

Non-Invasive Landscape Archaeology of the Great War

The complex interaction between human activities and the surrounding physical environment has shaped the current landscape. Understanding this interaction represents the central objective of landscape archaeology. This interaction is in particular recognisable in a war period, when landscape and the war activities developed reciprocally during time and over space. But, although the historical and military characteristics of past wars and their related activities have been studied excessively, they are rarely the subject of a landscape archaeological research. This is because landscape archaeological investigations need to be executed over large areas, which means that they cannot be based only on limited excavations or augering observations. Consequently, only investigation methods that do not require a physical penetration into the soil, such as remote sensing, geophysical survey and landscape analysis, are preferred. The integration of such methods defines what is known as "**non-invasive landscape archaeology**". Despite its potential, research is still required about a number of key steps within the integration of different disciplines supporting non-invasive landscape archaeology of war zones. Therefore our central research question is: ***How can we characterise the buried heritage of a former war zone within the present landscape using a non-invasive methodology ?***

One of the largest contiguous military conflict sites in the world is the **Western Front of the Great War**, extending over an area of 700 km from the Belgian coast until the Swiss border with France, with some 60 km in Belgium (Fig. 1). Today, this zone can be considered as one large archaeological site. Although fragmented archaeological surveys and inventories of WW I heritage have been conducted, an overall landscape archaeological investigation of the area is not yet achieved. However, such a study would be timely given the upcoming **centennial commemoration** of the beginning of the war which will result in a strongly increased attention for this conflict period and its heritage. Such complex questions cannot be answered by traditional detailed archaeological investigations but require an interdisciplinary non-invasive approach conducted on a landscape scale.

To answer the research question we will use a novel combination of three spatial information technologies, consisting out of the processing of >17,200 WW I aerial photographs (Fig. 2 and 4 top), the deployment of the latest geophysical soil sensing techniques (Fig. 3 and 4 bottom) and the digital reconstructions of the landscape before, during and after WW I within a 1200 km² study area in Belgium. Three research disciplines, each with a specific and complimentary expertise, will work along three major research lines: (1) Remote sensing archaeology; (2) Geophysical soil sensing; and (3) Historic and visual landscape analysis. Within each of these disciplines, several work packages, each with several deliverables, will be targeted. The results of these research activities will be integrated into an interactive cartographic **assessment model** of which one of the most tangible outcomes will be the production of **valuation maps** of the WW I heritage. Since the interactive cartographic assessment model will be compiled in a GIS database, it will be possible to consult the digital data layers interactively within a dynamic scale. This digital atlas can be used as a policy supportive document (heritage management and conservation, agricultural development, spatial planning), for raising public awareness (e.g. heritage tourism and education), and for the formulation of future aspirations of different users of the landscape (residents, visitors, entrepreneurs, farmers).

We aim to set out **international standards** for the non-invasive investigation of the heritage of conflict zones. Consequently, we expect our outcomes to guide future investigations of other parts of the Western Front and other theatres of war. Since aerial photography became a standard source of intelligence, our procedure will be applicable to almost every **post-WW I** conflict area.

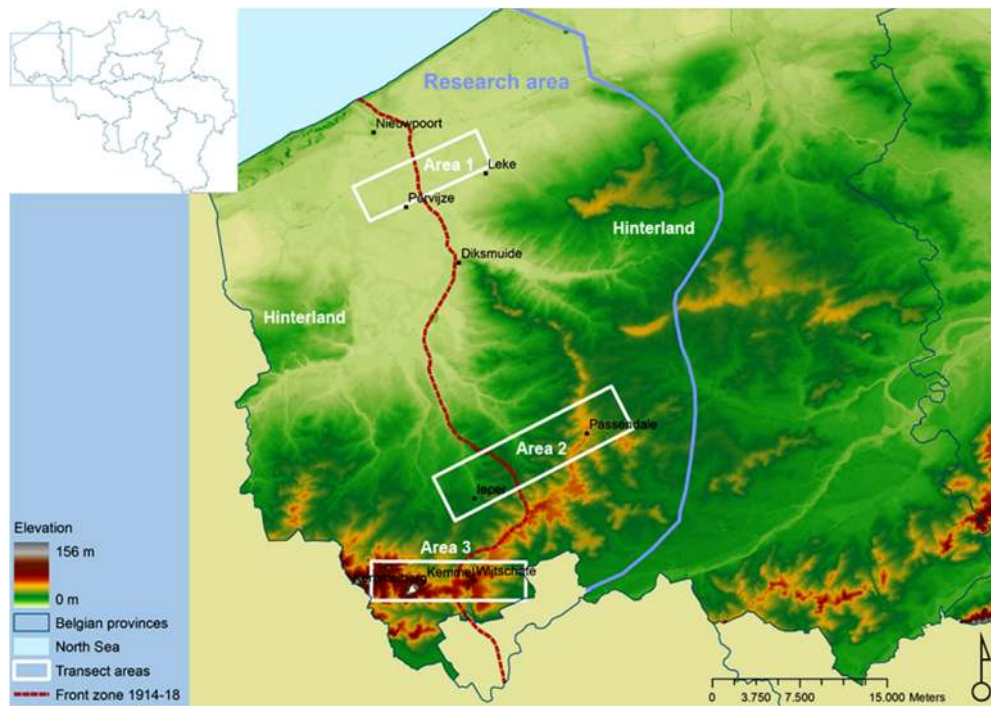


Fig. 1: Elevation of the western part of Belgium with indication of the central line of the front zone, the general research area and the three selected transect areas.

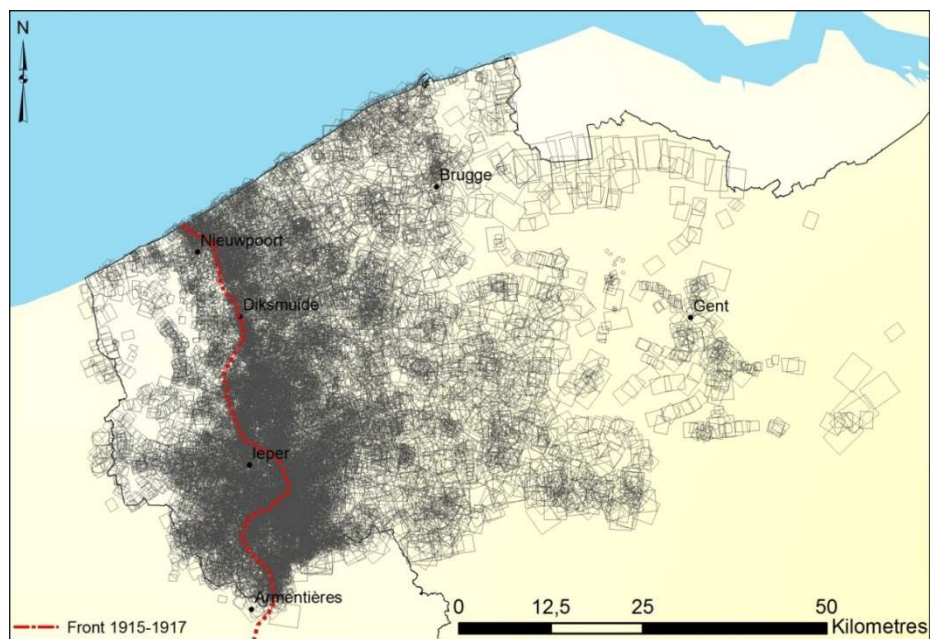


Fig. 2: Footprints of 17,200 geo-rectified WW I aerial photographs along the WW I front zone and in its hinterland.



Fig. 3. A mobile GPS-positioned geophysical soil sensing systems with two sensors: in front a suspending ground penetrating radar antenna-array, in the towed sled an electromagnetic sensor.

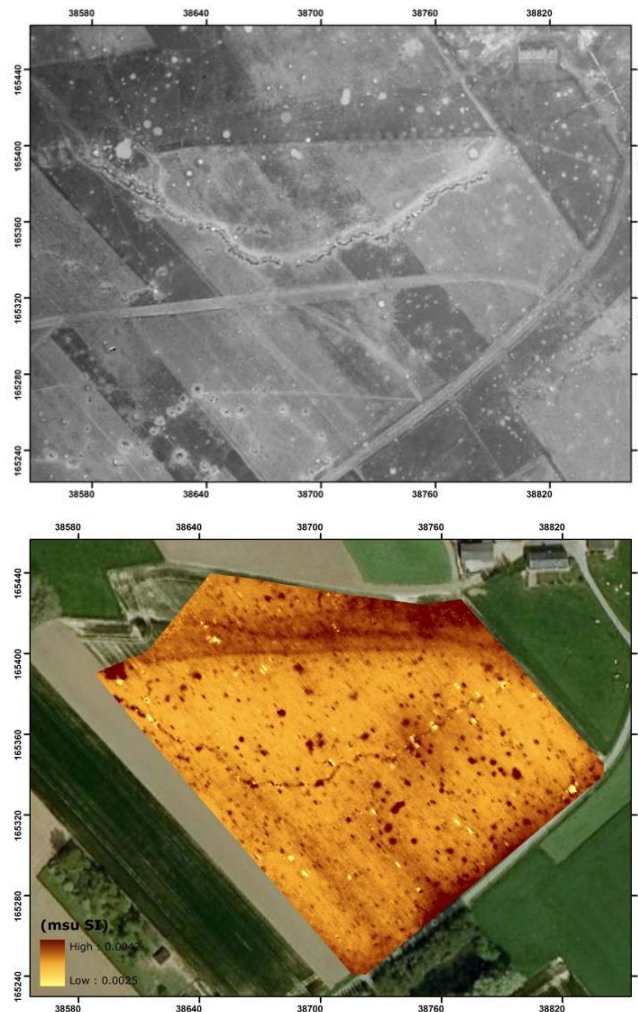


Fig 4: Past and present (Saey T., Stichelbaut B., Bourgeois J., Van Eetvelde V. & Van Meirvenne M., 2013. An interdisciplinary non-invasive approach to landscape archaeology of the Great War. *Archaeological Prospection*, **20**:39-44). **Top:** aerial photograph taken in May 1918 of a field nearby the Kemmelberg showing the typical staircase shape of trenches and many shell impact craters. **Bottom:** Aerial view of the same area with superimposed the image of a geophysical survey conducted on 10 November 2011. The image shows the magnetic susceptibility of a soil volume between 0 and 1 m depth, measured with an electromagnetic induction sensor (the sled in Fig. 3). The measurements reveal the present-day remains of the WW I trenches, metallic objects and shell craters as extreme values (low or high). Note that this field is ploughed annually, so these traces are mainly present in the subsoil.