A landscape biography of the 'Land of Drumlins': Vooremaa, East Estonia

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6 Case study 1: The Long-term history of settlement and land use in Vooremaa

6.1 Settlement sites

Human habitation and adaption to the surrounding environment in the past is represented by the location and distribution of archaeological settlement sites in the landscape. At present, 119 archaeological settlement sites are known in the Vooremaa study area (Figure 20), 81 of which are officially registered as cultural heritage in the National Registry of Cultural Monuments (http://register.muinas.ee). It is the most abundant type of archaeological sites in Vooremaa. At the same time, settlement sites represent the most under-investigated archaeological monuments in the region.

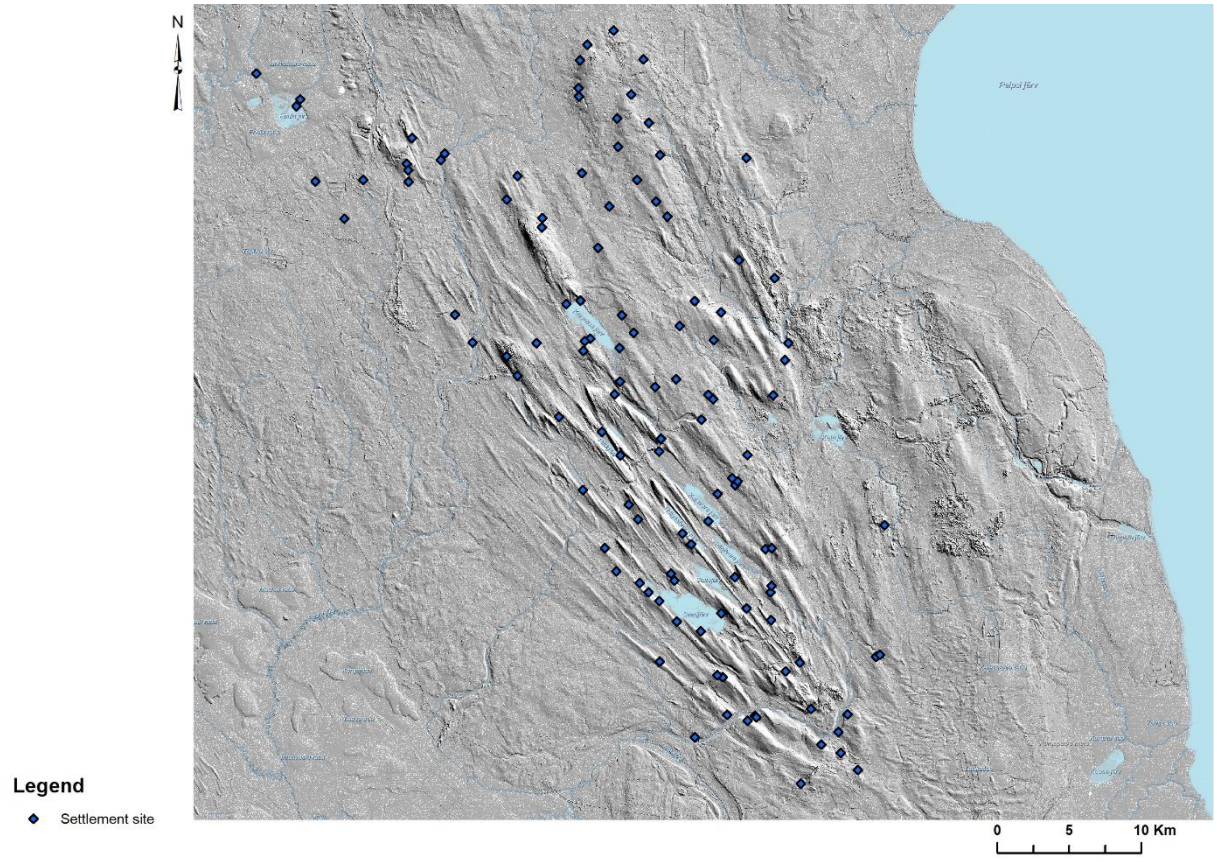


Figure 20. Distribution of archaeological settlement sites in Vooremaa. LIDAR map: Estonian Land Board.

Archaeological settlement sites can be defined as remains of prehistoric/historic villages or farms where cultural materials and features have accumulated over time because of various human activities. The associated anthropogenic layers differ from the surrounding topsoil in several aspects:

1. generally, the soil is dark and sooty, sometimes even dark greyish blue, whereas topsoils in the surrounding landscape lighter in colour and more of brownish in nature.
2. the soil contains burned stone debris and charcoal;
3. the soil contains pieces of pottery, animal bones, sometimes coins and bits of jewellery. Tools, such as knives, grinding and whetstones are also common. In the Vooremaa region iron dross is frequently found from settlement sites and refers to local iron casting and blacksmithing.

The distinctive burned stone debris that are so characteristic of settlement sites originates from *keris*-type chimneyless stoves, which were widely used for heating dwelling houses at least from the 7th century onwards (Tvauri 2012b, 67) until the beginning of the 19th century. *Keris*-stoves were mortarless hearths, approximately 2 m long and 1,5 m wide, covered with loose granite stones that retained heat (Tvauri 2012b, 68). The burned stones from the stoves were regularly replaced, and the old ones thrown away. Burned stone debris was also mixed in clay for making ceramic vessels. According to data gathered from excavations of settlement sites and hillforts, Iron Age dwellings were relatively small in size, measuring only about 4 x 5 m in size (see for more detail: Lavi 1997). The dwellings resembled small smoke-sauna houses, which are still widely used all over Estonia. A Viking Age dwelling house has been reconstructed (Kobrusepp et al. 2014) near Rõuge hillfort in South Estonia.

6.1.1 Archaeological sources

Archaeological excavations have only been conducted on three settlement sites in Vooremaa: 1) a Mesolithic settlement site in Rohe village (Indreko 1942); 2) a Viking Age settlement site adjacent to the Saadjärve hillfort (Lavi 1984), and 3) a Medieval/Early Modern site next to the Vaimastvere manor house (Bernotas 2010). All three ecavations were small-scale and no ^{14}C samples were obtained. Unfortunately, most of the archaeological research carried out on settlement sites in Estonia has been salvage driven, and therefore little is known about the spatial structure of settlement sites or their (possible) hierarchical relationships. Academic research has primarily focused on burial sites and hillforts, which very straightforwardly represent the “elite end” of the societal spectrum.

Most of the data on archaeological settlement sites can be derived from the archaeological passports archived at the National Heritage Board. Many of these have been compiled by the archaeologist Ain Lavi, who conducted extensive landscape surveys in the Vooremaa region

in the 1980s and 1990s. Landscape surveys for locating new settlement sites have also been carried out by Heiki Valk and Andres Vindi.

6.1.2 Chronology

One of the most problematic issues with settlement sites in Estonia is their dating and chronology, which in the case of Vooremaa is largely based on pottery finds gathered during field surveys. As a result, the time span and resolution of occupation assigned to settlement sites is relatively crude. The earliest settlement sites in Vooremaa, numbering six, date to the Mesolithic period (9000 – 4900 BC). Neolithic (4900 – 1800 BC) settlement layers have been discovered only in three locations. No traces of an anthropgenic settlement layer from the Early Bronze Age (1800 – 1100 BC) have been found so far in Vooremaa.

Pottery characteristic to the Late Bronze (1100 – 500 BC) and Early Iron Age (500 BC – 450 AD) is also relatively rare and has only been discovered from five settlements (Kõola, Igavere, Vaidavere, Eristvere, and Nava). Even though the number of *tarand*-type stone graves[14], built between 2nd – 5th centuries AD, is quite high in the region (65), there is very little evidence of contemporary regular permanent settlement sites. It can only be assumed that immediate surroundings of the *tarand*-graves were also settled. The pollen diagram from the Lake Raigasvere (Pirrus 2010) demonstrates a peak for spruce during this period, suggesting that the area was dominated by forest at the time, and open cultivated land was quite sparse. Therefore, the question remains: where did the people who were eventually buried in the *tarand*-graves, actually live?

Most of the settlement sites recorded in Vooremaa were established during the second part of the Iron Age (450 – 1225 AD) or during the Middle Ages (1225 – 1550) and have more or less continuously been used until the present day. Over time, the core areas of habitation might have slightly moved, but to detect shifts more fieldwork, including in-depth (on-site) investigations and surveys, is needed.

The number of settlement sites started to grow steadily around 7th – 8th century AD. This growth correlates with the spread of hillforts and forest clearings, which is reflected in the

[14] *Tarand*-graves – stone graves consisting of one or several rectangles constructed from large boulders, usually cremations, were built 2nd – 5th c AD. Two groups of them should be distinguished: the early *tarand* graves (since the end of the Bronze Age until the 1st century AD; one example from Vooremaa is probably located at Nava) and the typical *tarand* graves (late 1st to 5th century AD), where the examples from Vooremaa mostly belong to. *Tarand*-type stone graves are discussed in more detaile in chapter 7.

pollen diagrams. Altogether, we have data on 10 settlement sites in Vooremaa with anthropogenic layers dating from the end of the first millennium or beginning of the second millennium AD (Viking Age – Middle Ages). According to the site passports, survey reports and published data, it is possible to say that at least 12 settlement sites originate from the Viking Age (800 – 1050 AD), and at least 18 from the Final Iron Age (1050 – 1225). Without detailed pottery and ^{14}C analyses the exact chronology of the sites remains unclear. Still, it is quite plausible that most of the study area was settled from the Final Iron Age onwards, after the German-Danish Conquest in the 13th century. Probably most of the villages present on the 17th century maps can be traced back to some extent at least to the 13th – 14th century.

6.2 Soil and geomorpholgy of settlement sites

According to the soil bonity value[15], the most suitable areas for agriculture in Estonia are on *luvisols* ($K_{I;}$ average bonity value 52,1), *mollic cambisols* (Ko; 50,9), and *stagnic luvisols* (LP; 48,6). The most unfertile soils include *gleysols* and *histosols* with the soil bonity value remaining under 25 points (Astover et al. 2014, 15). When analysing settlement sites in relation to the soil map of Vooremaa (Figure 21) it appears that they are most commonly (about 32 %) situated on the edges of large masses of *stagnic luvisols* (*LP*). The fertility of *stagnic luvisols* in Estonia has been estimated above average with a soil bonity value between 40 – 50 points. The woodland value of these soils is rated with class I (Astover 2005, 5).

[15] Soil bonity value = indicates soil harvest value based on soil type, elevation, and water supply. Soil bonity values are provided on the soil map by Estonian Land Board.

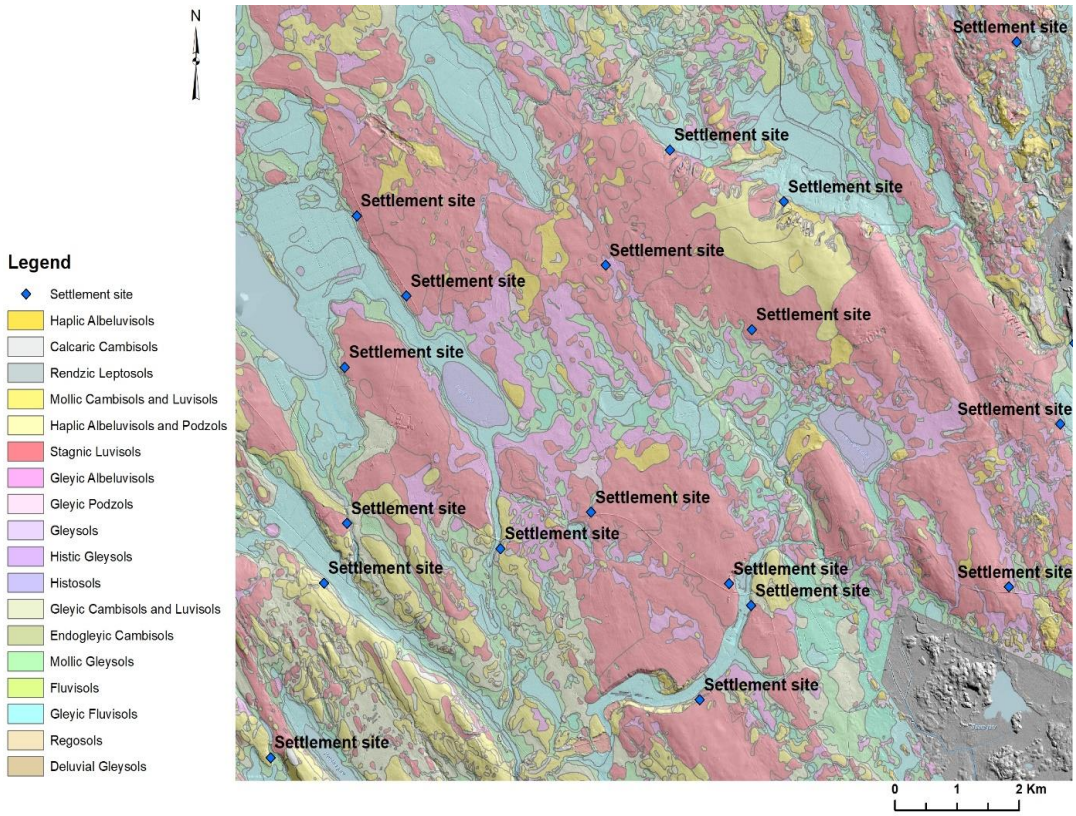


Figure 21. In the central part of Vooremaa settlement sites are often situated on the edges of stagnic luvisols or mollic cambisols. LIDAR and soil map: Estonian Land Board.

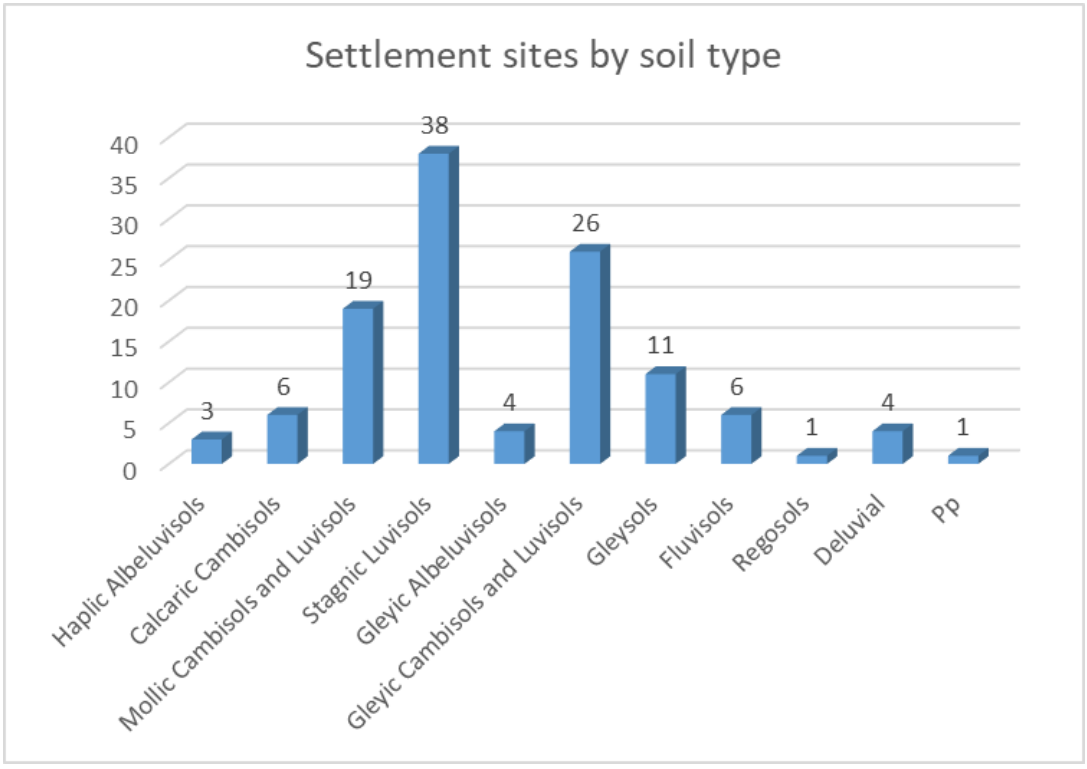


Table 3. Settlement sites by soil type.

Stagnic luvisols are especially characteristic for the eastern part of the region, which features

giant and affiliated drumlins[16]. In the western part of Vooremaa settlement sites are most commonly situated next to areas with *mollic cambisols* and *luvisols* (K-, Ko; 16%), very often in the transitional *gleyic* zones (Kog, Klg; 23%, Go Gl; 9%) which are wetter and therefore more suitable as meadows with grassland vegetation. The *cambisols* and *luvisols* in Vooremaa

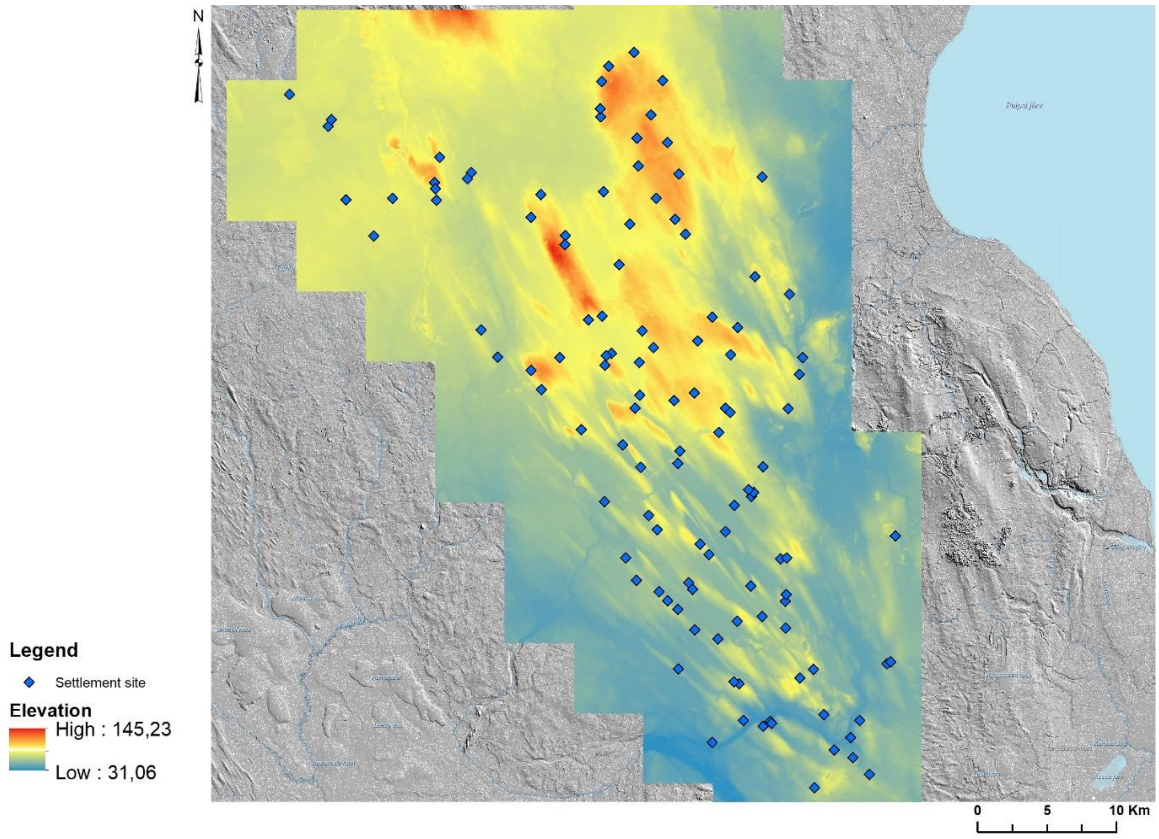


Figure 22. Digital elevation model of the region demonstrates, that the northern and central parts of Vooremaa are considerably higher than than the southern and eastern parts. Interpolated from LIDAR data provided by Estonian Land Board.

have been estimated as the most fertile soils with a bonity value of 40 – 60 value points (Table 3; Table 4).

A comparison of the Vooremaa settlement pattern with soil types thus indicates that the most suitable locations for establishing settlements were in the transitional zones between arable land and grassland or arable land and woodland. The correlation between settlement location and gradients with combinations of productive soil types (based on soil bonity values) is even more straightforward if we base ourselves on the 17th century maps.

[16] Affiliated drumlin = two or more drumlins are adjacently „melted together ".

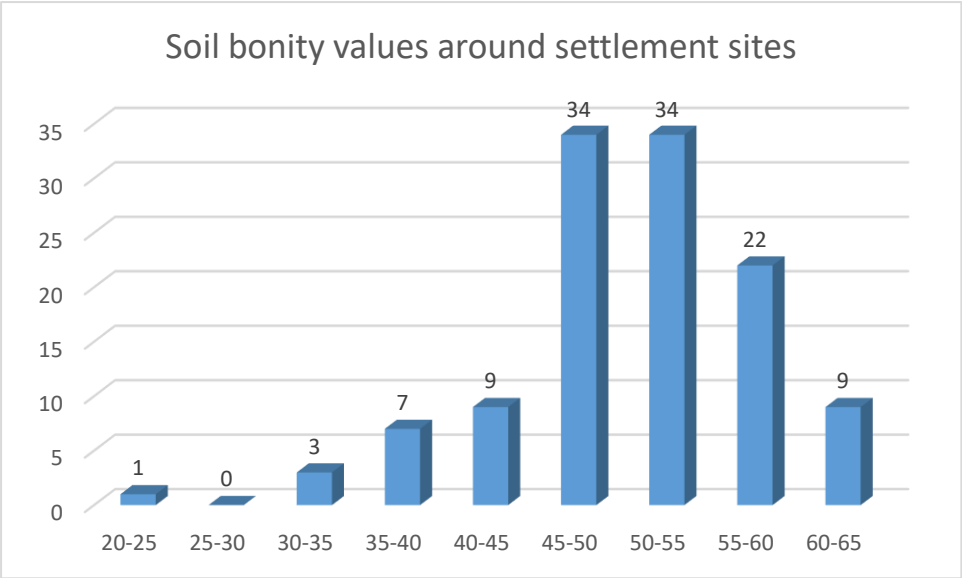


Table 4. The soil bonity value around settlement sites, 99 sites out of 119 were located on soils with bonity value higher than 45.

The settlement pattern in Vooremaa is also strongly composed on geomorphology and elevation. Although the average elevation of Vooremaa is only around 76 m. above sea level, the landscape is not flat. As explained in Chapter 2, the drumlins and depressions give the landscape its characteristic spatial rhythm. The average elevation of the region decreases from north to south. The the northern part includes large drumlins, whereas the southern part is characterised by lakes (Figure 22).

Although settlement sites have been found all over Vooremaa at various heights (Table 5),

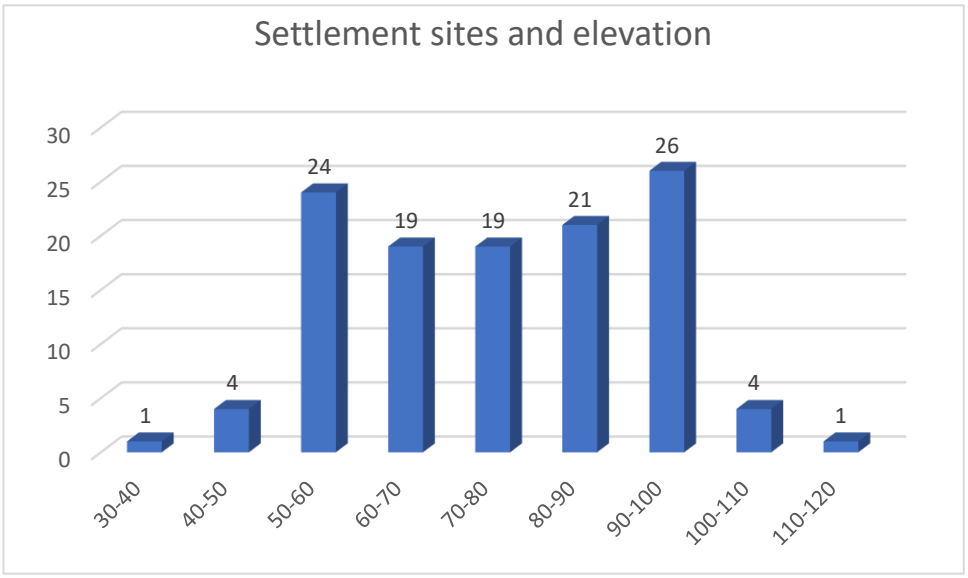


Table 5. Settlement sites and elevation.

some trends can be observed. The most favoured elevations for settlements cluster between 90 – 100 m (26 sites) and 50 – 60 m (24 sites) above sea level. The range of 60 – 90 counts slightly lower numbers (19 – 21 sites). However, these differences are quite marginal and may well relate to research intensity rather than to human location choices in the past.

6.3 Settlement and Environment in the Stone Age (9000 – 1800 BC)

Although the landscape of Vooremaa, especially the southern part which is rich in lakes, has been called an "open-air museum" of the Ice Age (Saksing 2007), we know very little about the earliest settlement in the region. There has been no specific systematic survey for Stone Age settlement sites, and our understanding of people using the landscape in this period is mostly limited to stray finds and a few sites that might be interpreted as the relics of temporary campsites. Altogether only eight locations may contain anthropogenic layers and materials that date from Stone Age (Figure 23): five of the sites are exclusively Mesolithic, one site contains both Mesolithic and Neolithic material, and two sites only Neolithic traces.

Archival recordings of stray finds sum up to around twenty and consist of stone axes and fragments of worked flint and quartz. As Stone Age groups probably practised a relatively mobile lifestyle, anthropogenic layers may be thin – if present at all – and therefore more difficult to detect in today's landscape, also as a result of later reworking of the soil and features.

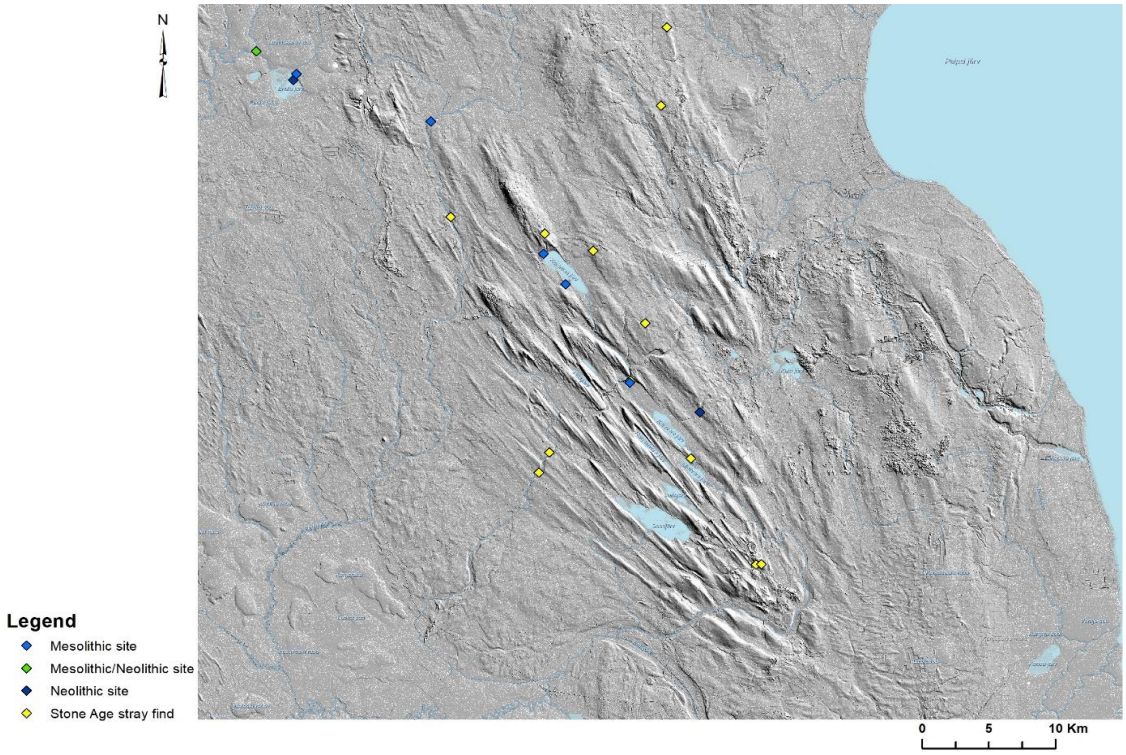


Figure 23. Stone Age sites and stray finds of Vooremaa. Base map: Estonian Land Board.

In addition to the scarce archaeological finds, we have some evidence of human activity during the Stone Age based on pollen analyses (Pirrus et al. 1988; Kihno et al. 2011; Kukk et al. 2000; Rattas 2004; Veski et al. 2012; Poska et al. 2004; Pirrus 1969). Still, the human impact on the surrounding environment is relatively low to be extensively expressed in pollen diagrams.

6.3.1 Mesolithic Period (9000 – 4900 BC)

6.3.1.1 Environment and Climate

About 10 300 – 10 200 years ago, silt with organic matter started to be deposited in the bottom of the lakes in South-Eastern Estonia instead of late glacial sand and clay. The start of this process is considered as the chronological boundary between the Pleistocene and the Holocene in Estonia; the agreed date is 8000 BC (Pirrus et al. 1996; Kukk et al. 2000, 93).

The start of the Mesolithic period in Estonia coincides, as elsewhere, with the transition from the Pleistocene to Holocene. The period is divided in three pollen-based chronozones – Preboreal (8000 – 7000 BC), Boreal (7000 – 6000 BC), and the first phase of Atlantic (6000 – 4500 BC).

The beginning of the Mesolithic period was characterised by a Preboreal climatic phase (8000 – 7000 BC) with a vegetation similar to forest-tundra. The Estonian landscape was covered with thin and light birch (*Betula*) and pine (*Pinus*) forests, with occasional willows (*Salix*), junipers (*Juniperus*), and sea-buckthorns (*Hippophea*) (Kukk et al. 2000, 3; Kihno et al. 2011, 154 Tabel 3).

This was the perfect habitat for the Eurasian elk (*Alces alces*), which was one of the main pray animals, both for people and predators. Other species included brown bear (*Ursus arctos*), red fox (*Vulpes vulpes*), wolf (*Canis lupus*), white hare (*Lepus timidus*), and Eurasian beaver (*Castor fiber*). At the end of the Preboreal chronozone other larger mammals, like aurochs (*Bos primigenius*), red deer (*Cervus elaphus*), European roe deer (*Capreolus capreolus*), and wild boar (*Sus scrofa*) emigrated from southern regions to Estonia (Kukk et al. 2000, 93).

The time period between 7000 – 6000 BC is known as the Boreal climate phase when the relative importance of pine forest started to rise, although the forests were still thin. The latter part of the Boreal (BO2; 6500 – 6000 BC) witnessed a sudden growth of alder (*Alnus*), which mainly populated riverbanks and lakesides (Kukk et al. 2000, 93).

In the first phase of the Atlantic chronozone (AT1; 6000 – 4500 BC) climate became warmer and damper. In pollen diagrams the amount of hazelnut (*Corylus*) and alder is rising constantly. Among broadleaf trees oak (*Quercus*), elm (*Ulmus*), and lime trees (*Tilia*) were prevailing, with occasional maples (*Acer*), willows (*Salixi*), common hornbeams (*Carpinus betulus*), and spruce (*Picea*). About 6000 BC the spruce intrusion in South-Eastern Estonia starts, and at the end of the first Atlantic phase the spruce belt reaches Vooremaa (Saarse et al. 1999; Kukk et al. 2000, 94).

Hazelnut groves with lots of nuts and thick nutritious topsoil provided a suitable environment for wild boars, badgers (*Meles meles*), hedgehogs (*Erinaceaus europeaus*), and moles (*Talpa europaea*) (Kukk et al. 2000, 94).

6.3.1.2 Settlement and Human Impact

The earliest traces of human habitation in Vooremaa date from the Mesolithic period, and have been discovered at six locations (Rohe, Kärde, Kuremaa, Änkküla, Ehavere, and Tooma).

From a landscape perspective, one of the most interesting sites is a Mesolithic dwelling place situated in Rohe village on the very northern tip of the Võduvere drumlin (Figure 24).

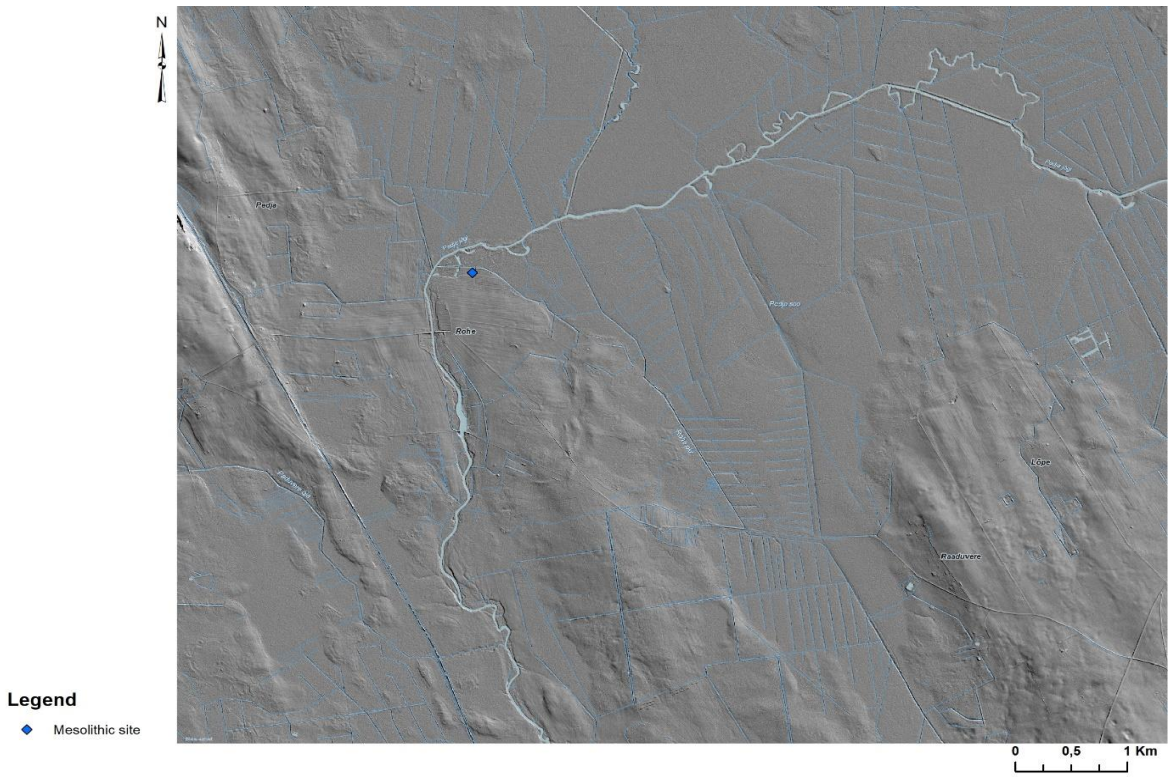


Figure 24. Rohe Mesolithic settlement site is situated on the tip of the drumlin on the shore of vast wetlands. LIDAR map: Estonian Land Board.

The site is on the shore of River Pedja, right on the verge of Pedja bog – a paleolake overgrown with peat. From the description of archaeological sites of the Laiuse parish we can learn that the site was well-known amongst local inhabitants already at the beginning of the 20th century:

> *The whole village has been collecting flint from here for a long time. Just recently, a student named Tiitsman while collecting antiquities took flint flakes to the Estonian National Museum in Tartu. The farmer said that he has also found some pottery sherds, but this cannot be verified* (Moora 1921, 3).

In 1942 the Stone Age researcher Richard Indreko[17] conducted small-scale excavations at the site unearthing some flint artefacts (AI 2671:43; A 167:52[18]). Later, an Iron Age anthropogenic layer (9239)[19] and several stray finds have been discovered in the vicinity as well.

In recent years several new sites with traces of Mesolithic settlement have been found around the Endla and Kuremaa lakes, but also from the village of Ehavere.

In 1955, a Stone Age anthropogenic layer was discovered on the North-Eastern shore of the Lake Endla. During a landscape survey, archaeologist Lembit Jaanits[20] found a stone adze, flint flakes, a fishing net weight, and pieces of a polishing stone (AI 4145). Jaanits dated the finds to the Neolithic (Jaanits 1955), even though no pottery or typical Neolithic artefacts were discovered. Later it has been speculated (oral communication with Kristiina Johanson) that the finds might originate from the Mesolithic period. In 2011 two new Stone Age settlement sites (Tooma and Kärde II) were discovered in the swamps surrounding the Lake Endla (Tõrv and Ots 2012, 275 – 76). The new site in Tooma village is quite spectacular – probably containing a Stone Age burial and a settlement site on a swamp island (TÜ 1936). In addition to the Mesolithic finds, Iron Age handmade pottery was discovered as well.

In the Stone Age the – now dissected, swamps surrounding Lake Endla most probably formed one large water body with small islands. This was an ideal landscape for temporary seasonal campsites, both for hunter-gatherers and fishers. Ethnographic studies demonstrate that fishing spears can most efficiently be applied during spring spawn.

[17] Richard Indreko (1900 – 1961) – Estonian archaeologist and ancient historian, studied mainly Stone Age, especially the Mesolithic period.
[18] Artefact numbers in archaeology collection.
[19] Indicates the number in the National Registry of Cultural Monuments, further referred to.
[20] Lembit Jaanits (1925 – 2015) – Estonian archaeologist, mainly Stone Age, especially the Neolithic period.

Around Lake Kuremaa there are two regions where exclusively pre-pottery Stone Age flint and quartz have been discovered – one settlement site on the NW-shore of the lake (TÜ 1464), and the other one on the most northern tip of the Palamuse-Änkküla drumlin (TÜ 1477). When looking at the LIDAR elevation map (Figure 25) we can see that the depression around the Lake Kuremaa forms quite a large waterbody surrounded by drumlins suitable for habitation. The Mesolithic landscape is here characterised by peninsulas and lake islands. Large waterbodies connected to each other provided excellent infrastructure for efficient movement over large distances, which was essential for hunter-gatherers. In this perspective Mesolithic Vooremaa can be characterised as an "islandscape" (Figure 25). During wintertime frozen lakes also made it easier to travel across the landscape.

The Mesolithic settlement site in Ehavere village (TÜ 2222) is also situated on the shore of a large paleo-lake, which by today has mostly dried up or turned into swampy forest or wetland meadows. According to the 17th century land use maps, all the three sites are situated in gradients between arable land and semi-natural grasslands. There is evidence that swamp formation in Vooremaa started already around 6500 BC – in the later part of the Boreal period, and intensified during the Early Neolithic (4900 – 4200/4100), which enjoyed warm and damp climate (Kukk et al. 2000, 94). Thus, when searching for traces of Mesolithic habitation we have to look for locations with high elevation ratio between swampy areas and dry land. Gradient-rich landscape sections were favourable for a broad-spectrum economy involving hunting, fishing, and gathering. However, at the moment this is just a hypothesis that needs to be checked by means of field research.

Stone Age settlement sites/villages were most probably of seasonal nature, depending on frequent movements following the migration of game animals and fish. Within this migratory pattern, people settled for shorter or longer periods on the shores of lakes and larger rivers. Human impact on the surrounding landscape was still very modest and cannot be detected in pollen diagrams. Mesolithic settlement was bound to waterbodies, where the most suitable dwelling or campsites were the transitional zones between waterfront and forest, which were the best grounds for fishing, hunting, and gathering.

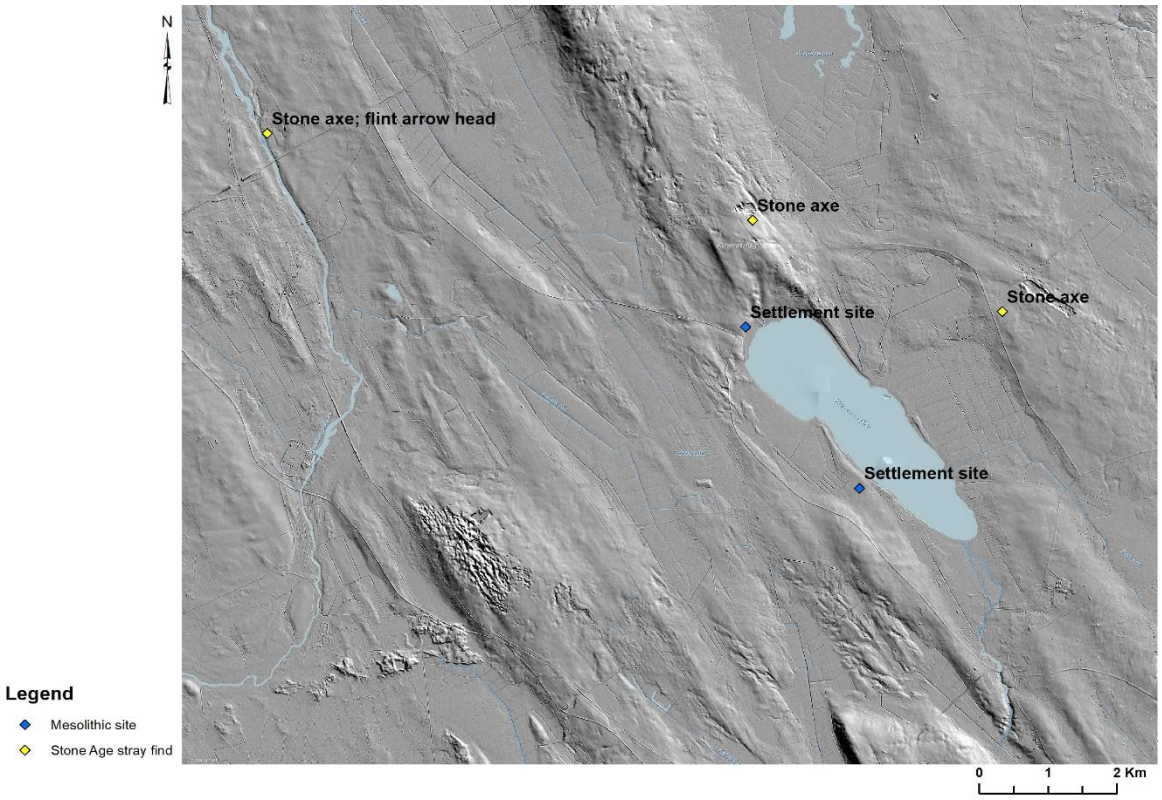
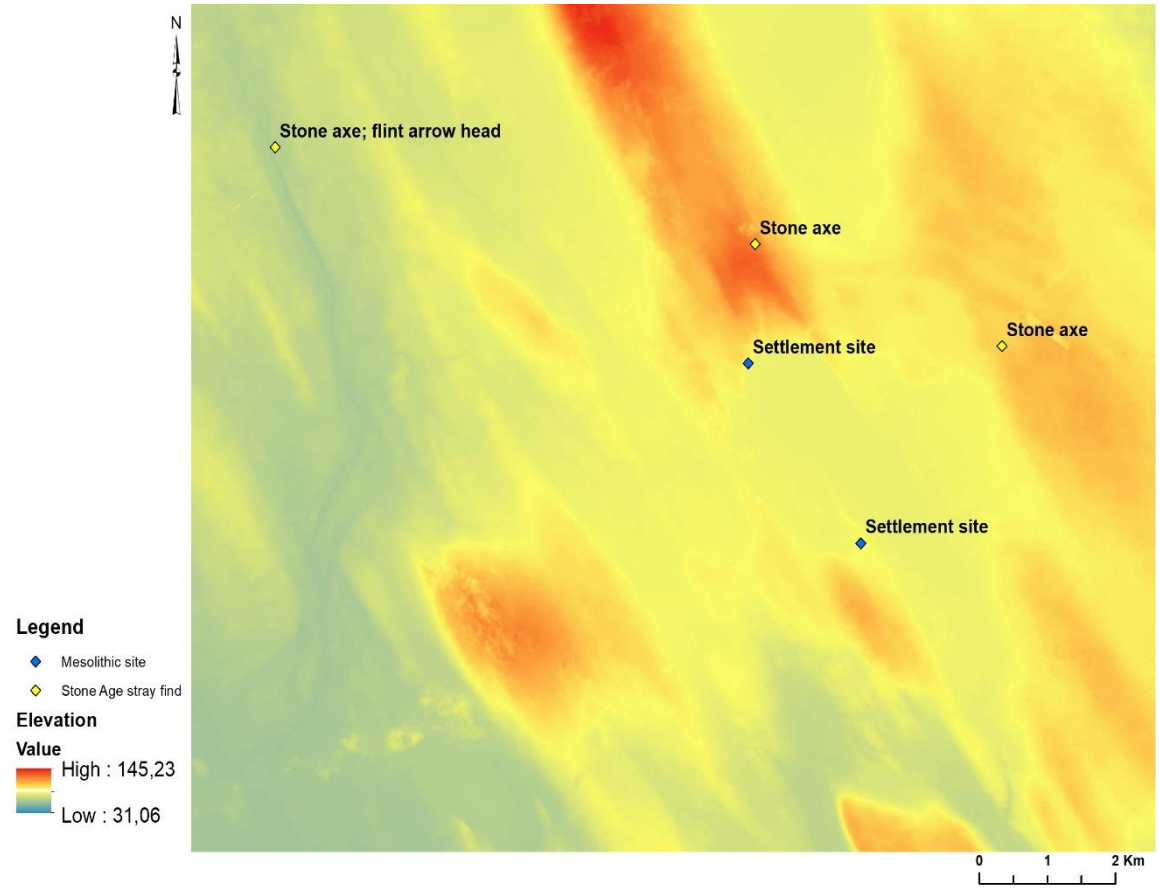


Figure 25. Digital elevation model of the area highlights the Stone Age island landscape. The drumlin edges on the waterline around Lake Kuremaa were suitable places for Stone Age habitation. LIDAR map: Estonian Land Board.



6.3.2 Neolithic period (4900 – 1800 BC) and Early Bronze Age (1800 – 1100 BC)

6.3.2.1 Environment and Climate

The second phase of the Atlantic chronozone (AT2; 4500 – 3000 BC) correlates with the Early Neolithic (4900 – 4200/4100 BC) period. This is the time of climatic optimum, when most of Estonia was covered with the same type of broad-leaved trees as are common for Estonia's forest today. The warm and damp climate, with lush vegetation and a high variety of species, provided a favourable habitat for various fungi as well. The intense process of paludification was one of the preconditions for a wider spread of European pond turtle (*Emys orbicularis*), beaver (*Castor fiber*), otter (*Lutra lutra*), water vole *(Arvicola amphibius)*, and Eurasian water shrew (*Neomys fodiens)* (Kukk et al. 2000, 94).

The Middle (4200/4100 – 3200/3000 BC) and Late Neolithic (3200/3000 – 1800 BC) overlap in time with the first phase of Subboreal chronozone (SB1; 3000 – 2000 BC), which started with the sharp fall of elm in the pollen diagrams. This was probably caused by several factors, including the cooler climate, and a stronger human impact on the environment compared with the previous periods. The changing conditions were more suitable for spruce, hazelnut, and oak. Light-needing herbaceous plants indicate open patches of cultural landscape (arable land and/or meadows) near riverbanks and lakeshores (Kukk et al. 2000, 95).

The Bronze Age correlates with the later phase of the Subboreal climate stage (SB2; 2000 – 500 BC), which is characterised by the gradual transformation from broadleaved forests to birch and pine forests. Oak is very common with its maximum in North Estonia around 2000 BC. About 1700 BC the spread of spruce is at its maximum in East Estonia. The increase of oak pollen in the diagrams points to habitats like forest meadows with relatively low density of trees. Juniper and plantain (*Plantago lanceolata*) also reflect the rise of open cultivated landscapes, supported by high charcoal frequencies in lake deposits from this period (Kukk et al. 2000, 95).

6.3.2.2 Settlement and Human Impact

Most of the Neolithic artefacts (Figure 26) discovered in Vooremaa are stone axes or fragments thereof, which have been found as stray finds and originate mostly from the Neolithic period (4900 – 1800 BC) or the early Bronze Age (1800 – 1100 BC), an era which shared similar environmental conditions and material culture with the latest parts of the Neolithic. Amongst the finds is only one flint arrowhead discovered on a riverbank near the Jõgeva manor, together with an axe (AI 689 – 690). The stone artefacts have usually been found during land cultivation or other earth works, such as ditch digging or river dredging. At the moment we have reliable data for 11 stone axes from the region.

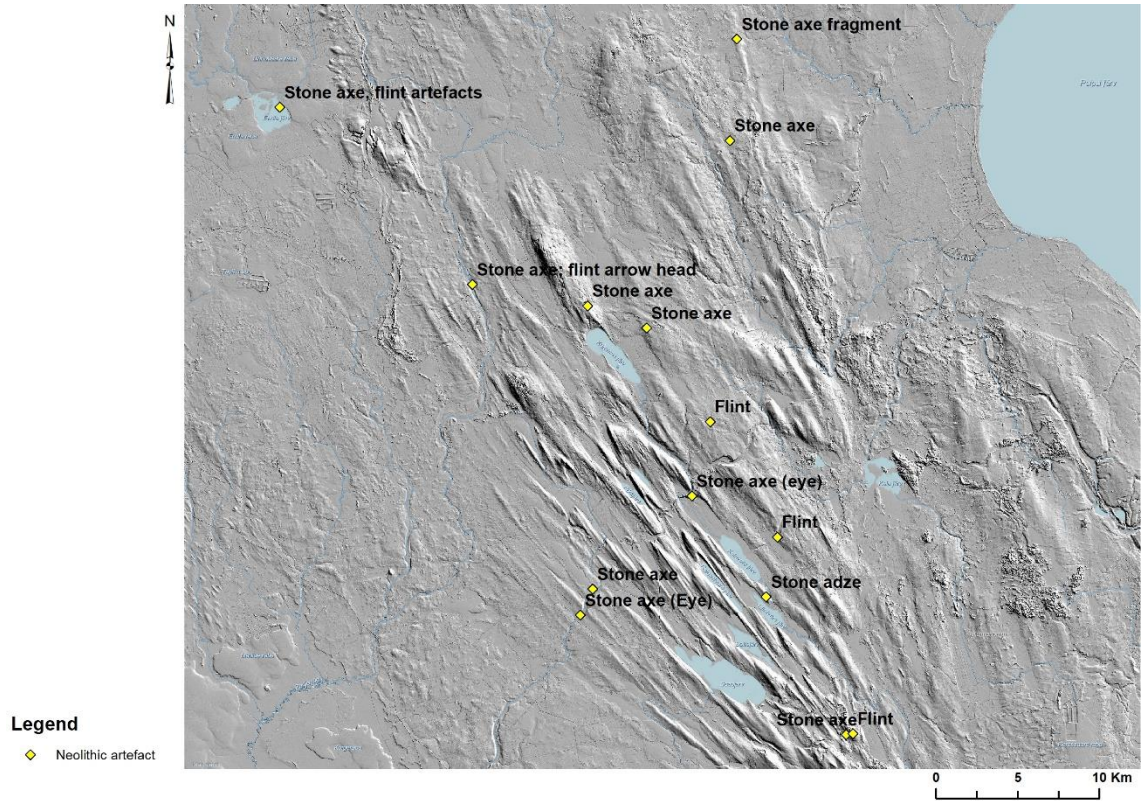


Figure 26. Neolithic artefact finds from Vooremaa. LIDAR map: Estonian Land Board.

From the Early Bronze Age, we have very little material evidence of human activity in the study region. The only bronze artefact from this period is a high-flanged axe (AI 2513:90), discovered on an arable field of Mõisamaa manor in 1921. From the whole of Estonia only six bronze axes of that type are known (Zadin 2012, 20)[21]. The flanged axes were produced in southern Scandinavia and northern Germany in the 16th century BC (Lang 2007b, 39).

[21] Since 2012 several new flanged bronze axes have been discovered by metal detectorists.

A anthropogenic layer dating from the end of the Neolithic was encountered beneath a 2nd – 5th century stone grave in Kõrenduse village excavated between 1975 – 1976 by Lavi (Lavi 1978a; Lavi 1978b).

Pollen samples collected from a swamp near Kõrenduse stone grave suggested that the first indications of crop farming in the region date from the Middle Neolithic (Pirrus et al. 1988). Furthermore, the pollen diagrams revealed significant human impact on the surrounding vegetation already since the Early Neolithic – the diversity of herbaceous plants suddenly increased, accompanied by a variety of plants characteristic of open grasslands and landscapes with disturbed soil (Lang 2003, 60; Pirrus et al. 1988). Several layers of charcoal in the same soil samples date to the end of the Neolithic and beginning of the Bronze Age. It is well possible that these mark activities like slash-and-burn agriculture in the area. The earliest cultivated gramineous plants detected in Kõrenduse pollen diagram are roughly dated to 2500 BC. The introduction of cultivated plants to the area is also supported by the presence of nettle *(Utrica*) and sorrel (*Rumex acetosella*) in the pollen diagram (Pirrus et al. 1988; Kukk et al. 2000, 95).

The pollen data from the Lake Raigastvere (Pirrus et al. 1987; Pirrus et al. 1988; Pirrus 2010), which is situated some 5 km SW from the Kõrenduse stone grave, demonstrates large-scale visible human impact on the surrounding areas with the first traces of cultivated cereals, which can be detected around 1500 BC (Figure 27) . At the same time the proportion of elm (*Ulmus*) pollen declines more than three times. The pollen count also indicates a sudden fall of spruce, and a rapid increase of birch (*Betula*), which can be a result of landscape/forest clearance (talk with Corrie Bakels).

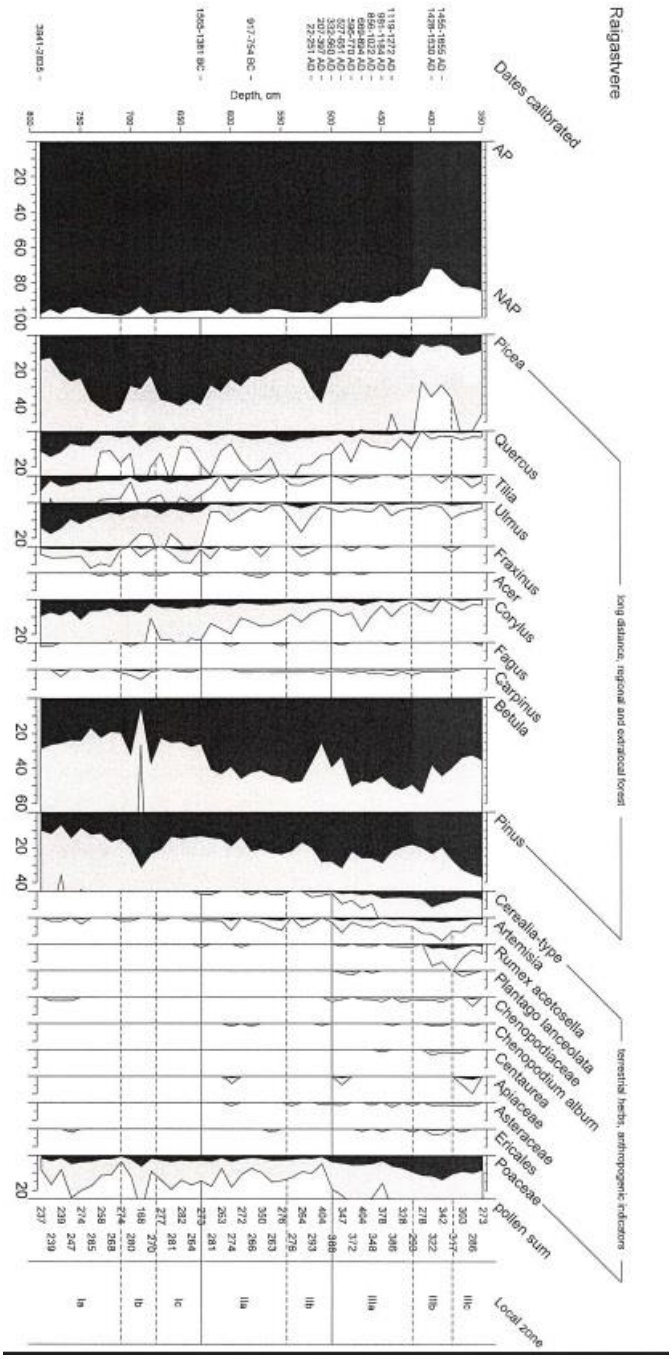


Figure 27. Raigastvere pollen diagram compiled by Corrie Bakels, based on data from Pirrus 2010.

The earliest evidence of primitive cereal cultivation in eastern Estonia are dated to around 4000 BC (Poska et al. 2004, 45), and comes from the Neolithic/Early Bronze Age settlement site of Akali, located some 25 km SE from Vooremaa. The Akali settlement site is situated in the delta of the Emajõgi river, which over the past millennia has transformed into a vast swamp.

It has been pointed out by palaeo-botanists (Poska et al. 2004, 45; Saarse et al. 1999; Saarse et al. 2001) that the simultaneous decline of broad-leaved trees, such as elm (*Ulmus*) and lime

(*Tilia*), and extensive spread of spruce (*Picea abies*), is directly connected to the introduction of farming in the area. Furthermore, the expansion of spruce and downfall of elm correlates with the first finds of cereal pollen. According to the pollen data, the disappearance of elm forests in Estonia was not a single synchronous event, but took place over the period of 3800 – 3200 BC (Saarse et al. 2001). This gives ground to speculate that the gradual decline of broad-leaved trees was caused by human impact rather than natural factors. The fall of broad-leaved trees, and the general increase of vegetation diversity has also been interpreted as suitable environment for (and result of) cattle grazing in forest meadows (Poska, Saarse, and Veski 2004, 46 – 47). This suggests that primitive crop farming and cattle breeding were already visible in pollen data, and thus simultaneously well-established already at the end of the Neolithic/beginning of the Bronze Age.

6.4 Environment and Settlement in the Late Bronze Age (1100 – 500 BC) and Pre-Roman Iron Age (500 BC – 50 AD)

6.4.1 Environment and Climate

For the end of the Early Bronze Age, pollen diagrams show considerably less indications of human impact on the environment, and the study area was reforested once again. Yet, a new wave of human impact on the landscape of the central part of Vooremaa can be detected between 900 – 700 BC (Lang 2007b, 22).

The first 500 years of the Iron Age are characterised by the first Subatlantic climate phase (SA1, 500 BC – 1st century AD), in pollen diagrams dominated by birch, spruce and alder. At the end of the period spruce achieved its second optimum in Estonia, and taiga-like environments attracted forest-belt animals from the east. With the spread of spruce forests Estonia became a transitional zone between north- and south-boreal forests. Animals such as aurochs (*Bos primigenius*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*) and wild cat (*Felis silvestris*) were forced to migrate further south, due to harsher conditions (Kukk et al. 2000, 95).

6.4.2 Settlement and Human Impact

It has been estimated that the population of the Estonian region during the Bronze Age remained most likely under 10 000 (Lang 2007b, 35), meaning that human impact on the land was not very intensive, but still quite considerable.

Archaeological information on the Late Bronze Age (1100 – 500 BC) and the Pre-Roman Iron Age (500 BC – 50 AD) in Estonia predominantly relates to stone-cist graves, but also early *tarand* graves and fortified settlements (Figure 28). The stone-cist graves are most characteristic of northern Estonia with its limestone bedrock formations and are relatively uncommon in eastern and southern parts of Estonia. Data on stone-cist graves in Vooremaa is somewhat controversial. Only two locations in the study area can be associated convincingly with stone-cist graves. A probable base of a stone-cist grave was discovered under one of the *tarand*-graves in Nava village with inhumation burials and artefacts dating to 1st century AD. Unfortunately no exact plans or drawings from the excavations have survived (Lang 2007a, 147). The second location is in Endla (Tirma) village in the NW part of Vooremaa, where a group of stone graves might originate from the Pre-Roman Iron Age.

Archaeological research on Bronze and Early Iron Age settlement sites in Estonia is still in its early stage. Only six open settlements[22] have been thoroughly investigated archaeologically.

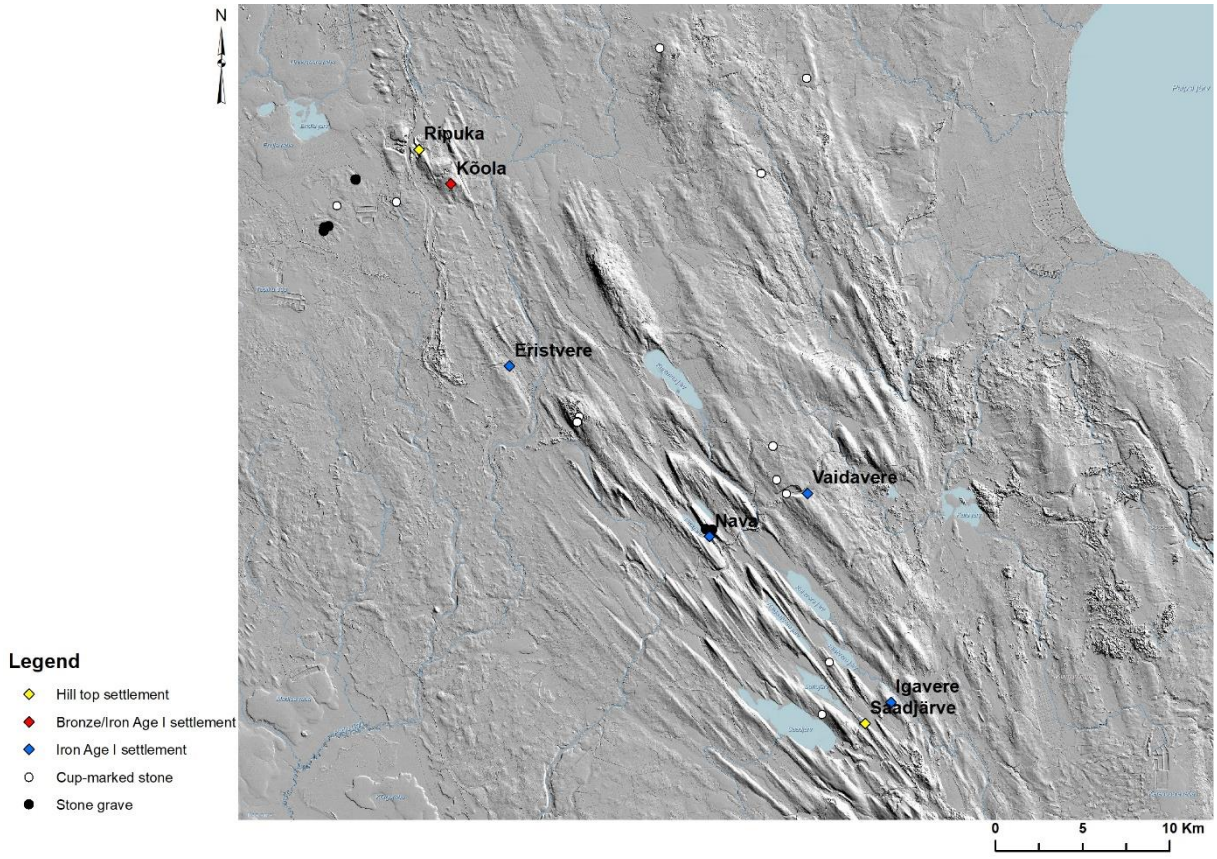


Figure 28. Late Bronze Age (1100 – 500 BC) and Pre-Roman Iron Age (500 BC – 50 AD) sites in Vooremaa. LIDAR map: Estonian Land Board.

The results demonstrate that the settlements were small in size, rarely covering more than a hectare. Anthropogenic layers are fairly thin and contain few finds. Information on the spatial

[22] Open settlement as opposed to fortified settlement, for more details see Lang 2007b.

organisation of the settlements and the nature of relations between the sites is scanty. So far, most of the settlement sites have been dated on the basis of pottery typology, which however is not very precise (Lang 2007b, 51). The pottery types common for this period are textile impressed and striated pottery.

From the Vooremaa region we have practically no information about open or hill top settlements. Valter Lang (Lang 2007b, 50, fig 15.; 56, 17.) dated only four settlement sites in Vooremaa to the Late Bronze Age/Early Iron Age: Kõola and Eristvere as open settlements; Ripuka and Saadjärve as hill top settlements[23]. Striated Early Iron Age pottery has also been discovered from the villages of Igavere and Vaidavere.

Interesting but also rather controversial Late Bronze Age/Early Iron Age sites are cup-marked stones[24], of which 15 are known from Vooremaa. At least five of these have been used during historical times as offering stones. In Estonian archaeological research, cup-marked stones have been dated to the Late Bronze/Early Iron Age, primarily on the basis of other archaeological sites in their close vicinity. No datable archaeological finds have been discovered that could be reliably associated with cup-marked stones. As for the practises related to cup-marked stones, there is no canonised version either. So far the prevailing interpretations suggest connections with early arable lands, with the cup-marked stones marking land ownership and fertility rites related to agriculture (see for more detailed discussion: Tvauri 1999).

6.5 Environment and Settlement in the Iron Age (50 – 1225 AD)

According to the most recent research conducted on the Iron Age in Estonia (Tvauri 2012a) no exclusively Migration Period (450 – 600 AD) nor Pre-Viking Age (600 – 800) settlement sites in Vooremaa have been distinguished. The main reason for that is the lack of reliably dated archaeological information from the settlement sites.

It is therefore only from the Viking Age (800 – 1050 AD) and the Final Iron Age (1050 – 1225 AD) that we can detect changes in the settlement pattern (Figure 29). Change is mostly affected by the establishment of hillforts (Tõnisson 2008a) and introduction of wheel-thrown pottery (Tvauri 2005b). The Roman Iron Age (50 – 450 AD) is characterised by numerous

[23] Earlier settlement layer was unearthed beneath hillforts.
[24] Cup-marked stones – natural boulders with man-made symmetrical holes, usually 3-10 cm in diameter and 0, 5-5 cm in depth.

tarand-type stone graves, which allow us to draw some assumptions on the overall distribution of settlements during this period.

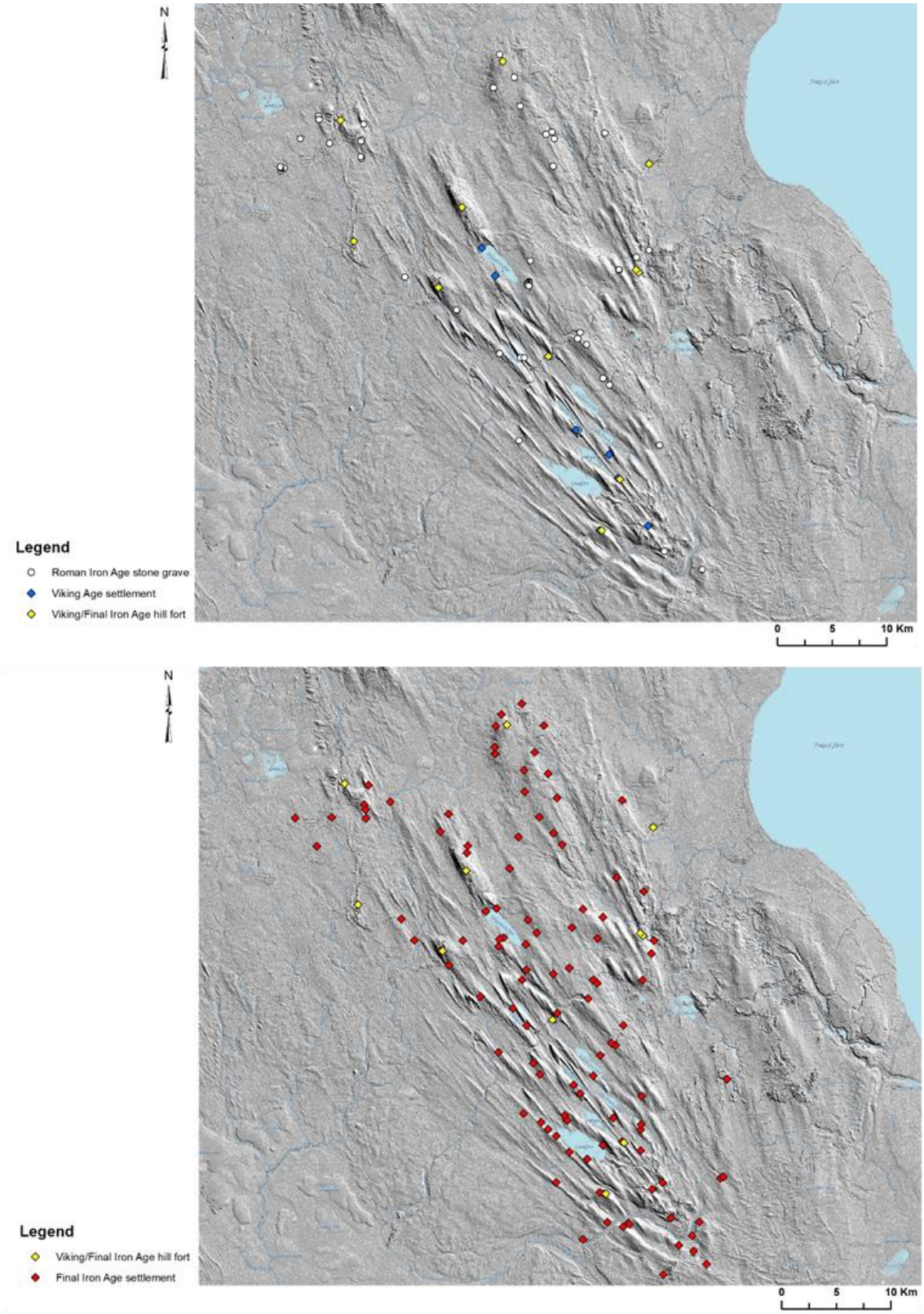


Figure 29. Changes in the settlement pattern during the Viking Age (800 – 1050 AD) and the Final Iron Age (1050 – 1225 AD). LIDAR map: Estonian Land Board.

Important sites related to the Iron Age settlement pattern are iron smelting places, for which we have more detailed data from Tindimurru (AI 5363:1 – 5), Puiato (AI 5066), Kassinurme (AI 4848:1 – 4), Varbevere (TÜ 373), and Torma. In addition to sites specifically distinguished as iron smelting places, iron dross and raw iron indicating local smelting and blacksmithing has frequently been found from the settlement layers of sites in Vooremaa. Various studies have demonstrated (Peets 2003, 33 – 34) that the local bog iron ore, or limonite, found from the Estonian bogs and lakes contains about 38.5% of iron.

The earliest signs of bog iron ore smelting in Estonia have been discovered from the Maarja-Magdaleena parish in Vooremaa. The iron smelting site in the Tindimurru village has been dated to 1st century BC – 2nd century AD (Peets et al. 1987; Peets 2003, 59). The constructions of the iron-smelting furnace in Tindimurru suggested that bellows were used already at that time. Still, if we take into account locally produced metal artefacts discovered from early *tarand*-graves in other parts of Estonia, it has been assumed that iron smelting might have been introduced already several centuries earlier (Lang 2007b, 125).

When recording local iron smelting, place names can also convey valuable information. The Estonian word for iron, *raud*, has several origins and is a loan word either from Germanic or Baltic languages. In the Old Norse *rauði*, meaning "bog iron"; the Baltic word *raudā* refers to the colour red (ETÜ n.d.). The place names with a component derived from the word *raud* are for example Raaduvere in the northern, and Raadivere in the middle part of Vooremaa. Although, the toponyms containing the word *sepp*, meaning "blacksmith", are more common and mostly represent farm names, their origin is also probably much later. The same farm names have been used over centuries and generations, and the name probably outlived the smithing tradition on the farm (Lavi 1999d, 40). Another common component in toponyms is *veri*, meaning "blood", such as in Verioja, which might also refer to the presence of local iron ore.

The most suitable places for extracting iron from the ore where higher mineral lands on the edges of wetlands. It has been suggested (Lavi 1999c, 42) that the first processing of raw iron also took place on the smelting sites. From the 17th century map we can infer that the site in Puiato was situated on a small moraine hillock on the outskirts of a large wetland forests away from the main settled areas (Figure 30). This was a perfect location for gathering bog iron and dry wood, which was needed for producing charcoal and extracting iron from the ore.

Radiocarbon samples obtained during archaeological excavations enabled to date iron smelting in Puiato to 1st – 2nd century AD (Peets 2003, 62).

Some 5 km north from Puiato is a very similar iron smelting site in the village of Tindimurru. The site is also situated close to extensive wetland areas.

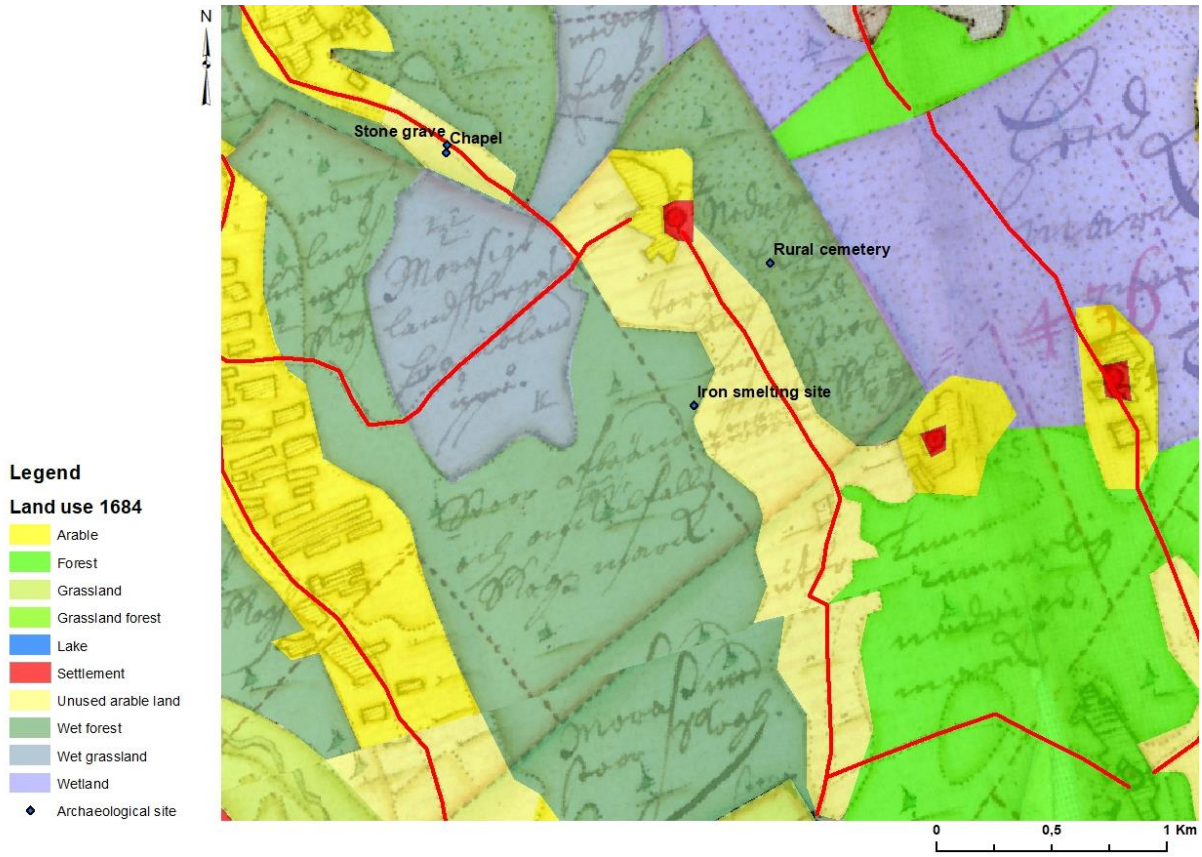


Figure 30. In the 17th century landscape the iron smelting site of Puiato is situated on the border of wetland forest and unused fallow arable land. EAA.308.2.69.

In the case of the settlement sites that contain traces of iron smelting and ore processing, Lavi has noted (Lavi 1999c, 43) that these tend to be positioned on the descending parts of the drumlins in the peripheries of occupied areas. This was probably due to high flammability the smelting furnaces, which imposed fire hazard on the houses and barns of farmyards. Shorter distance to potential procurement places of ore and wood must have also played a role.

Iron smelting was of significant social importance for consolidating local communities. Extracting iron from the ore consisted of several time-consuming seasonal work stages, which required manpower, common effort, planning and leadership. Thus, it can be assumed that the spread of ironworking paved way for the emergence of social stratification, supporting a new elite (Lang 2007b, 125) which also substantiated itself through erecting hillforts.

In my view iron was not the end-product for export as argued by Mauri Kiudsoo (Kiudsoo 2016), but that it instead enabled a more effective grain cultivation, the surplus of rye was the source for cumulating wealth and power from the Pre-Viking Age (600 – 800) onwards.

6.5.1 Environment and Climate

In the middle of the Subatlantic period (SA2; 0 – 1000 AD) climate became more humid and marine-like. Due to cultivation the landscape became more open in terms of vegetation cover. Around the Viking Age (800 – 1050 AD) hemp (*Cannabis*-type) as raw material for rope was introduced and according to pollen diagrams, widely cultivated (Kukk et al. 2000, 95). At the same time warm and damp climate favoured the process of swamping in the forested areas, and also water levels in lakes and rivers rose (Tvauri 2012b, 36). In the Raigastvere pollen diagram (Pirrus 2010) we can see that the spruce achieves its maximum around 3rd – 4th century AD. Around 6th – 7th century AD the proportion of spruce starts to decline sharply, reaching its minimum by the end of the Final Iron Age/Early Middle Ages. Still, it has been estimated that by the end of the first millennium over 65% of Estonian mainland was still covered by forest (Rõuk 1992, 22). From the Pre-Viking Age (600 – 800 AD) onwards landscape really started to open up, and the percentage of both uncultivated grasses (*Poaceae*) and cultivated grasses (*Cerealia*) increased considerably[25].

The transition from the Migration period (450 – 600 AD) to the Pre-Viking Age (600 – 800 AD) witnessed a climatic catastrophe in 536/537 most probably triggered by a series of events including volcanic eruption(s) and/or a comet/meteorite impact somewhere in the southern hemisphere (the debate over the cause of the climatic catastrophe is ongoing, for more detail see Gräslund et al. 2012). This resulted in cold weather and declined crops all around the northern hemisphere as well, which continued at least until the year 545 (Gräslund and Price 2012, 430 – 31; Tvauri 2014, 31).

6.5.2 Iron Age Settlement Regions of Vooremaa

In order to present a systematic overview of the archaeological settlement sites in Vooremaa, I have divided the study region into three sub-regions: 1) northern Vooremaa, 2) central Vooremaa, and 3) southern Vooremaa.

[25] Discussion with Corrie Bakels

Northern Vooremaa was surrounded by vast wetlands and lowlands from three directions – in the east and north-east by the Peipsi and Alutaguse lowlands, in the north by Lusika and Pedja swamps, and in the west by Endla and Vaimastvere swamps. This part of Vooremaa features two of the largest drumlins of the study region, Koimula and Laiuse, which are central areas in the settlement pattern. Separate settlement clusters can also be observed in Endla-Kõola, Leedi-Reastvere, and Torma regions. Archaeological settlement sites are

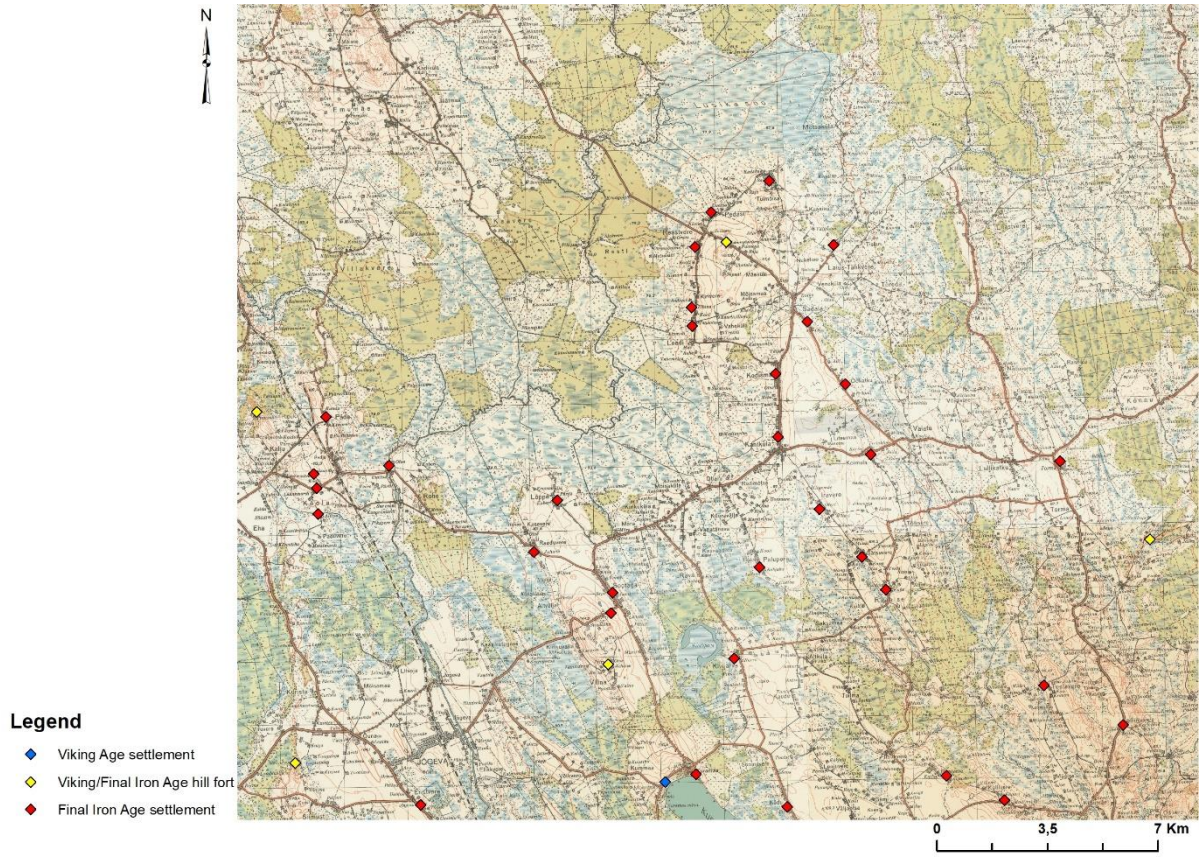


Figure 31. Iron Age settlement sites in the northern part of Vooremaa are often situated on the slopes of drumlins between wetlands and arable lands. Topographic map, 1930s: Estonian Land Board.

especially abundant along the drumlin edges and slopes of the Pedja and Luskikasoo swamps, where occupation layers have been listed in the villages of Pedja, Rohe, Raaduvere, Lõpe, Vanatänava, Leedi, Kirivere, Reastvere, Pedasi, Tuimõisa and Tähkvere (Figure 31). All these settlement sites have been discovered and proposed for listing by Ain Lavi during landscape surveys in the first half of the 1980s.

The most outstanding natural feature of the northern part of Vooremaa is the Laiuse giant drumlin, which with 144 m asl boasts as the highest point of the region. Laiuse drumlin is widely known for the offering spring called *Siniallikas* (Blue Spring) on top of its highest part. Around 1,3 km south from the Siniallika spring is the hillfort of Vilina. Although, there

are no precise datings, the hillfort was probably established and used in the 11th – 12th century (Tõnisson 2008).

Central Vooremaa correlates more or less with the historic church parish of Palamuse. From this region we have archaeological information on 16 listed settlement sites, and at least six unregistered similar locations with archaeological occupation layer. Settlement areas rich in archaeological sites are the joint drumlins of Parjala-Kassinurme-Kaarepere, surroundings of

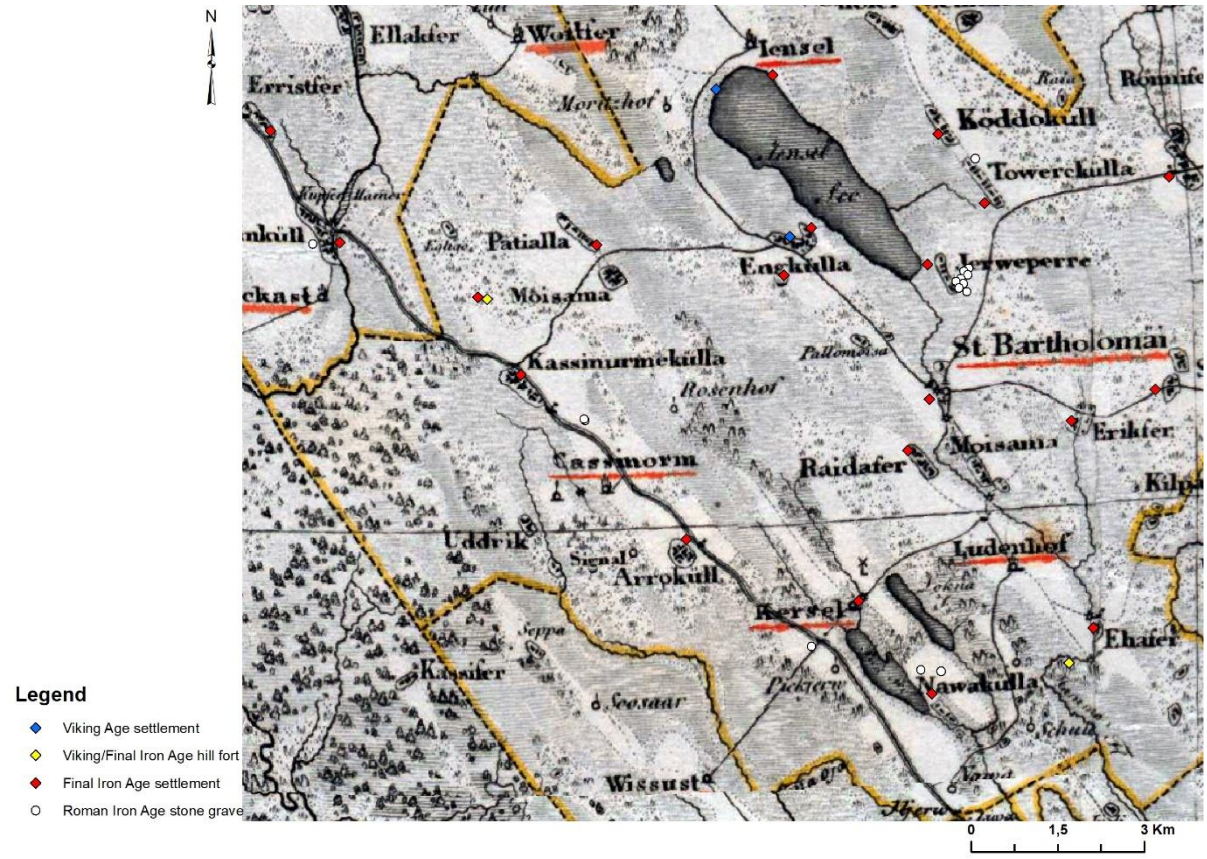


Figure 32. Iron Age settlement in the middle part of Vooremaa. Special map of Livonia 1839: EAA 1393.1.81.

the Lake Kuremaa, and old valleys of the rivers Amme and Kõlaoja (Figure 32).

For central Vooremaa the river Amme is the connecting characteristic feature. The river Amme is only ca 60 km long (Järvekülg 2001). It originates at Lake Kuremaa flows and from there flows through the central and southern parts of Vooremaa. The river has been dredged and canalized considerably in several places, especially in the depressions between the drumlins. In the past the river was probably wider during times of higher water levels was at least partly navigable with shallow boats.

Close to the southern tip of Lake Kuremaa we can find a cluster of sites comprising of a settlement site and eight possible stone graves. The archaeological character and chronology

of the graves remains unclear, for none of them have been thoroughly studied. The monuments were discovered in 1957 by the archaeologist Evald Tõnisson. Later it has been questioned whether they are burial sites at all (Lõugas 1972). No archaeological finds or human remains have ever been found from the monuments.

In the old valley of the river Amme archaeological settlement sites have been discovered from the vicinity of the Palamuse water mill and from the villages of Raadivere and Ehavere. The village area of Ehavere on the southern bank of the river Amme contains the only hillfort of the central part of the study region. The hillfort is situated on a remarkable post-glacial moraine ridge following the shape and direction of the river. The fort was built on the triangular peninsula of the ridge, which was then separated from the rest of the natural ridge by a man-made rampart. The river side of the fort was protected by a steep slope of 14 m in height. Although a thin occupation layer was discovered in the top soil of the hill in 1953 (Moora 1953), no datable finds have been reported so far. Based on similar hillforts in the region the site was most probably used in 11th – 12th century.

Southern Vooremaa contains large post-glacial lakes such as Saadjärve, Soitsjärve, Elistvere, Raigastvere and Kaiavere. The region is characterised by a typical and outstanding drumlin landscape is part of the Vooremaa landscape protection area. While in the northern part of Vooremaa the settlement was spread along higher ground adjacent to swampy areas, in

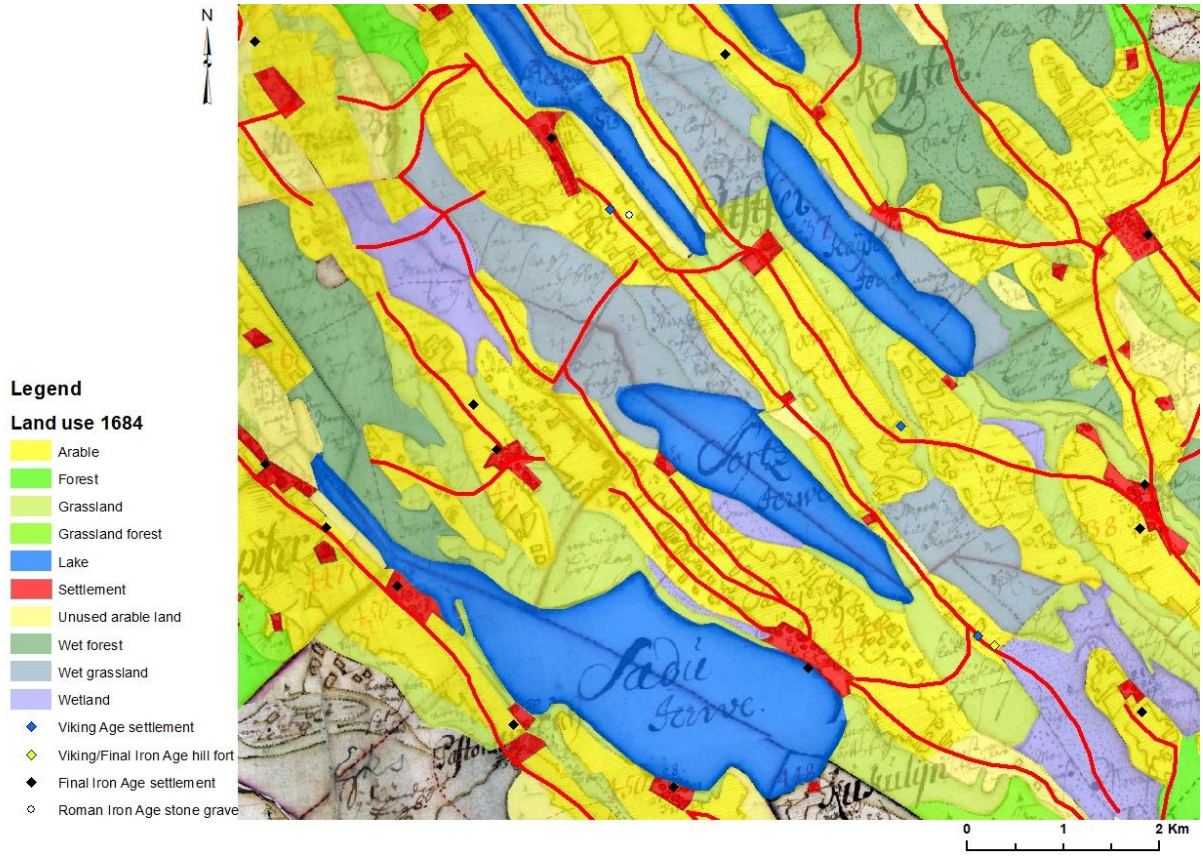


Figure 33. Iron Age settlement sites in the southern part of Vooremaa are often situated on or near 17th century villages.

the south, where the elevation is considerably lower the swamping level of the lakes is lower as well. When the distribution of archaeological settlement sites is compared with the 17th century maps, we can see that most of the Iron Age settlements continue to be used in the Middle Ages and Early Modern times (Figure 33).

The most densely settled part of this part of Vooremaa is the area around the Lake Saadjärve, where settlements have been discovered in the villages of Äksi, Voldi, Tabivere, Valgma, and Saadjärve. From this part of Vooremaa we also have information on unlisted settlement sites and stray pottery finds. Of these, at least 20 locations can be considered as archaeological settlement sites that still need to be officially registered in listings.

6.6 The Middle Ages (1225 – 1550 AD) and Early Modern Period (1550 – 1800)

The transition from the Iron Age to the Middle Ages in Estonia took place during the first quarter of the 13th century in the framework of the Nordic conquest and Christianisation, executed by Danish and German crusaders (1208 – 1227). The *Chronicle of Henry of Livonia* (HCL 1982) as the main historical source for the conquest has been thoroughly discussed in the Estonian historiography (Vahtre 1990; Selart 2002; Selart 2007; Tamm 2009; Jensen et al. 2011; Kala et al. 2012).

Whereas historians generally draw the line between Iron Age and Middle Ages at the year of 1227, marking the end of the conquest, the shift is not so apparent in material culture and the archaeological evidence. From an archaeological perspective, the transition is dated somewhere between 1200 and 1250 AD (Russow et al. 2006: 159). As a compromise the date of 1225 AD is now considered to mark the end of Prehistory in Estonia. During the early Middle Ages Estonia was Christianised and subjected to landlords, who were of German descent.

From the *Chronicle of Henry of Livonia* (HCL 1982) we know that at the transition – the Vooremaa region included at least three relatively small prehistoric counties: Vaiamaa (*Vaiga*[26]), Soopoolitse (*Soboliz*) and Jõgentagana (*Jogentagania*). In relation to the process of Christianisation several places in Vooremaa have been mentioned in the chronicle.

The features characteristic for the Middle Ages, such as urban settlements, churches, stone castles, and monasteries did not appear in the landscape overnight. In rural areas, the changes took even longer. The same applies for the end of the Middle Ages, which is usually marked

[26] In brackets are the name forms as occurring in the chronicle.

by a sequence of different wars referred to as the Livonian war (1558 – 1583) (Russow et al. 2006: 159). For the peasant communities the Middle Ages did not in fact conclude until 1819 (1816 in Estonia), when bondage (servitude) was abolished in Livonia.

In addition to the political and social changes accompanying the beginning of the Medieval period, landscape and land use started to change rapidly as well. The Iron Age hillforts as the central nodes in the settlement pattern were abandoned, and gradually a feudal landscape similar to western and central Europe started to emerge. The settlement pattern became denser, and settlements were now also established in areas where occupation had not been substantial earlier. More land was cultivated, and forests decreased in size. The latter process can be clearly observed in the pollen diagrams.

Around 1200 – 1300 AD winters started to get more sever, and based on different sources, the period 1350 – 1850 AD has been addressed as the "Little Ice Age". This period provided suitable habitats for wolves, which resulted in the decline of wild boar, elk, roe deer and red deer populations. (Kukk et al. 2000, 96).

By the end of the Middle Ages c. 80 churches and 50 stone-built forts had been erected in the rural areas of Estonia. In the Vooremaa region, however, there was only one stone-built fort – Laiuse castle –, which was first mentioned in written records in 1406, but was probably established already at the beginning of the 14th century.

6.6.1 The Medieval and Early Modern manor landscape

The central economic unit of the medieval feudal landscape was the manor. The first manors,

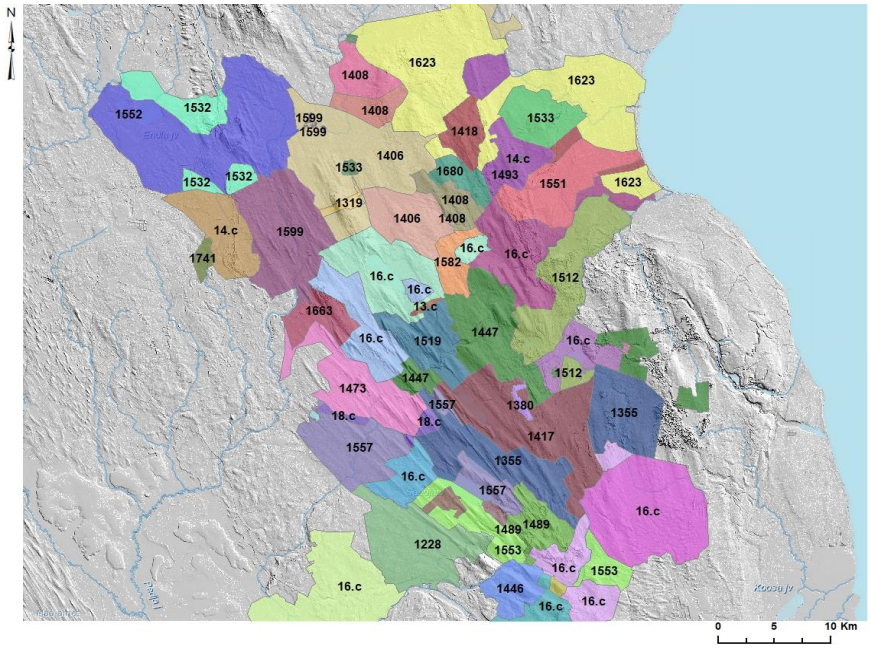


Figure 34. Vooremaa manors and their first mentioning in written records. Digitised from parish maps of 1900.

which relied on local peasant labour, were already established during the 13th century conquest, and by the 16th century the number had risen to at least 483 in Estonia (Kala et al. 2012). From Vooremaa we have knowledge of 32 manors, including 5 church manors, which originate from the Middle Ages.

The social and cultural differences between Estonian peasants and German landlords were extremely sharp – the first social group was based on "pagan" Iron Age traditions, the second one on European Christian nobility. In addition, there was the language barrier, which remained between the locals and the Germans until the beginning of the 20th century. The word *saks* (*sakslane* = German) became a synonym for a noble and is even today used in a sarcastic manner for arrogant better-off people. Gradually the indigenous Estonian peasants were subjected by the German landowners, and by the 14th century had lost their personal freedom and were forced into bondage.

According to the historian Juhan Maiste (Maiste 1996) the oldest manors were established as feudal fiefs in the vicinity of stone castles, which not only functioned as military but also as political, social and economic centres. The first manors were relatively small in size and did not last for long. In the case of early manors, the vassals' relation to the land was quite loose, and usually meant collecting taxes from the villages belonging to the liege a couple of times a year. Gradually the vassals moved to live in the country, and the network of manors became permanent by the middle of the 14th century (Maiste 1996, 16 – 18). Before the manor system had fully developed, the vassals used to live together in stone castles. Whether new manor complexes were built in the middle of old villages or areas or in the margins of old settlement territories is still unclear (Kahk 1992, 214). Yet, it is obvious that the manor economy was based on local peasant labour, meaning that the wealth of the manor depended on the number of nearby villages and its inhabitants. Thus, there was little reason for establishing a manor far away from already settled areas.

The archaeological record of Vooremaa demonstrates a strong link between manor centres and earlier settlement. Settlement layers pre-dating the manors have been discovered from the following manor centres: Vaimastvere, Torma, Rääbise, Kivijärve, Kuremaa, Kaarepere, Kudina, Saare, Tabivere, Äksi church manor, Saadjärve, and Vedu. This makes around 37,5% of all the manor centres in Vooremaa (Figure 35). It has to be mentioned that for the other 62,5% there is not enough data, which does not rule out the possibility that they might be of earlier origin. The Medieval rural settlement unit was the village, which consisted of a small

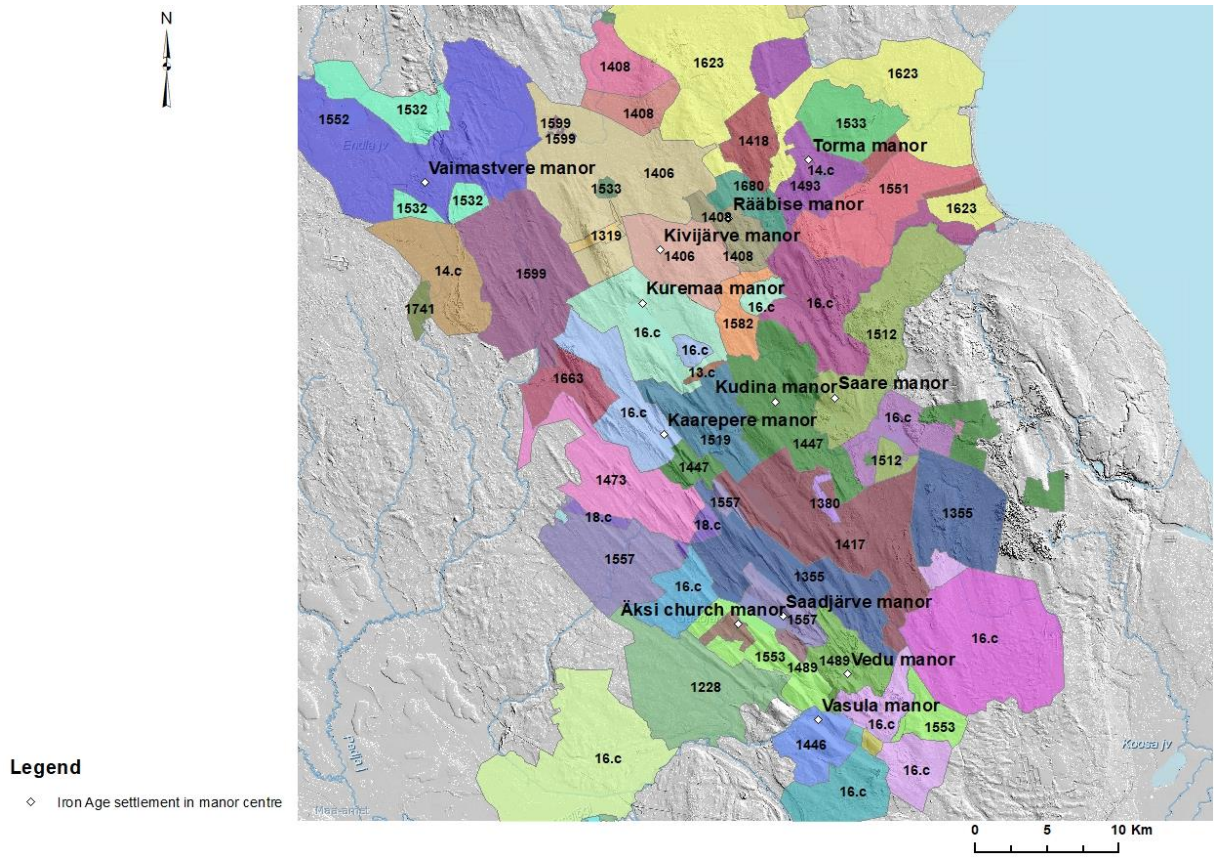


Figure 35. Iron Age settlements that have been discovered from Medieval and Early Modern manor centres. LIDAR map: Estonian Land Board.

group of farms, sharing arable land and common meadows. Common land exploitation has been considered as one of the main criteria in defining the essence of a medieval village (see: Coulton 1925; Rippon 2008; Gurevich 1988; Goff 1997).

Old village names with the suffix – *vere* are historically specific for Vooremaa and widely spread all over the area. The two most common linguistic theories associated with the – *vere* suffix are:

1) indications of local iron casting. *Veri* in Estonian means blood and local bog iron, which is abundant in Vooremaa, turns the colour of springs and creeks reddish. This is the case e. g. in *Verioja*, which literally means “Blood Creek”;

2) -*vere* refers to *veer*, indicating edge or slope (Ernits 2007).

In the case of Vooremaa, both explanations can be equally valid, for the Iron Age settlement sites and villages of historical periods are mostly situated on the slopes of drumlins.

Probably until the Pre-Viking Age, when the habitation started to consolidate around the small hillforts, settlements consisted mainly of 1 – 3 single farms.

There is little information about the medieval village types, but it is possible to draw some assumptions about the village formations from the 17th century maps. The traditional village types have probably remained the same throughout the Middle Ages. Parallel to the dispersed settlement, nucleated and linear villages were most common and widely spread (Viires 2007).

Figure 36. During the past 330 years the nucleated village of Änkküla (1684) has become a linear village (2010s). EAA 308-2-69; Estonian basic map: Estonian Land Board.

Figure 37. The linear village of Raigastevere in 1684 has spread out to a sparse linear village in 2010s. EAA 308-2-69, Estonian basic map: Estonian Land Board.

A nucleated village is characterised by farms which are situated in a compact cluster without a particular pattern. The village streets connecting the farms are often joined in the middle. A nucleated village is surrounded by arable fields and grasslands. In the Vooremaa region

nucleated villages are generally situated at one end of the drumlin (Figure 36) or between two drumlins, separated by a river or a creek. The formation of a nucleated village can also be quite dispersed, which we can be observed for example at Palamuse. In a linear village, farms are located in a row on one side of the village road. Linear villages are usually situated along the edges of various landscape features or waterbodies. In Vooremaa linear villages are most commonly situated either along the top of a drumlin or along one slope of a drumlin. A sub-category of this village type is the "sparse linear village", where the distances between farmsteads are larger (Figure 37). Linear and sparse linear villages are considered the most traditional village type of Vooremaa.

Newly constructed features in the landscape, which appeared after the 13th century crusades and directly influenced rural village life, were churches, castles, taverns, and water and windmills. Churches, taverns, and mills were social establishments, where people from different villages could meet up and discuss business and everyday life. Mills and taverns were always situated next to main communication roads or at the crossroads. The church was the geographical, social and religious centre of the medieval parish. The parish churches of Vooremaa include Äksi (St. Andreas, 1443), Maarja-Magdaleena (St. Maria-Magdalena, 1443), Palamuse (St. Bartolomeo, 1234), Laiuse (St. Georg, 1319), and Torma (St. Maria, 1755).

6.6.2 Occupation patterns in the 19th and 20th century

After the abolishment of servitude of peasants in 1816 in Estonia (today North Estonia) and in 1819 in Livonia (today South Estonia), and the peasant law of 1856, peasants were given the right to rent or buy land from the landlord. With the parcellation of communal lands, the existing feudal land structure started slowly to change into a landscape of private farmsteads. Still, the most profound change in land ownership relations did not come until 1918 with the independent republic of Estonia. The land reform of 1919 initiated the nationalisation of Baltic-German manors, and the core areas of feudal estates were given out as rewards for the soldiers who had participated in the War of Independence from czarist Russia. In many places the main manor buildings were turned into schools or hospitals (Palang et al. 2005, 294). Also, a large number of completely new farmsteads were established. The landscape before WW II was a mosaic divided between agricultural land and semi-natural grasslands in lower and wetter areas.

After World War II the land was nationalised, and private farmsteads were forced into collective and state farms. In many ways the new collective farms resembled the medieval feudal estates. Even the collective farm centres were often established around the main manor houses. During Soviet times pressure to cultivate land was intensified, and most of the land, which was suitable for agriculture, was put into use. At the same time, former wetlands were drained by melioration, and at the cost of grasslands and lowlands, the percentage of forested land grew considerably. The settlement pattern shifted once again from sparsely located private farmsteads into larger, almost rural town type settlements with blockhousing and infrastructure.

With the collapse of the Soviet Union in 1991 the collective farms system also collapsed. Once again, a land reform was initated with the goal to re-establish the pre-war landownership relations as much as possible. The land reform initiated in 1991 is still not 100% complete with a small amount of unreformed land owned by the state. As a result of landownership relations during the 20th century, the landscape is a synthesis of small private farmsteads and large-scale agricultural lands introduced by collective farming, melioration and forest managing. The same also applies to the settlement pattern, which is a combination of scattered farms and large villages concentrated around former collective farm centres.

6.7 Historic land use around archaeological settlement sites

Using GIS software, I analysed the land use around archaeological settlement sites within 150 m. buffer zones. For this purpose, special vector layers were created, and all the sites were checked individually. The data for historic land use was extracted from four period-specific maps or map series: 1) 1684 topographical maps; 2) special map of Livonia 1839; 3) topographical map of 1930s; 4) Estonian basic map 2010s.

In this way, it was possible to analyse 17th century land use in the vicinity of 77 archaeological settlement sites. However, a remaining number of 42 settlement sites are situated in the northern part of the study area, which is not covered by the 17th century regional maps. Land use in 1839, 1935 – 1939, and 2010s could be analysed for all the 119 settlement sites. In order to maintain optimal objectivity, the 77 sites which were covered with maps from all the periods, were analysed separately and are described as one group in the text. Statistics for all the 119 sites are presented in the tables.

6.7.1 Land use in 1684

For archaeological settlement sites, the most important locational factor is their connection with historic villages, and other settlement units, such as manors, mills, taverns, and churches. From the 77 recorded settlement sites 49 were located directly in or in close vicinity of the settlement units presented on the 1684 regional maps. This makes almost 64 %, which demonstrates a rather strong connection between the distribution of 17th century villages and the Iron Age settlement pattern (Table 6).

Landscape feature	1684	
	77	%
Settlement (1)	49	63,6
Arable land (2)	69	89,6
Unused arable land/bush land (3)	9	11,7
Grassland (4)	40	51,9
Forest (5)	8	10,4
Wetland (6)	4	5,2
Water (7)	25	32,5
Road (8)	57	74,0
Gravel/Sand quarry (9)	0	0,0

Table 6. Land use around archaeological settlement sites in 1684.

Of course, this does not necessarily mean that the settlements were continuously used or remained on the same spot. Still, for future prospection, checking and mapping 17th century settlement is essential. A quick scan shows that in that part of the study area that is covered by the 17th century maps, in addition to already discovered archaeological settlements, there are more than 200 potential places for finding archaeological settlement remains, which very likely could extend to the Iron Age as well. These are only places that can be connected directly to the 17th century settlement units. Comparing the position of registered archaeological settlement sites with the 17th century maps also enables us to define the boundaries of protected monuments more precisely, and – thereby – raise the efficiency of archaeological heritage management. For example, in the village of Patjala only a small area is registered as archaeological settlement site, although from the 17th century map we can detect a large village with 19 farmsteads.

Another important factor is the presence of arable land. From the 77 registered archaeological settlement sites, 69 (89.6%) were located in 17th century arable fields. Suitable meadows and grasslands are also vital for the agricultural economy, thus 40 (51.9%) out of the 77 settlement sites can be directely associated with grasslands. It is self-evident that the settlements needed

to have access to water as well. The presence of waterbodies (n=25; 32.5%) was only recorded in cases where the site was located directly on a lakeshore or next to a riverbank or larger creek. Surprisingly, 57 (74 %) settlement sites were situated next to 17th century roads, suggesting that the road network was, at least in part, a continuation of the Iron Age system of routes.

Only in 9 cases (11.7 %) archaeological settlement sites were characterised on the 17th century maps as unused arable land overgrown with bushes or small trees. Forested areas (n=8; 10.4 %) and, obviously, wetlands (n=4; 5.2 %) were also relatively far removed from the settlements.

6.7.2 Land use in 1839

From the Livonian *Special map* of 1839 by Rücker we can learn that 51 (66.2%) archaeological settlement sites are related directly to settlement units that were still in use at that time. This is two places more than in 1684, and probably results either from slight fluctuations in village formations or inaccuracies in mapping techniques.

Landscape feature	1839			
	77	%	119	%
Settlement (1)	51	66,2	84	70,6
Arable land (2)	61	79,2	90	75,6
Unused arable land/bush land (3)	13	16,9	19	16,0
Grassland (4)	40	51,9	64	53,8
Forest (5)	1	1,3	4	3,4
Wetland (6)	3	3,9	7	5,9
Water (7)	30	39,0	41	34,5
Road (8)	48	62,3	71	59,7
Gravel/Sand quarry (9)	0	0,0	0	0,0

Table 7. Land use around archaeological settlement sites in 1839.

Compared to 1684 the proportion of arable land around archaeological settlement sites in 1839 (n=61; 79.2%; Table 7) has decreased to c. 10%. At the same time, the percentage of grassland has remained on the same level (n=40; 51.9 %), while the prosportion of unused arable land (n=13; 16.9 %) has increased slightly. Only 1 site (1.3%) was situated next to a forested area. The percentage of (n=3; 3.9%) remained almost on the same level. The minimal changes in the road network and waterbodies can most probably be attributed to the cartographic differences. In the broader sense, all the minor alterations in the maps that remain under 10 % most likely the result of different cartographic traditions.

Valter Lang, the most prominent archaeologist specialiazing in ancient field systems in Estonia, has pointed out that the system of strip fields cultivation originates from the Late Iron Age, and continued without larger changes until the late 19th century, when private farm plots were introduced (Lang 1995; 2000, 221 – 249). The correlation of archaeological and cartographical data presented in this section for Vooremaa, seems to support this theory.

6.7.3 Land use in 1930s and 2010s

In the 1930s, both the proportions of settled areas (n=62; 80.5%) and agriculturally cultivated land (n=75; 97.4%) around archaeological settlement sites reached their peak (Table 9). The same applies for the road network (n=71; 92.2%). These results are quite logic and confirm the fact that in the 1930s rural areas were most densely populated and cultivated than ever before or after. Although the number of settlement sites related to wetlands is relatively high compared to previous periods, they are mostly in combination with newly reclaimed wet

Landscape feature	1930s			
	77	%	119	%
Settlement (1)	62	80,5	97	81,5
Arable land (2)	75	97,4	113	95,0
Unused arable land/bush land (3)	6	7,8	11	9,2
Grassland (4)	36	46,8	60	50,4
Forest (5)	5	6,5	8	6,7
Wetland (6)	6	7,8	10	8,4
Water (7)	25	32,5	35	29,4
Road (8)	71	92,2	107	89,9
Gravel/Sand quarry (9)	3	3,9	3	2,5

Table 9. Land use around archaeological settlement sites in 1930s.

Landscape feature	2010s			
	77	%	119	%
Settlement (1)	59	76,6	93	78,2
Arable land (2)	71	92,2	106	89,1
Unused arable land/bush land (3)	14	18,2	20	16,8
Grassland (4)	35	45,5	52	43,7
Forest (5)	23	29,9	33	27,7
Wetland (6)	0	0,0	3	2,5
Water (7)	32	41,6	47	39,5
Road (8)	70	90,9	106	89,1
Gravel/Sand quarry (9)	4	5,2	4	3,4

Table 8. Land use around archaeological settlement sites in 2010s.

grasslands. In other words, wetlands often represent over flooded grasslands and swampy forests near historic villages.

During the Soviet occupation, in the second half of the 20th century, extensive drainage works, in order to improve the quality of arable land, were carried out. The results we can see on the land use maps of the 2010s, were the proportion of wetlands near settled areas is reduced to the minimum. The land improvement projects also altered the hydrology of the region considerably, and many smaller rivers and creeks were canalised into straight ditches. This further resulted in a change of vegetation. Also, many previously overflooded meadows were unmanaged, and gradually turned into wet forestland. The total proportion of forested land in the near vicinity of settlement sites increased 23.3% between 1930s (n=5; 6.5%) and the 2010s (n=23; 29.9 %). Compared to earlier periods, the 20th century also witnessed the disappearance of the historic mosaic landscape. During land improvement projects and communist collectivisation, small patches of arable land were redesigned into large cultivated field units. Yet, in Vooremaa these changes were not so extensive as in other parts of Estonia, and as a result the landscape maintained some of its historical and ecological variety.

6.8 Example 1: settlement and sites on Leedi-Reastvere drumlin

The Leedi-Reastvere settlement area is situated in the northern part of Vooremaa on the western slope of the Leedi-Reastvere drumlin. Actually, there are five separate settlements in a row dotted along the drumlin, dating from the Iron Age to the Modern Period (Figure 38). The place names of the area are also of significance for understanding the settlement history. Leedi is probably derived from old Finno-Ugric word "*leede"*, which means both sandy soil and a sandy slope emerging from water (ETÜ n.d.). The name Reastvere refers to a historical process of village formation, where farmsteads are added in straight rows (the word "*reast"* is a form of "*rida"* = row) at both sides of the village street, while *"vere*", meaning the verge or the edge, as discussed previously.

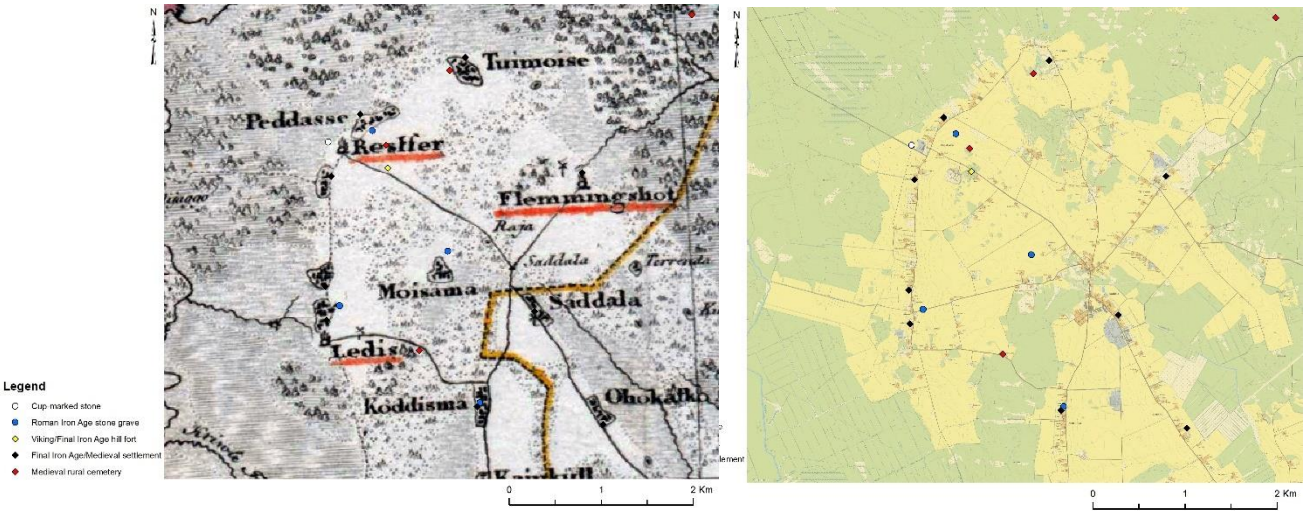


Figure 38. Leedi-Reastvere settlement area in northern part of Vooremaa, 1839 and 2010s. Special map of Livonia 1839: EAA 1393.1.81; Estonian basic map: Estonian Land Board.

As an example of a typical listed settlement site of Vooremaa, a description of the Reastvere settlement site is presented here. According to the archival file (Lavi 1983b) the archaeological occupation layer of the site was spread over the local landscape in patches, stretching on to several farms, and under modern houses. The thickness and intensity of the layer varied, yet remaining between 15 – 50 cm. The most intensive parts of the cultural layer yielded numerous pieces of pottery, animal bones, charcoal, and burned stone debris. The first finds (AI 5267) gathered during the landscape survey in 1983 were dated to the Final Iron Age (1050 – 1225). The name of the village Reastvere has been mentioned several times in written records (Pall 1969, 202), starting from the 15th century: *Restfer* (1408), *Rehsfer* (1624), *Reestfer* (1638) and *Restfer* (1702).

The earliest site that can be associated with the settlement area is represented by a Late Bronze Age/Early Iron Age cup-marked stone from Reastvere village. The stone has 11 artificial depressions, and according to oral tradition has been used as an offering stone (Karu 1929, 8). We also have archival data on 3 destroyed stone graves from the villages of Leedi, Pedasi, and Mõisamaa. For all three graves the finds of burned bones, fragmented ornaments and weapons have been recorded (TaM: A8; A32) (Moora 1921, 24 – 25; Lavi 1987; Mss, n.d., 120 (13)). These can be interpreted as originating either from Roman Iron Age *tarand*-graves (dating from 2nd – 5th century AD) or Late Iron Age cremation burials (dating from 9th – 13th century).

Despite of the density of Iron Age settlement sites in the area, there are no ceramic finds that can be associated with the cup-marked stone or Roman Iron Age stone graves, which leads us to suspect that the destroyed graves originate from the Late Iron Age. As there are no visible

remains of the graves, the sites have not been listed officially as cultural heritage. As a result, the fields surrounding the destroyed graves are now popular spots for metal detecting.

In the middle of the Leedi-Reastvere settlement area we can find a small Iron Age hillfort, which has been investigated archaeologically on several occasions (Moora 1953; Lavi 1999b). Charred wooden defence constructions discovered from the rampart of the fort were dated to the 11th – 12th century AD. Radiocarbon dates from the hillfort correlate well with Final Iron Age settlements on the drumlin. From the close vicinity of the hillfort 3 silver penannular brooches (TaM: A 15 – 17) from the same period were discovered in 1880s (Lavi 2001).

In the Middle Ages the northern part of the area belonged to the manor of Reastvere, which was first mentioned in written records in 1408, when Konrad von Vietinghoff, the *landmaister* of the Livonian Order, gave the villages of *Restfer, Cublitz* and *Pettes* as a liege to Hans Oertin. It has been recorded that in 1688 the manor estate included 17 households situated in the villages of Reastvere and Kirivere. By the end of the 19th century, in 1893, the number of farms had already risen to 35 (Kõpp 2009). Considering that an average household at that time consisted around 10 – 15 people, this caused quite an extensive pressure on the surrounding lands. The southern part of the area belonged to the Leedi manor (*Ledis*), which was also mentioned in 1408 for the first time.

In addition to the settlement sites continuing into the Middle Ages (1225 – 1558) and Early Modern Era (16th – 19th) there are 3 rural cemeteries in the area, which served as alternatives for the parish churchyard, as the Laiuse parish church was situated about 16,5 km from Leedi-Reastvere.

Unfortunately there is no 17th century detailed map available for this part of Vooremaa, but the Leedi (*Ledenhof*) and Reastvere (*Resterhof*) manors are present on the general map of the Livonian Province of Swedish Empire drawn in 1686 (EAA.308.2.3 1686). The locations and names of surrounding villages can be found on the maps by Mellin (1798; EAA.1365.1.31 1798) and Rücker (1839; EAA.1393.1.81). At least from the end of the 19th century the whole western slope of the drumlin is densely populated with farms.

6.9 Example 2: Iravere settlement site

One of the most remarkable settlement sites at the slopes of the Koimula giant drumlin is located in the village of Iravere on the border of Laiuse and Torma parishes. The settlement site was discovered in 1981 by Ain Lavi. The archaeological layer was thick (40 – 60 cm) and

contained charcoal, burnt stone debris, ceramics, iron dross, clay jointings, but also pieces of bricks. Lavi estimated the settlement to be around 3 ha large (Lavi 1983a), which is quite impressive for Vooremaa. Probably the area has been continuously settled since the Late Iron Age. The closest site to Iravere settlement is a Medieval rural cemetery 1.2 km SW. Until now, no archaeological excavations have been executed in Iravare.

Although there is no 17th century map for this micro-region, the earliest written records mentioning the village of Iravere originate from 1409 (*Yrevere*) and 1599 (Liitoja 1992, 97). The Atlas of Livonia compiled by L. A. Mellin in 1783 – 1798 depicts the village of *Irrafer* at the intersection of local roads. A detailed map from 1825 (EAA.3724.4.1229) shows the linear village formation, with the farmsteads situated in a straight row together with arable fields at one side, and grasslands at the other (Figure 39). Similar linear village formation, a pattern which, though with some alterations, has persisted until today. The key characteristic of this settlement site is the ensemble of historic village/arable land/grassland/road.

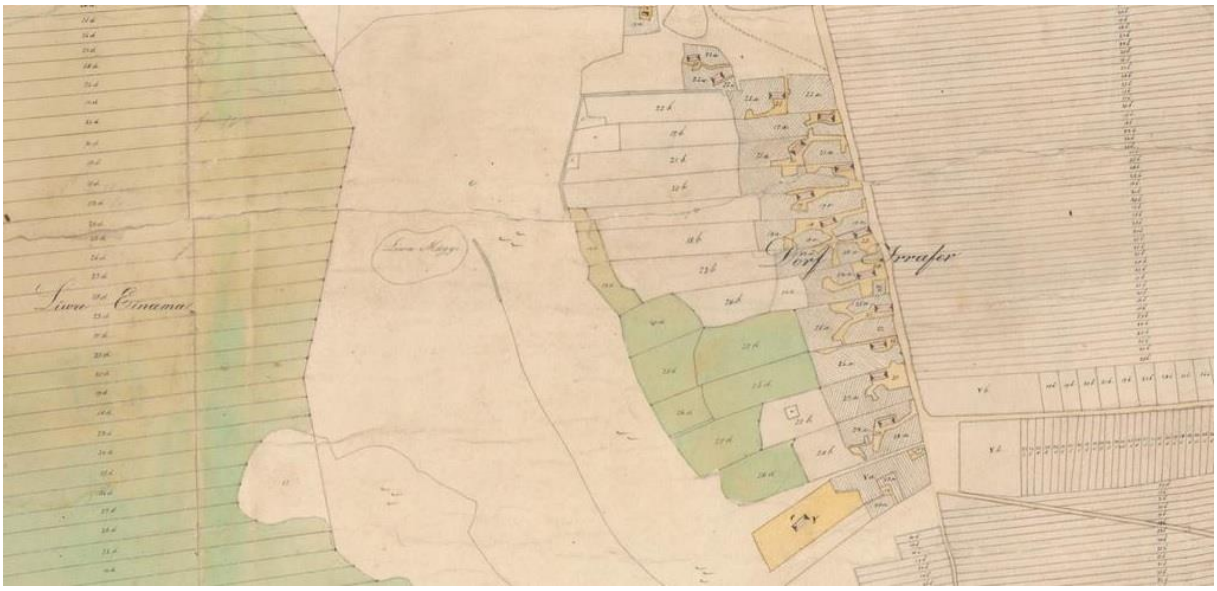


Figure 39. Iravere village in 1825; EAA.3724.4.1229.

The prevailing soil types around the settlement site are *stagnic luvisols* and *mollic cambisols* with an average soil bonity value of 55 – 56 in the cultivated areas, and slightly wetter *gleyic cambisols*, where the grasslands are located.

6.10 Example 3: Raigastvere settlement/burial site

Raigastvere settlement site was discovered in 1975 by Ain Lavi, who during a landscape survey noticed a dark bluish-grey cultural layer along the top of the drumlin. Subsequently, in 1980, he also discovered inhumation and cremation burials in the same area. The artefacts

related to these burials, such as fragments of bronze ornaments (AI 4885; AI 5343) and a spear head, could be dated to 11th – 12th century (Lavi 1993). Only some 120 m SW from the settlement/burial site lies a stone grave with a rectangular stone formation, indicating that it could be a 2nd – 5th century AD *tarand*-grave, though there is no solid evidence yet to support this. No settlement layer from this period has been found in the vicinity of this monument

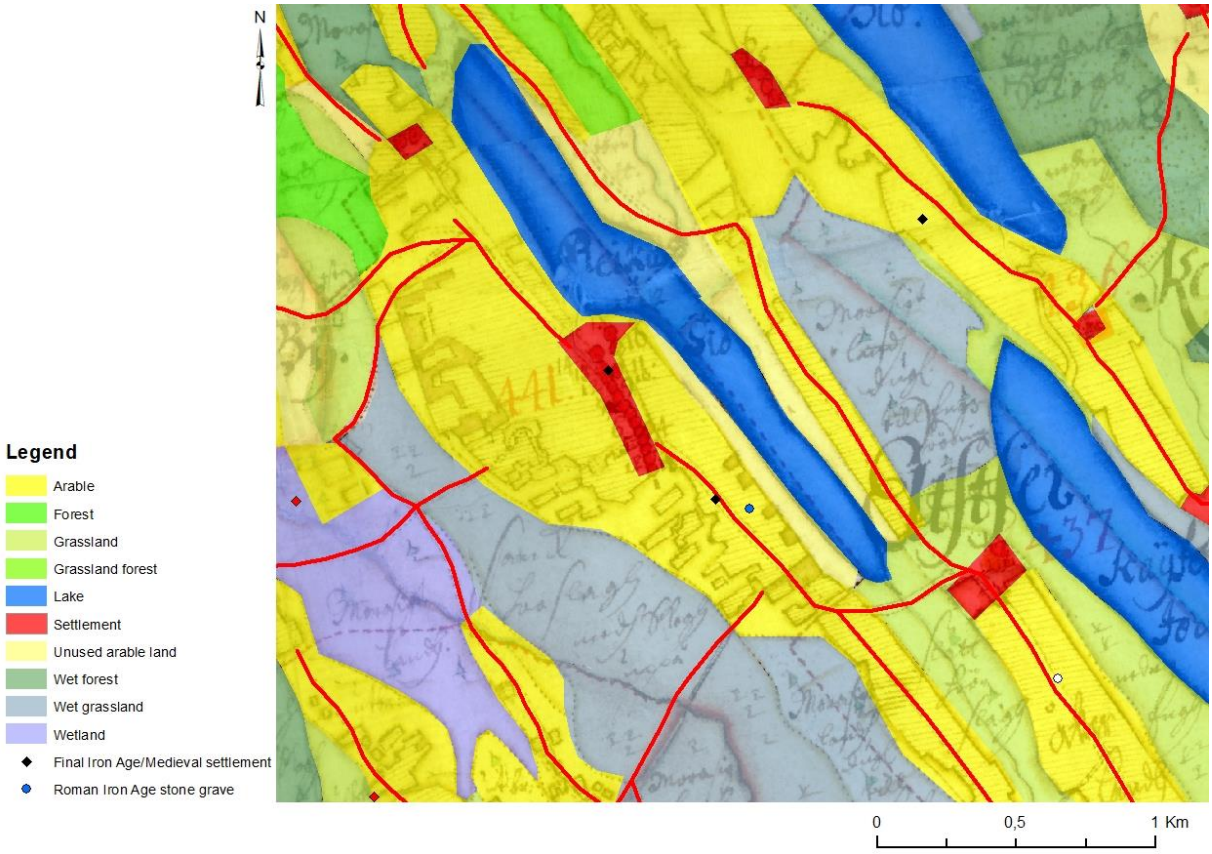


Figure 40. Land use in Raigastvere village in 1684. The archaeological settlement site is situated in the middle of the historic village centre.

either.

According to the map, at the end of the 17th century there were at least 18 farms in the village of Raigastvere. A large road led right through the village (Figure 40). Although there is a high probability of archaeological layers all over the affiliated drumlins between the Lake Saadjärve and the Lake Raigastvere, such layers have been listed officially only in two small areas of this big village. According to the cartographic evidence, Raigastvere has been a linear village with farmsteads situated very compactly in a row at least since the 17th century. While similar village formation also continued throughout the 19th century, from the cadastral map of 1930 – 1944 we can learn that the village became more stretched out when the land was divided into private plots after the land reform of 1919. During the Soviet period some

collective farm buildings were erected in the northern part of the village, but otherwise the settlement pattern remained the same.

The historic village centre was situated on both sides of the intermediate depression of two drumlins, which were surrounded by the most suitable agricultural lands. At the same time, the settled area remained on the edges of the most fertile land plots. The land around the archaeological sites has constantly been in agricultural use. The prevailing soil types here are *mollic cambisols* and *luvisols* with a soil value between 53 – 63 points (Figure 41). The historic land use analysis demonstrates that the area around the sites has always been cultivated on both sides of the village road. The key ensemble of this settlement site consists

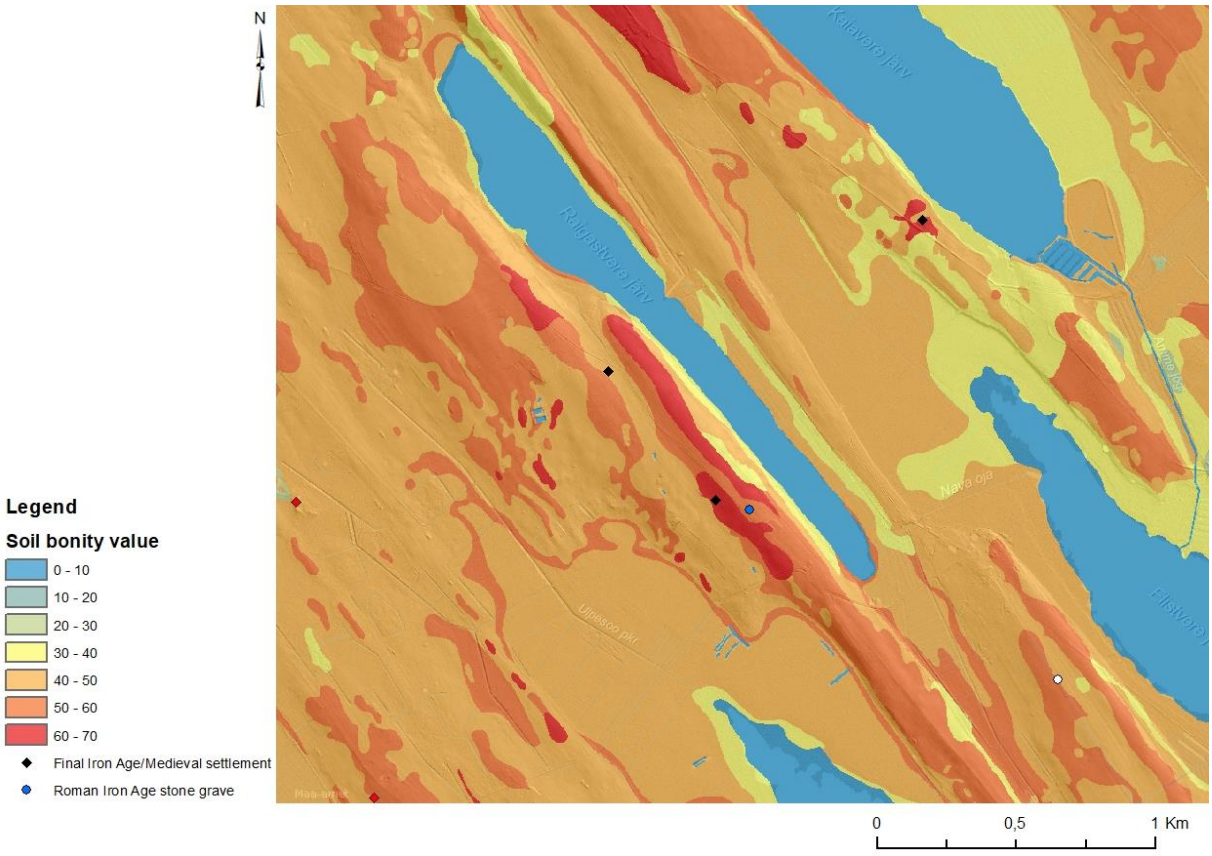


Figure 41. Soil bonity value around the Lake Raigastvere is highest near settlement sites. Soil data: Estonian Land Board.

of a combination of arable land and road, which has not changed over the centuries.

The pollen diagram obtained from the Lake Raigastvere suggests human impact on the surrounding environment at least from 1500 BC (Pirrus et al. 1987; Pirrus 2010), when the first traces of cultivated crops emerged. Unfortunately, archaeological evidence, such as fossil fields, from that early has not yet been discovered. The first traces of *Cerealia*- type grain occur in Raigastvere diagram (Pirrus 2010) around 1550 BC. The diagram shows that this kind of pollen is not continuously present and does not demonstrate a stable curve until some

1500 years later. As most *Cerealia*- type of grains, such as wheat and barley, do not disperse their pollen freely, but only through threshing, the extent of crop cultivation remains unclear. From the 6th to 9th century AD share of *Cerealia*-type pollen in the diagram increases more than 5 times, and between the 10th – 13th century it is already 15 times more than at the start of the millennium. The growth of *Cerealia* pollen can be explained by an increasing importance of grain cultivation but also with the introduction of rye (*Secale Cereale*), which is the only grain that releases quantities of pollen freely in the air during flowering. This does not necessarily indicate increase in crop cultivation but the growing importance of rye as the main cultivated crop. The second half of the 13th century witnesses a rapid downfall, and at least for two centuries the *Cerealia* pollen count is considerably lower than in the 10th century and may indicate lower agricultural production of rye.

6.11 Conclusion

It has to be stressed that historical maps never correlate entirely with today's topographical projection, and therefore always leave room for some interpretation, human error, and inaccuracies. Also, the maps have been created for different purposes. Nonetheless, comparisons between the maps may be reliabe enough to draw general conclusions.

Although the settlement sites are spatially correlated with suitable arable land, they are seldomly located in the middle of large cultivated areas. Instead, they tend to be situated in gradient-rich zones connecting different land use units. From the dwelling perspective of the villagers the distance to meadows and pastures was equally important as the distance to the fields. At the same time, we can observe that forested areas were located further away.

The choice for settlement locations therefore depended on physical and ecological landscape characteristics given specific subsistence strategies. For instance, Stone Age settlements were often situated close to larger waterbodies and were most probably used in some kind of seasonal cycle. Communities that depended on early agricultural techniques and methods were located in areas with a thin topsoil that was easier to cultivate but was also rapidly exhausted. This in turn resulted in relatively short-term settlement histories within a semi-mobile system, producing thin archaeological layers.

After the transitional Migration Period (450 – 600 AD), the Pre-Viking and Viking Ages (600 – 1050 AD) introduced a noticeable shift – more permanent settlements, especially next to hillforts, started to occur. The appearance of the combination of hillfort and permanent

settlement indicates changes in social stratification, suggesting the emergence of a local nobility, whose wealth was probably based on taxation of some kind. Together with new land clearances and the (gradually) increasing importance of grain cultivation demonstrated by pollen data, we can see growth of settled areas, which continues throughout the Late Iron Age. This is also characterised by higher frequency of Late Iron Age occupation layers. Most of the farms and villages established at the end of the Iron Age are more or less continuously used until Modern Times and can very well be detected on the 17th century maps, which are an excellent source for searching and locating new archaeological settlement sites from this period. Although the Middle Ages witnessed several demographic fluctuations caused by wars, famine, and plague, the settled areas remained the same.