largely in the southeast where the survey area includes a portion of high ground.

All open fields (cultivated and meadow) were investigated in one half (13) of the transects. One hundred sixty-five parcels were surveyed, comprising 431 individual fields. An area of 1.81 km² was actually walked. This is nearly 10% of the total survey area in the basin.

According to the literature and archival search, there are 39 known prehistoric locales within the limits of the survey area in the Kelheim basin. In addition, aerial photographs reveal 24 locations of possible cultural activity. Most known locales were recorded through excavations or salvage operations required by rapid urban growth and canal construction.

Field walking yielded an additional 86 prehistoric locales. These results more than triple the number of known prehistoric find spots in the basin. Prehistoric cultural remains collected in the basin include 5.5 kilograms of stone debitage and tools, and 238 sherds. Most of the material is undiagnostic, but preliminary analysis revealed extensive areas of Neolithic and Bronze Age activity on upper terraces of the basin. Diagnostic lithics and pottery indicate the presence of at least two Neolithic locales (Figure 15.8, 1). Four Bronze Age locales produced decorated ceramics (Figure 15.8, 2-3).

Sherds with typical Late Bronze Age decorative motifs (Figure 15.8, 4) were identified from one locale. Combined archival and survey data indicate that settlement and burial activity during the Late Bronze Age was concentrated in the northwest corner of the basin on a former island between the Altmühl and Danube Rivers (Figure 15.9). Elsewhere, remains are lightly though evenly distributed and consist of ceramic scatter and cemeteries.

During survey, the discovery of fragments of highly decorated impressed and painted pottery (Figure 15.8, 5-6) from a surface feature revealed the presence of an Early Iron Age cemetery on a terrace along the Danube's northern edge. The archaeological landscape of the Early Iron Age in the basin (Figure 15.10) is similar to the Late Bronze Age. Intensive occupation of the island continued, and there is a regular distribution of burial places and ceramic scatters throughout the basin.

Twenty-two survey parcels yielded Late Tène ceramics with graphite pastes, and characteristic Late Tène pottery was recovered from three parcels (Figure 15.8, 7-8). In contrast to the preceding periods, occurrences of Late Iron Age residues in the basin appear high compared to the Late Bronze and Early Iron Ages (Figure 15.11). This appearance belies the transitory nature of most remains. While the Altmühl island just outside of the oppidum walls continued to be a location of intensive cultural activity, the remaining occurrences are markedly thin, as indicated by the modest sum of 32 sherds recovered from 25 survey parcels. Most occurrences consist of one or two sherds. Some plain graphite wares may be Early Iron Age; only three sherds can be dated securely to the Late Iron Age. The ceramics are scattered across the floodplain, on adjacent sand and gravel bars, and along the bluff top. Two distributions of graphite sherds and Late Iron Age pottery in adjacent survey parcels may indicate the presence of more substantial buried remains. One scatter (five sherds) occupies a sandy terrace south of the Danube above Saal; the second scatter (eight sherds) is sited on loess soil on the southern exposure of a narrow ridge that divides the basin from rolling hills to the south. Overall, the results suggest widespread but very low-intensive activity in the basin beyond the oppidum during the Late Iron Age.

**Jurassic Upland**

The survey area in the Jurassic Upland at Ihrlerstein above Kelheim measured 2.5 x 2.5 km, incorporating 6.25 km² of typically abrupt, rocky terrain. The area was divided into 10 transects measuring 0.5 km wide and 1.25 km long. All exposed terrain in five transects (50% of the area) was investigated.

Although the land is marginal, farmers till nearly 75% of the ground around Ihrlerstein. About 10% of the survey area is built-up or otherwise disturbed and inaccessible to field survey techniques. Nearly 10% of the area consists of stony grassland, particularly along the plateau's southern edge. The shallow soil is unfit even for burrowing animals, so the lack of visibility prevented these meadows from being included in the survey. Forest covers approximately 5% of the area, mainly along the western and eastern edges. Many fields around Ihrlerstein had been planted with winter crops which were already sprouting during survey, prohibiting the scrutiny of a large portion of
Figure 15.8. Representative artifacts recovered in the Kelheim Basin during surface collection: 1 is flint, 2-8 are ceramic. Scale is 1:1. 1: projectile point fragment (base), Neolithic; 2-3: decorated sherds, Bronze Age; 4: decorated sherd with graphite, Late Bronze Age; 5-6: impressed and painted sherds with graphite, Early Iron Age; 7-8: rim sherds, Graphittonkeramik, Late Iron Age (drawings: M. L. Murray and V. Woelfel).
Figure 15.9. Late Bronze Age (1300-750 B.C.) remains in the Kelheim Basin, including previously recorded finds and results of field survey in 1991.
Figure 15.10. Early Iron Age (750-350 B.C.) remains in the Kelheim Basin, including previously recorded finds and results of field survey in 1991.
Figure 15.11. Late Iron Age (350-15 B.C.) remains in the Kelheim Basin, including "laténoid" graphitic sherds (ca. 450-15 B.C.); data include previously recorded finds and results of field survey in 1991.
the Jurassic Upland sample. Nineteen parcels were investigated, comprising 35 individual fields and an area of 0.36 km². This is about 6% of the survey landscape in the Jurassic Upland.

Only two known prehistoric locales were identified within the survey area on the Jurassic Upland. Both places consist of a small grouping of visible monuments assumed to be prehistoric tumulus cemeteries, although no finds are known from the earthen and stone mounds. Similar mounds nearby have produced characteristic funerary remains from the Middle Bronze and Early Iron Ages. No other prehistoric cultural resources have been recorded for the entire area, in spite of continuous building and intensive agriculture. Aerial photographs fail to reveal traces of cultural activity.

The paucity of previous evidence gives the impression of little remnant cultural activity in the upland. But the presence of cemeteries would suggest that this is a distorted view. Field survey identified five new prehistoric locales. These locales are of questionable quality, since they consist of a handful of lithic fragments (nine pieces) and a single undecorated and undiagnostic prehistoric body sherd.

Because of the small number of fields in the Jurassic Upland available for study, we should exercise caution, so as not to overreach the evidence. A handful of finds may suggest some prehistoric use, but the overall sterility of the investigated parcels is dramatic when compared to other survey areas. Field and weather conditions during survey in the Upland were similar to those in effect during surface collection in portions of the Tertiary Hills (see below), so the negative results are not the result of survey bias.

**Tertiary Hills**

In the Tertiary Hills, the survey area measured 3 x 4 km, incorporating 12 km² of gently rolling farmland. The survey area was divided into 12 transects measuring 0.5 km wide and 2 km long. All open fields in 50% of the transects (six) were walked. Occasionally, parcels outside the transects also were investigated to take advantage of opportunities afforded by good conditions and open terrain. Seventy-two parcels were walked, involving 75 individual fields and 1.79 km². About 15% of the total survey area actually was walked.

Modern settlement in the area is relatively sparse and consists of a regular pattern of small villages based on one or more farmsteads sited 1–2 km apart. This pattern is typical for the southern Bavarian hills and probably was established already by the early Middle Ages, if not earlier. Only about 5% of the survey landscape has been modified by construction. Less than 1% of the terrain is forested, mainly along the northern edge where the survey area adjoins Jurassic outcrops. The remaining 94% of the landscape is cultivated, and the soils are considered fair to good. Agricultural fields are considerably larger in the hills than in the Basin or on the Jurassic plateau; the tilled land is not as intensively subdivided.

There are 13 known prehistoric locales within the survey landscape in the Tertiary Hills. Also, 16 locations exhibit soil or crop marks. Field survey in the hills produced 67 new prehistoric locales (an in rease of over 500%). These results suggest that previously recorded data represent a very small portion of existing prehistoric cultural resources in the hills.

Recovered cultural material comprises mainly lithic debris and ceramic fragments from surface scatters and features. Nearly 18 kg of flint were collected. Flint residues are so common in the fields that only six of 72 surveyed parcels produced no lithic material. A total of 1327 prehistoric sherds were collected. At least four Neolithic locales have been identified. One Neolithic locale yielded classic pottery of the Linearbandkeramik culture (Figure 15.12, 1). Numerous pieces of fine Bronze Age pottery were recovered from two parcels (Figure 15.12, 2).

Combined archival and survey data reveal two clusters of Late Bronze Age activity on the southern aspects of gentle loess hills in the survey landscape (Figure 15.13). During survey, four parcels yielded evidence of subsurface features with associated artifacts (Figure 15.12, 3-4). Finds associated with these loci suggest various domestic activities, textile production, metal working, ceramic production, and trade in graphite. One locale on the southern edge produced fine decorated pottery (Figure 15.12, 5), burned bone, and bronze debris and may mark the place of destroyed Late Bronze Age cremation burials.

The mixing of Early Iron Age materials (Figure 15.12, 6-7) with Late Bronze Age sherds on most parcels indicates that occupation of most locales continued during the Early Iron Age (Figure 15.14).

Similar to survey in the Kelheim Basin, field collection in the Tertiary Hills yielded scattered La Tène graphite sherds and a small amount of Late Iron Age pottery in several thin scatters (Fig-
Figure 15.12. A sample of artifacts recovered in the Tertiary Hills during surface collection: 1-5, 7-9 are ceramic, 6 is bronze. Scale is 1:1. 1: decorated rim sherd, Linearbandkeramik culture, Early Neolithic; 2: decorated sherd, Bronze Age; 3-4: rim sherds, Late Bronze Age; 5: decorated sherd, Late Bronze Age; 6: decorated bronze ring, Early Iron Age; 7: fired clay spindle whorl, Late Bronze Age or Early Iron Age; 8: decorated sherd, Kammstrichkeramik ("combed ware"), Late Iron Age; 9: rim sherd, Graphittonkeramik, Late Iron Age (drawings: M. L. Murray and V. Woelfel).
Figure 15.13. Late Bronze Age (1300-750 B.C.) remains in the Tertiary Hills at Kelheim.
Figure 15.14. Early Iron Age (750-350 B.C.) remains in the Tertiary Hills at Kelheim.
Figure 15.15. Late Iron Age (350-15 B.C.) remains in the Tertiary Hills at Kelheim including "latènoid" graphitic sherds (450-15 B.C.).
Chapte 15 - Murray

ture 15.12, 8-9). There is no evidence of associated subsurface features, dense surface scatters, or other indicators of more intensive occupation (Figure 15.15). This lack of evidence for intensive Late Iron Age activity is in sharp contrast to a wealth of evidence from the Late Bronze and Early Iron Ages.

Discussion

The Kelheim survey project has produced a broad, integrated data base to study the local history of a landscape. For the purposes of this report, discussion will focus on the final millennium B.C. and the development from the Late Bronze to the Late Iron Age. Some preliminary conclusions are suggested, but like most archaeological fieldwork, the results pose more questions than they answer.

Historical Development and the Hinterland of the Oppidum

The Late Bronze Age (Bronze Age D and Hallstatt A–B horizons) at Kelheim is preserved in a fairly even distribution of settlements, ceramic scatters, and cemeteries (Figure 15.16). Cave occupations and hoards are also common residues of this time. Cemeteries are characteristically flat cremation burial grounds, sometimes containing hundreds of graves (Müller-Karpe 1952). Several localities at cliffs along the Altmühl appear to be the places where ritual activity involved intentional destruction of ceramic vessels. Thick sherd deposits at the base of cliffs indicate that pots were either tossed from the cliffs or shattered at their bases (Maier 1984). Late Bronze Age sites are found throughout the Altmühl River Valley, Kelheim Basin, and the Tertiary Hills. Field survey confirmed this pattern, locating particularly extensive areas of settlement and some funerary activity on loess deposits in the hills. There are no known finds from the Jurassic Upland north of the Altmühl and Danube. Late Bronze Age remains have been found mainly through excavation and surface collection, an indication that they correspond with modern archaeological interest and agricultural activity in the area, focused respectively on the Altmühl River Valley and on the relatively good soils of the Tertiary Hills.

The Early Iron Age (Hallstatt C–D horizons) is preserved as an assemblage of burial remains, ceramic scatters, and settlements (Figure 15.17). Burial grounds of the Early Iron Age are either far more numerous or more visible than from the preceding period. The act of burying the dead beneath stone and earth mounds increases the chances of survival and visibility of these remains. Many of the 50 known prehistoric tumulus groups in the area date to this time period. Like the preceding period, Early Iron Age remains have been found along the Altmühl, in the Kelheim Basin, and in the Tertiary Hills. The mute presence of tumuli in the Jurassic Upland speaks of activity on the plateau, although both archival search and field survey failed to locate significant settlement remains there. Field survey discovered remains of extensive settlement in the Kelheim Basin and Tertiary Hills, often mixed with Late Bronze Age residues. A new location of funerary remains was discovered above the northern bank of the Danube in the eastern Basin. There is increased activity within caves and rockshelters during this period. The contexts of discovery for Early Iron Age remains at Kelheim are similar to those for Late Bronze Age locales. This pattern suggests certain similarities in the relationship between the nature of archaeological remains and methods of discovery.

By the Later Iron Age, there appears to have been a constriction of settlement around the Michelsberg (Figure 15.18). During the second century B.C., the time of oppidum construction, activity in the surrounding landscape either does not seem to have matched the apparent intensity of the late eighth to early fourth centuries B.C. or was of a very different nature. Exceptions to this are the Mitterfeld in the Altmühl River Valley within the oppidum walls, and the western Kelheim Basin at the foot of the Michelsberg. These are the only known locations of extensive Late Iron Age remains. Subsurface features are associated with Late Iron Age artifacts at two locales in the Altmühl Valley and at one locale in the eastern Basin, but these "settlements" consist only of one or two pits. Late Iron Age sherd scatters were commonly found during excavation of other prehistoric settlements. Fertile terrain of the Tertiary Hills and loess islands on the Jurassic Upland near Hienheim are particularly devoid of settlement. No Late Iron Age features were observed during field walking in the Hills or Basin. The oppidum seems to command a rather empty "hinterland."

Landscape data from regions in Germany without large Late Iron Age defended sites contrast with those from Kelheim. Archaeological survey undertaken at the extensive open-pit coal mines of the Rheinland (Simons 1989) reveal a pattern of diffuse Late Bronze and Early Iron Age settlement, with regular site displacement over time. There was no observable regularity in settlement size or
spacing. In contrast, Late Iron Age settlement was concentrated in larger "villages" with increased longevity and regular spacing at one km intervals. Similar patterns of intensive rural settlement during the Late Iron Age are apparent in data from the lower Schwarzbach River Valley (Schmidt 1986; Bockisch 1987) in northern Bavaria, the Danube River Valley near Regensburg 20 km east of Kelheim (Schier 1985), and the Danube-Isar confluence about 80 km downstream (Schmotz 1989).

Extensive extra-murus settlement remains similar to Kelheim are known from numerous Late Iron Age fortifications, such as on the Kleiner Gleichberg bei Römhild (Spehr 1971) and at the Moravian oppidum of Staré Hradisko (Meduna 1970a). At Závist in Bohemia, there is a Vierereckschanze in close proximity to the oppidum walls (Břeč 1971), and there is a similar Late La Tène enclosure within the walls on the Donnersberg in western Germany (Engels 1976). Similar rectilinear enclosures have been identified in aerial photographs of the interior of the Manching oppidum, and the recent find of a miniature gold "cult-tree" suggests a ritual place at the core of the defensive enclosure (Maier 1990).

The discontinuous occupation of the surrounding hills and eastern basin during development of the Kelheim oppidum is reminiscent of the rural settlement implosion known from prehistoric urban settings such as Teotihuacan (Sanders et al. 1979) and the Uruk countryside (Adams and Nissen 1972). There is evidence at the Manching oppidum, 36 km southwest of Kelheim, that rural communities combined during the second century B.C. into a single intramural population (Krämer 1985). Archaeological survey data from central France also reveal a sharply constricted pattern of Late Iron Age settlement around the oppidum at Levroux (Buchenschutz et al. 1988). Similarly, several areas in central and western Europe have revealed a process of abandonment of open settlements in favor of defended agglomerations during the final century B.C. This process is suggested for Aulnat and Gergovie in south-central France (Collis 1975, 1980) and has been documented in Switzerland at Basel-Gasfabrik and Basel-Münsterhügel (Furger-Gunti 1980). It may also have occurred in southwestern Germany at Breisach-Hochstetten and Breisach-Münsterberg (Collis 1984a).

At Kelheim, this "implosion" may be evidence of the urban agglomeration of rural population at the oppidum. To maintain such an agglomeration, intensive food production and raw material extraction beyond the settlement walls would be necessary. Compared to the numerous Late Bronze and Early Iron Age settlements with pit features, a few thin sherd scatters from the Late Iron Age seem scant evidence of this exploitation. On the other hand, they may reflect transitory occupations, for example those of food producers housed within the oppidum who tended the fields and flocks by day and returned to the oppidum at night. In this manner, the daily needs of the Late Iron Age community were addressed by individuals or groups living within or near the oppidum in the Altmühl Valley and western Basin. The sherd scatters in the surrounding countryside may be the residues of seasonal migrations by food producing groups into the hinterland, or may indicate the manuring of fields (Wilkinson 1988) using dung collected within or near the oppidum. The oppidum, then, did not serve as a redistributive center or market for surrounding communities (up to a distance of 16 km), and there was no extensive network of rural villages providing agricultural or raw material surplus. The only central function that the oppidum served on a local level was as a focal point for habitation, iron production, and other craftwork. This interpretation has independent confirmation from the palaeobotanical analysis of plant remains from the Mitterfeld within the fortification (see Chapter 8).

An alternative interpretation is that the sherd scatters are the residues of small mobile or semi-mobile groups that roamed the Late Iron Age countryside, such as specialized pastoral communities. Such herding groups may not leave behind remnant features such as storage pits or post-hole structures that are used to identify "intensive" settlement. The oppidum population may have interacted with specialized pastoralists in the surrounding countryside, so that the settlement functioned as a central place for the interface between permanent oppidum and extra-murus communities and mobile herding communities. Patterns of cattle remains from the Mitterfeld suggest that beef stock was raised and processed outside of the oppidum (see Chapter 9).

* Landscape and Social Reproduction at Kelheim

While traces of Late Iron Age activity in the surrounding landscape are few, there are numerous rectilinear enclosures (Vierereckschanzen) that probably date from the Late Iron Age. Four Vierereckschanzen are still preserved south of the
Figure 15.16. The Late Bronze Age archaeological landscape at Kelheim (ca. 1300-750 B.C.).
Figure 15.17. The Early Iron Age archaeological landscape at Kelheim (ca. 750-350 B.C.).
Figure 15.18. The Late Iron Age archaeological landscape at Kelheim (ca. 350-15 B.C.), not including generic "laténoid" finds.
Danube, and one is known from excavation immediately east of Kelheim's old city. The subterranean outlines of several others appear in aerial photographs of the Tertiary Hills and the eastern Basin, and one possible enclosure occupies a small spur above the Altmühl River Valley east of Riedenburg. If these sites were the focus of Late Iron Age ritual activities, as is currently believed (Schwarz 1975; Planck 1982; Bittel et al. 1990), then clearly the "hinterland," while sparsely occupied, was incorporated into the Late Iron Age sociospatial frame of reference. The social and ritual contexts of the Vierecksschanzen are poorly understood, and unfortunately none of the structures at Kelheim have been adequately studied; it is not clear if the enclosures were in use at the same time. Were these sites used by a small rural population, each enclosure constructed by an independent community, or were they visited seasonally by a united population? Were they established by oppidum elite to bring the surrounding landscape into their control? Each enclosure occupies a particular ecological niche in the landscape, from infertile Jura outcrop to good loess soil. Perhaps one or more communities erected these specialized structures for the worship of different natural agencies in the Celtic religious pantheon (Brunaux 1988).

Deposition of cultural remains in caves or in association with cliffs was common from the Neolithic to the Early Iron Age at Kelheim. In the Late Iron Age, cave deposition declined markedly, although it did not cease entirely, particularly in caves along the cliffs of the Danube Gorge below the Michelsberg (Nadler 1986). This pattern of deposition is found throughout Germany (Bem-Blancke 1976; Weismüller 1986; Züchner 1977). In his analysis of post-Mesolithic cave occupations in the southern Nördlinger Ries, Weismüller (1986) notes that deposition in caves is linked to the intensity of settlement in the surrounding landscape and the ways in which people used and discarded their materials (i.e., how they became part of the archaeological record). Post-Mesolithic cave occupations often have an extra-domestic, "ritual" character. While usually composed of artifact types associated with habitation (ceramics, metals), cave deposits lack the breadth of domestic refuse (Weismüller 1986) or possess qualities that otherwise differentiate them from habitations, such as the mixing of debris with select human remains (Maier 1965; Schauer 1981; Leja 1991).

When cave and cliff use declines in the Late Iron Age, a new formal structure, the Vierecksschanze, appears in the landscape. This change may herald a restructuring of Iron Age ritual life, from practice in natural places to the formal incorporation of nature into built places. Whereas practice was previously governed by nature (such as natural boundaries and existing places such as caves and cliffs), nature was now artificially bounded and incorporated into the process of social reproduction. Was this incorporation of nature a form of natural legitimation for new social, political, and religious structures?

These changes in the structuring of nature and ritual parallel transformations in mortuary ritual and burial place from the Late Bronze to Late Iron Ages in southern Germany. Typical flat cremation fields of the Urnfield Late Bronze Age are found throughout the Kelheim region. There are seven known cremation cemeteries. There are also two known flat inhumation cemeteries of the Late Bronze Age D horizon in the Kelheim Basin. In addition, Early Urnfield funerary materials were found in a Middle Bronze Age tumulus on the Wurzberg above Weltenburg, and several Urnfield cremation burials were recovered under destroyed tumuli on the Danube shore near Herrnsaal. Urnfield cemeteries tend to be very uniform and densely packed, and the typical grave comprises a simple pit with two or three ceramic vessels and occasional bronze objects (Pfauth 1989). Like the Urnfield cemetery located on the eastern outskirts of the Kelheim old city (Müller-Karpe 1952), these cemeteries may contain many hundreds of graves. Mounds, ditches, and posts occasionally delimited grave space in some cemeteries (e.g. Rocha 1965), but grave monuments demarcating burial space within the larger urnfields are usually absent or consist only of flat stones placed over each pit. While the burials of the Urnfield Late Bronze Age contain little material wealth, objects were deposited in hoards and votive contexts in large quantities during this period. Three Late Bronze Age hoards were found along the shores of the Danube within the study region. Late Bronze Age metal hoards comprise single items to over 100 objects. The Kelheim hoards are small and consist of bronze axes and sickle fragments. Following Rissman's (1988) analysis of the patterns of Harappan wealth consumption, hoards and votive deposits may represent ritual consumption of private wealth, whereas the consumption of materials in funerary contexts represents public display. I have argued elsewhere (Murray 1992) that the contradiction evident in the consumption of the materials of social discourse between private and public ritual
arenas during the Late Bronze Age in southern Germany represents a mystification of social inequality by a dominant ideology.

Burial places of the Early Iron Age are especially numerous within the Kelheim region. There are 13 known tumulus cemeteries, four flat cremation fields, and five flat inhumation burial plots. In addition, many of the more than 50 unexplored tumulus cemeteries visible in the forests and in aerial photographs probably contain funerary remains from this period (as well as Middle Bronze Age graves). The Early Iron Age is traditionally associated with the practice of inhumation under and within mounds, but there is actually a striking variety of burial formats in southeastern Germany, often within the same cemetery. For the Oberpfalz, Torbrügge (1979) charted at least 20 different kinds of burial from the Hallstatt Iron Age, with different funerary rites and structures. This change does not necessarily represent the introduction of new cultural norms (Barrett et al. 1991, 224), but a reworking of the existing material resources of social reproduction. Older traditions of cremation burial in nongrave pits with few offerings continued side-by-side with the new emphasis on monumentality in many cemeteries. Hoards and votive deposits are rare from the Early Iron Age, and no such finds are known within the study area. Many of the same kinds of materials, such as metalwork, that had been deposited in very large quantities in hoards and votive deposits during the Late Bronze Age were now worked into the transformed burial practices and appeared in graves as complements of jewelry, weapons, metal vessels, and other appurtenances. The material resources of private ritual were thus transformed into the resources of public ritual. This transformation may be interpreted as contentious discourse between social groups with conflicting versions of their social conditions, in which the dominant structures of age, gender, and inheritance were open to public debate rather than euphemized through a uniform funerary ritual (Murray 1992).

In contrast to the Early Iron Age, there are very few funerary remains from the Late Iron Age. A couple of graves from an early phase of the Middle La Tène were found at the Weltenburg cloister opposite the Michelsberg at the southern end of the Danube Gorge (Koch 1991), and objects from two graves were salvaged from gravel pits on a lower terrace at Saal in the Kelheim Basin. Older salvage work and excavations for the Rhein-Main-Donau Canal at the confluence of the Altmühl and Danube Rivers in the western Basin uncovered a series of at least 19 Middle and Late La Tène burials just east of the oppidum in Kelheim-Gmünd (Kluge 1985). At least two burials are suspected from the Mitterfeld within the oppidum on the basis of older finds (Krämer 1952). Pottery recovered intact from a sand pit south of Saal may be from a Late La Tène cremation burial. Finds of bronze belt hardware near Eining may also be from destroyed Late Iron Age graves (Krämer 1968). Except for Kelheim-Gmünd, the burial places contain very small numbers of graves and appear to lack any formal structuring. In spite of the lack of formal burial from the Late Iron Age, there are many finds of human remains within settlements in central Europe, both from structural features and as scattered finds (Wiedemer 1963; Ruoff 1964). Although such remains have not been identified at Kelheim, they have been recovered from the oppidum at Manching and cannot be associated with warfare (Lange 1983; van Endert 1987, 55-58). These finds and the general absence of formal burial places in southern Germany represent dramatic transformations in the treatment of mortuary remains and the reproduction of social relations during the Late Iron Age. It appears that the discourses relating to classification of the dead and the structuring of inheritance, kinship, and social obligations previously undertaken within separate burial places may have shifted to the settlements themselves.

Conclusions and Prospects

Both archival data and field survey results reveal that the remnants of Late Iron Age life in the landscape around Kelheim are light and scattered, in contrast to dense patterns of activity and deposition in the Late Bronze and Early Iron Ages. Not only are there fewer Late Iron Age locales, but the deposits tend to be surface scatters without associated subsurface features. By the second century B.C., settlement was concentrated within or near the large fortification on the Michelsberg. There is little evidence of intensive habitation up to 16 km from the oppidum, in spite of the presence of numerous rectilinear ritual structures. This observation is more significant when we note that nearly one-half the distance to the Late Iron Age oppidum of Manching is included in the study region. In other parts of Germany that have been carefully studied through large-scale archival or survey research, rural Late Iron Age settlement is dense and often regular. The decline of rural populations at Kelheim represents a process of popula-
tion centralization in large fortified settlements that occurred throughout central and western Europe. In southern Germany, these changes were associated with transformations of the social and spatial contexts of ritual and the use of the material resources of social reproduction to represent alternative strategies.

Two interpretations of Late Iron Age landscape have been presented, based on a preliminary overview of the archival and field survey evidence. One interpretation is that the daily needs of the Late Iron Age community were addressed by the inhabitants of the oppidum itself. The sherd scatters in the surrounding countryside may be the residues of seasonal migrations by food producing groups into the hinterland or may indicate the manuring of fields using dung collected within or near the oppidum. In this case, the oppidum was not a local redistributive center or market for an extensive network of rural villages. The only local central function of the oppidum was as a focal point for settlement. Palaeobotanical analysis of plant remains from the Mitterfeld indicates that crops were grown and processed by farmers living within the fortification. Alternatively, the sherd scatters may be the residues of small mobile or semi-mobile cattle pastoralists. In this scenario, the oppidum may have functioned as a central place for the interface between settled communities and mobile herding groups. Patterns of cattle remains from the Mitterfeld suggest that beef stock was raised and processed outside of the oppidum.

The interpretations outlined above are not exhaustive nor mutually exclusive, but they provide a direction for future examination of the historical development of the Iron Age landscape and the nature of oppida-hinterland interaction. Findings of graphite and painted pottery, metal work, coinage, and Roman imports within the oppidum are evidence that the settlement participated in an extra-regional circulation of goods, probably enhanced by its location at the confluence of two important waterways (Kluge 1986), but on the local level the settlement was apparently self-sufficient, with the possible exception of stock farming. The low-intensive rural settlement around the large Late Iron Age oppidum at Kelheim has important implications for the study of social and spatial dynamics of Iron Age societies, especially if the oppidum is interpreted as a thriving settlement of several thousand souls. The results of the Kelheim survey project may give pause to reassess the "urban" nature of Kelheim or rethink traditional notions of prehistoric urban settlement and consider alternative structures, such as clustered settlement (McIntosh 1991).

The analysis and interpretation of the Kelheim landscape is an ongoing research program. Part of the program is the examination of important bias issues in the use of archival and surface collection data to study archaeological landscapes. The three major bias issues are: 1) the visibility of archaeological deposits, 2) the use of surface collections to establish cultural affiliation and develop functional interpretations, and 3) the accuracy of field work. A brief analysis of the relationships between discovery context and archaeological period and locale type presented above suggests that there are biased conditions operating on the formation, preservation, and recovery of certain archaeological deposits. In particular, a greater proportion of later prehistoric locales were recorded through modern excavations in contrast to earlier archaeological periods. The nature of these biased conditions is not clear and should be investigated in greater depth. Focal points for a source criticism of the landscape project are the history and process of archaeological discovery in the region and the analysis of archaeological accumulation and postdepositional processes specific to the Kelheim landscape.

A second important bias issue is the nature of assemblages composed of surface collected artifacts and the use of artifact scatters to establish cultural affiliation and function. Graphite rim sherd and one "combed ware" sherd make up the limited evidence of Late Iron Age activity from the Kelheim survey. While graphite pots are archetypal for the La Tène archaeological culture, they constitute only about one third of ceramic assemblages from Late Iron Age oppida (Kappel 1969; Stöckli 1979a). Perhaps fewer graphite wares were in use at rural sites than at the oppida. If this was the case, then some undecorated, non-graphite pastes in the surface collection may be Late Iron Age, and our inability to recognize them may lead to a misunderstanding of the relative intensity of Late Iron Age activity around Kelheim. However, ceramic assemblages from sites such as Berching-Pollanten (Pischer et al. 1984), Altendorf (Stöckli 1979b), and Köfering-Eggelfing (Osterhaus 1988) show that graphite wares also were widely used in undefended Late Iron Age communities in Bavaria, so we would expect these ceramics to be present in rural sites at Kelheim. Ceramic paste characterization studies from excavations at Kelheim (Schaarf 1988; see Chapter 12) may provide future assistance in the identification of non-graphite undecorated Late
Iron Age ceramics from surface collections. The problems and promises of interpreting artifact scatters have been examined in recent publications (Schofield 1991). Continued research at Kelheim will examine the implications of artifact scatters to the study of patterns of later prehistoric behavior at Kelheim.

Finally, a variety of managerial data were recorded during field walking, such as surface visibility, field condition, light and cloud cover, weather, and time of day. Analysis of these data will allow the evaluation of external interference during survey that may have affected the accuracy of the results.

In addition to the ongoing source criticisms described above, research continues to address the two theoretical approaches to the archaeological landscape outlined earlier. The first approach involves the analysis of manifold data concerning the physical location of cultural residues—i.e., landform, geology, soils—collected during the archival search. The relationships between the physical landscape and the cultural landscape of the Late Bronze and Early Iron Ages as well as the patterns of land-use around the oppidum in the Late Iron Age will be examined. The second approach involves visualizing the archaeological landscape as a resource in prehistoric structures of social discourse. Some preliminary observations on the utility of this approach have been presented. On-going work involves the integration of archival and field survey data into a program of social landscape archaeology.

Acknowledgements

I am indebted to Professor Peter S. Wells, who appreciated the value of a landscape approach to the interdisciplinary study of Iron Age society at Kelheim. The survey project was funded through Wells' National Science Foundation grant. Access to regional archives and permission to conduct fieldwork were generously provided by Dr. Bernd Engelhardt of the Bayerisches Landesamt für Denkmalpflege, Landshut. Numerous individuals offered friendly support and advice during my study of the archives in Landshut, and I would especially like to thank Stuart Aitchison, Tommy Dannhorn, Helen Manley-Jones, Robert Pleyer, Günter Wullinger, and Werner Weber. Werner Hübner shared his expertise in the detection and collection of surface remains in the German landscape.

During field work at Kelheim, Dr. Ingrid Burger of the Archäologisches Museum generously offered space to clean and analyze artifacts, and opened the museum's collections and archives to study. Dr. Michael Rind, Kreisarchäologe for the district of Kelheim, allowed access to his unpublished data from archaeological investigations in the Kelheim region and was a valuable advocate of the field project; he also offered helpful observations on many of the ceramics collected during survey. Bettina Arnold, Peter S. Wells, and Nancy L. Wicker offered helpful comments on earlier drafts of this report. Any omissions or errors are entirely my responsibility.

My heartfelt thanks to the many farmers and landowners in Kelheim, who accepted my field-walking and queries with good humor and curiosity, and shared with me a personal knowledge of their landscape.

Notes

1The term “locale” is used here to avoid problems of defining an archaeological “site,” particularly when the data consist of surface collected materials. It is meant to identify a locus of prehistoric deposits while avoiding any gross functional interpretation.