A future for GIS in Archaeology: the integration of theory and analysis

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Since the late 1980s

- GIS for Cultural Resource Management, mapping, data management
- Focus on the tension between GIS, analysis and theoretical approaches since the late 1980s (in UK archaeology)

The importance of scale:

What and why of scale

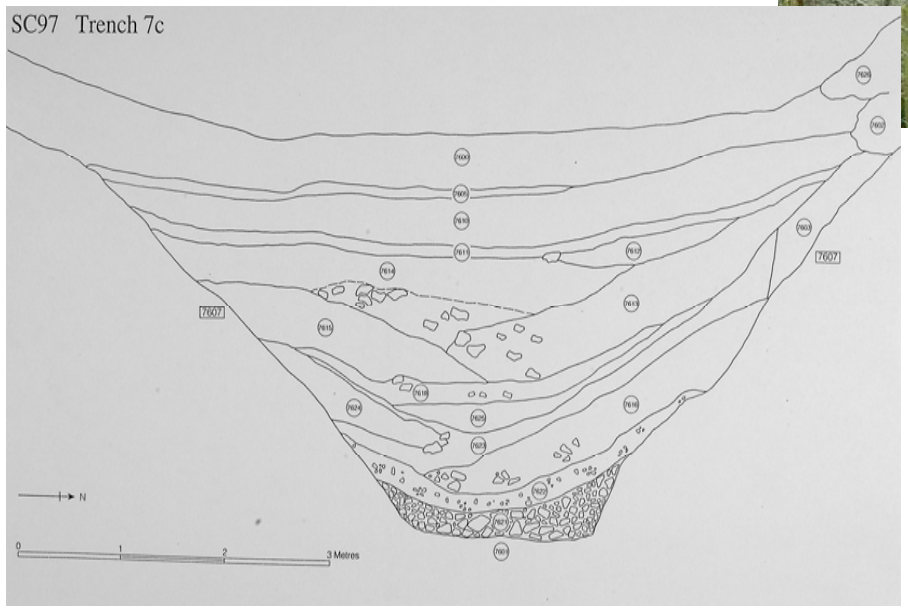
Scale and spatial archaeology

Integrating landscape, what role GIS?

Scale

- At the same time – a concept, an analytical framework and a lived experience
- Analytical scale (a ratio of representation)
- Lived scale (a phenomenological experience)
- Quantitative vs Qualitative

Segsbury Camp



Lived scale

- Being human/in the world (Ingold's 'dwelling perspective')
- Gibsonian affordances – relational to the agent and his/her action and world
- The appropriate scale is one that makes the agent and his/her world comparable
- Scale of practice and agency – individual/group

Scales of reasoning

- General cultural processes

- ‘Holistic/multidimensional’ approach

- Isolated in personal subjectivity

Positivism of the 1960s and 1970s
Quantification

The way forward?

Post-modern ‘crisis of representation’
Qualitative

The impact of GIS on archaeological analysis: soft technological determinism?

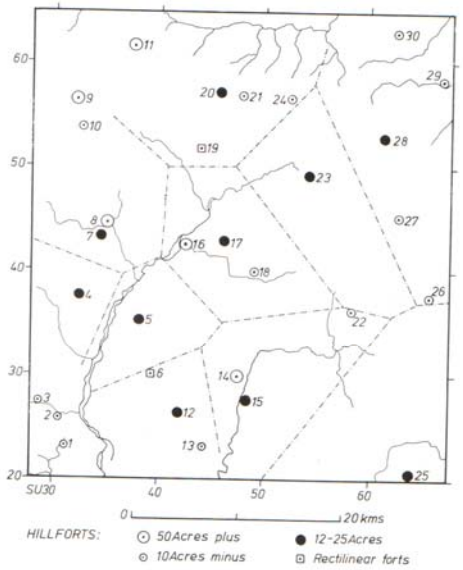
- Focus often at the regional scale
- Acceptance that GIS are ‘multi-scalar’
- The ease of ‘push-button’ solutions

- BUT:

- does GIS detract from thinking about scale as a fundamental concept with a theoretical basis with implications for interpretation?

Understanding hillforts and landscape 1970s: scale = economic modelling, Central Place Theory, Thiessen Polygons

Hillfort territories
Settlement hierarchies
Redistribution centres
Social relationships based on economics



Site Catchment Analysis:
Agricultural potential
Of site's 'catchment'

Quality of land – 'status' of site

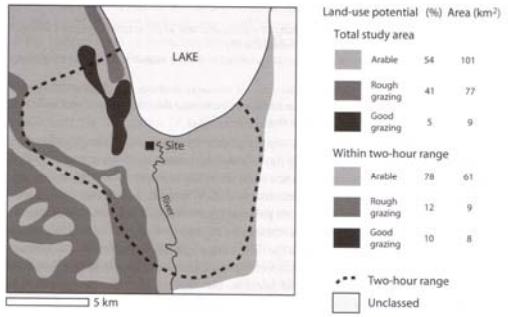


Fig. 10.13 Cross-tabulation of land-use potential within a two-hour territorial limit of a site (after Vita-Finzi 1978, Fig. 87).

Social modelling – 1970s

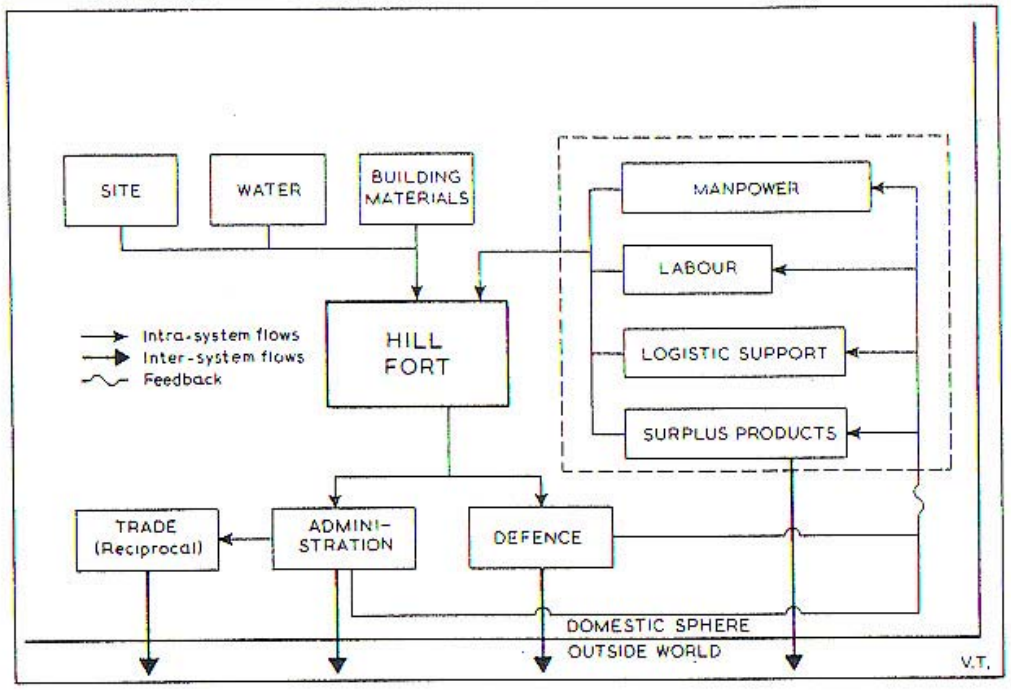


FIG. 1.9. A simple system model for a category of Iron Age hill fort in Cornwall

Systems Theory - people and culture as a component of a 'system'

Continuation - the early adoption of archaeological GIS

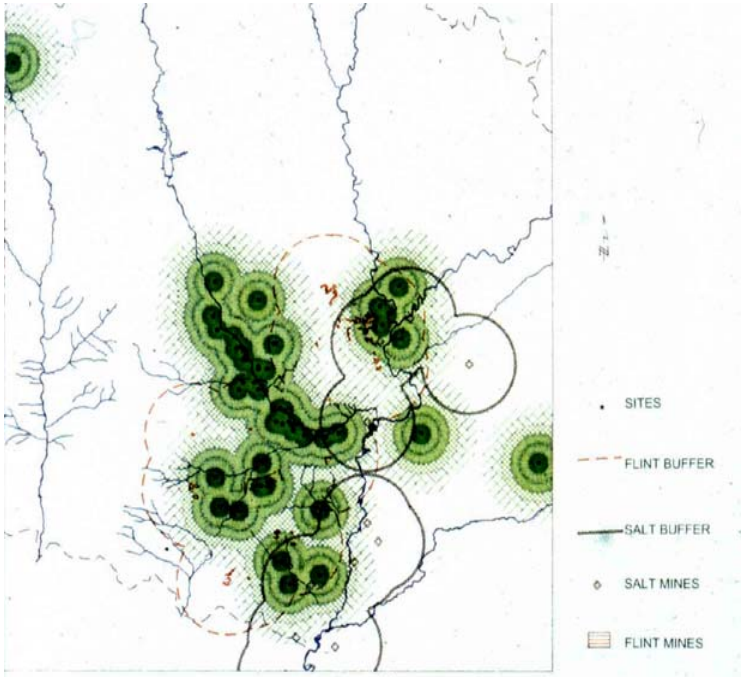
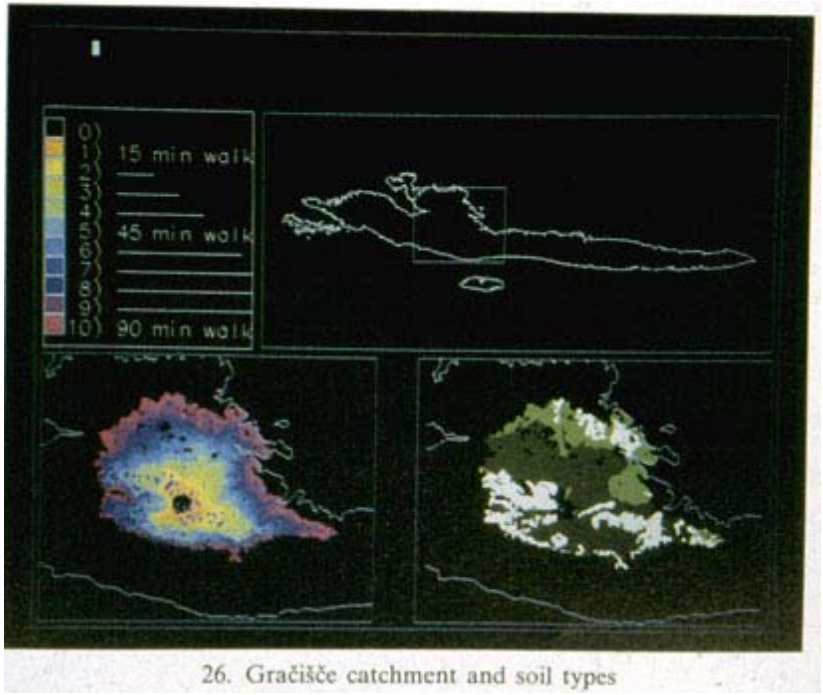


Plate 1. Five-kilometre salt and flint buffers together with variable buffers around Bell Beaker sites in the Madrid region of Spain.



26. Gračišče catchment and soil types

BUT beware the ‘God-trick’ –
seeing everything from a position of nowhere

‘Humanising’ the landscape – visibility and movement

From line-of-sight
To binary viewshed
To cumulative viewshed
And visibility index

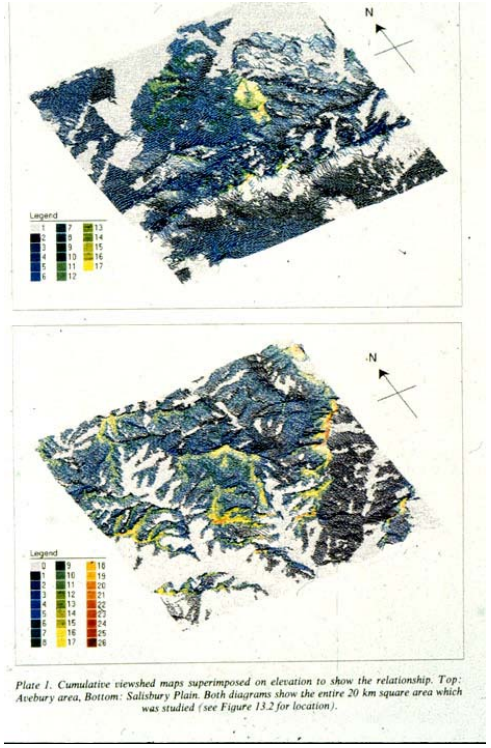
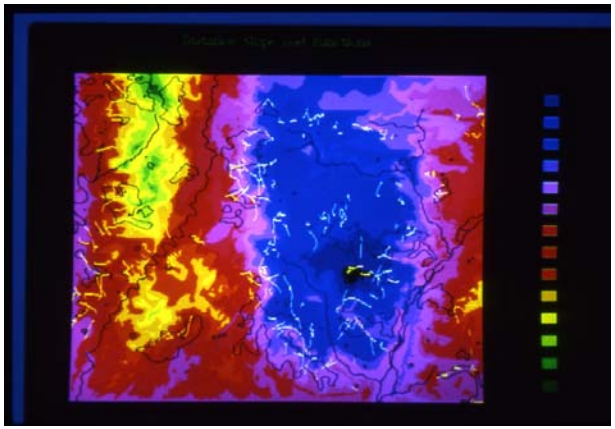
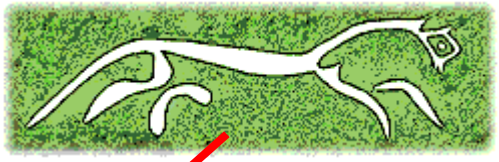


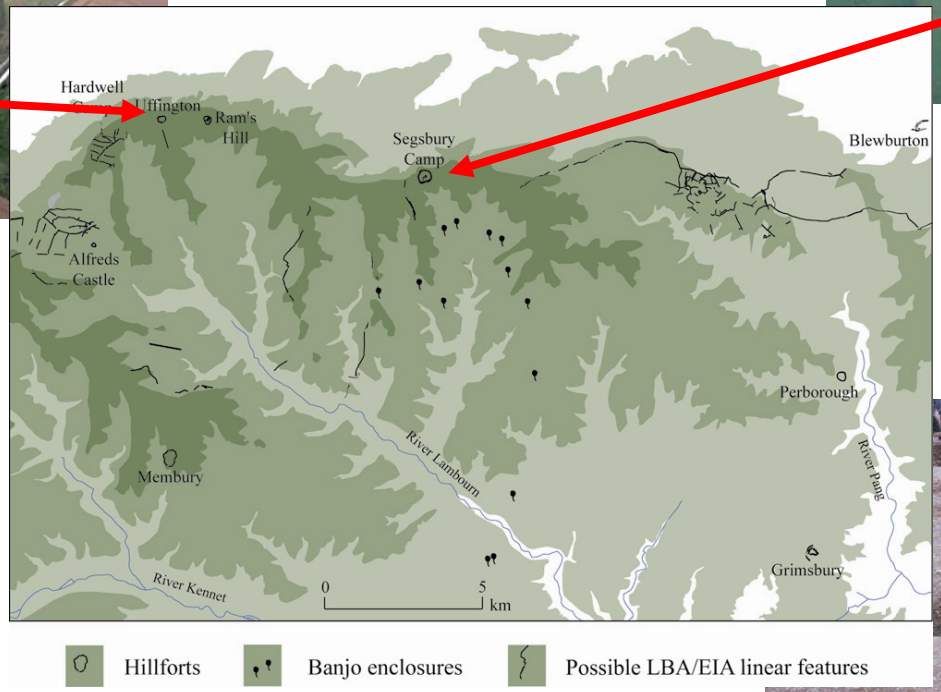
Plate 1. Cumulative viewshed maps superimposed on elevation to show the relationship. Top: Avebury area, Bottom: Salisbury Plain. Both diagrams show the entire 20 km square area which was studied (see Figure 13.2 for location).

From least cost paths
To least cost surfaces
And accessibility index
Access times

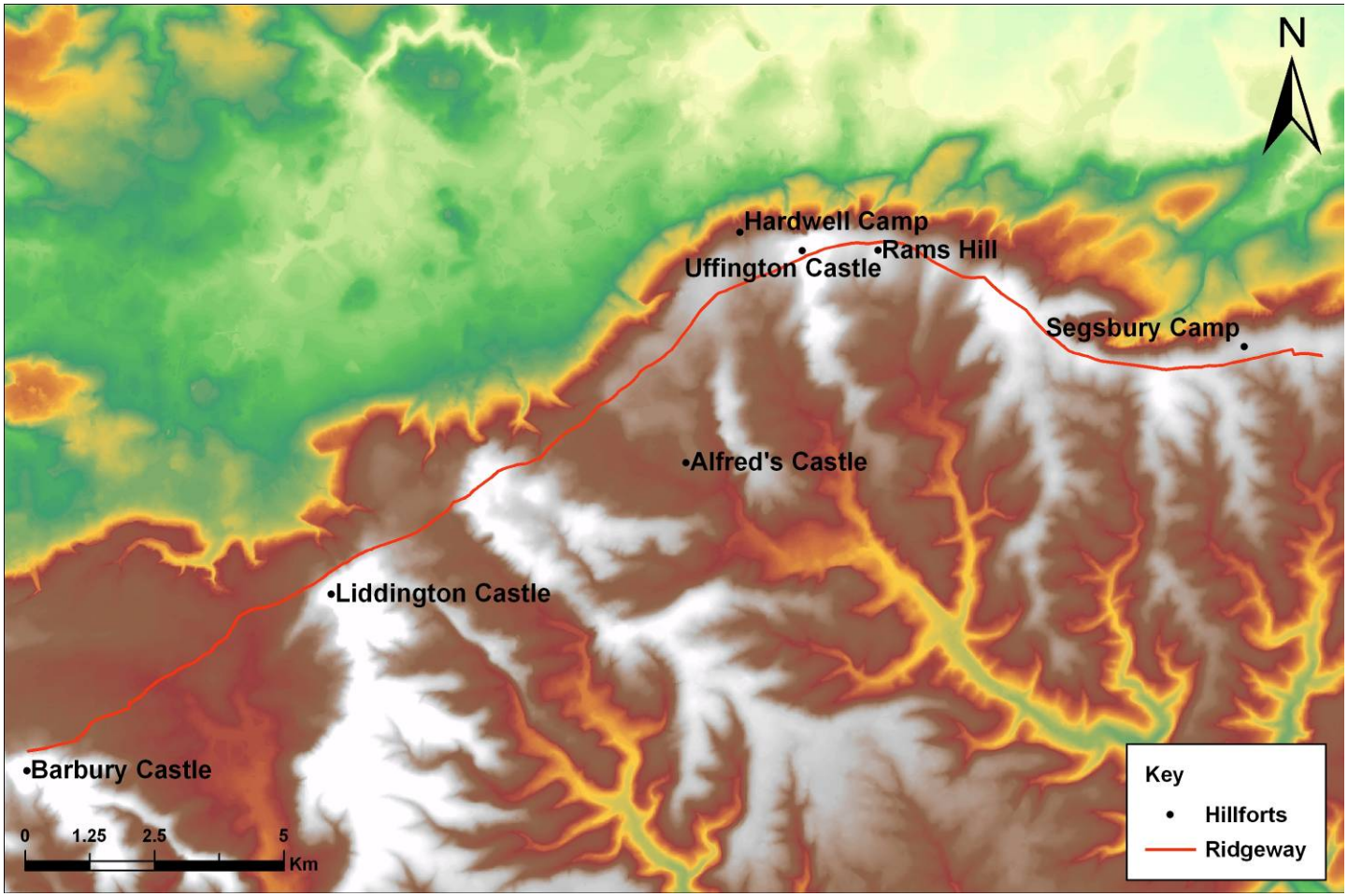


Integrating theory, analysis and fieldwork: the Hillforts of the Ridgeway



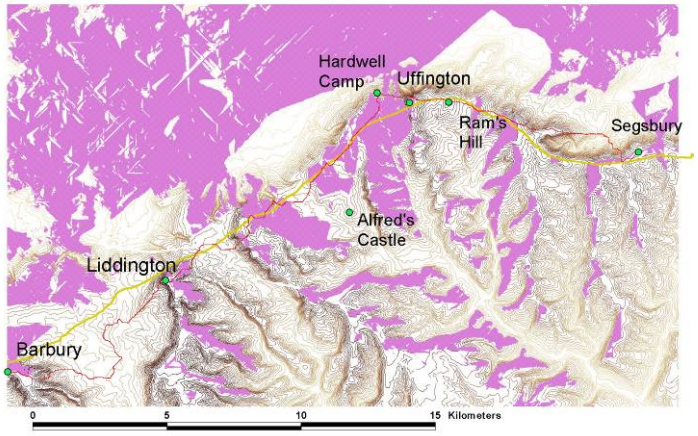


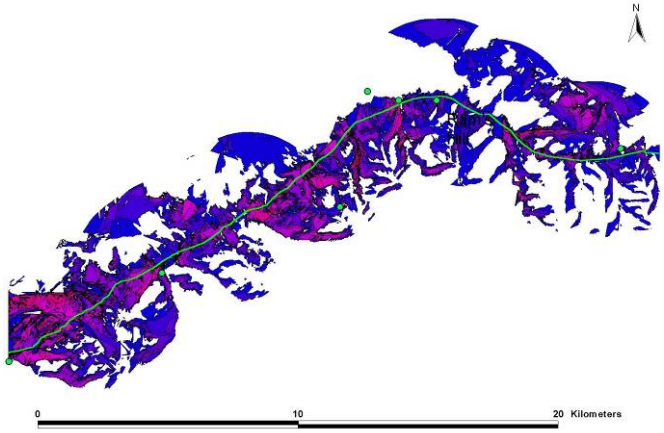
Hillforts of the Ridgeway



Initial work - movement and Visibility

- Binary Viewsheds
  - Polylines for hillfort ramparts digitised from 1:10,000 mapping
  - Binary viewsheds for multiple viewpoints at each hillfort
  - Long distance (traditional)
  - Intervisibility – location of hillforts
- Cumulative Viewsheds
  - Points @ 250m intervals
  - Range = 3km
  - 0 ≥ Visibility Index ≥ 25
  - Near/Middle distance
  - Were hillforts sited to be visible when moving along the Ridgeway?





The technical/theoretical challenge

"…current GIS can only make local decisions as to which neighbouring cell has the highest or lowest value – they incorporate no global knowledge of the landscape at all." (van Leusen 1999, p.218).

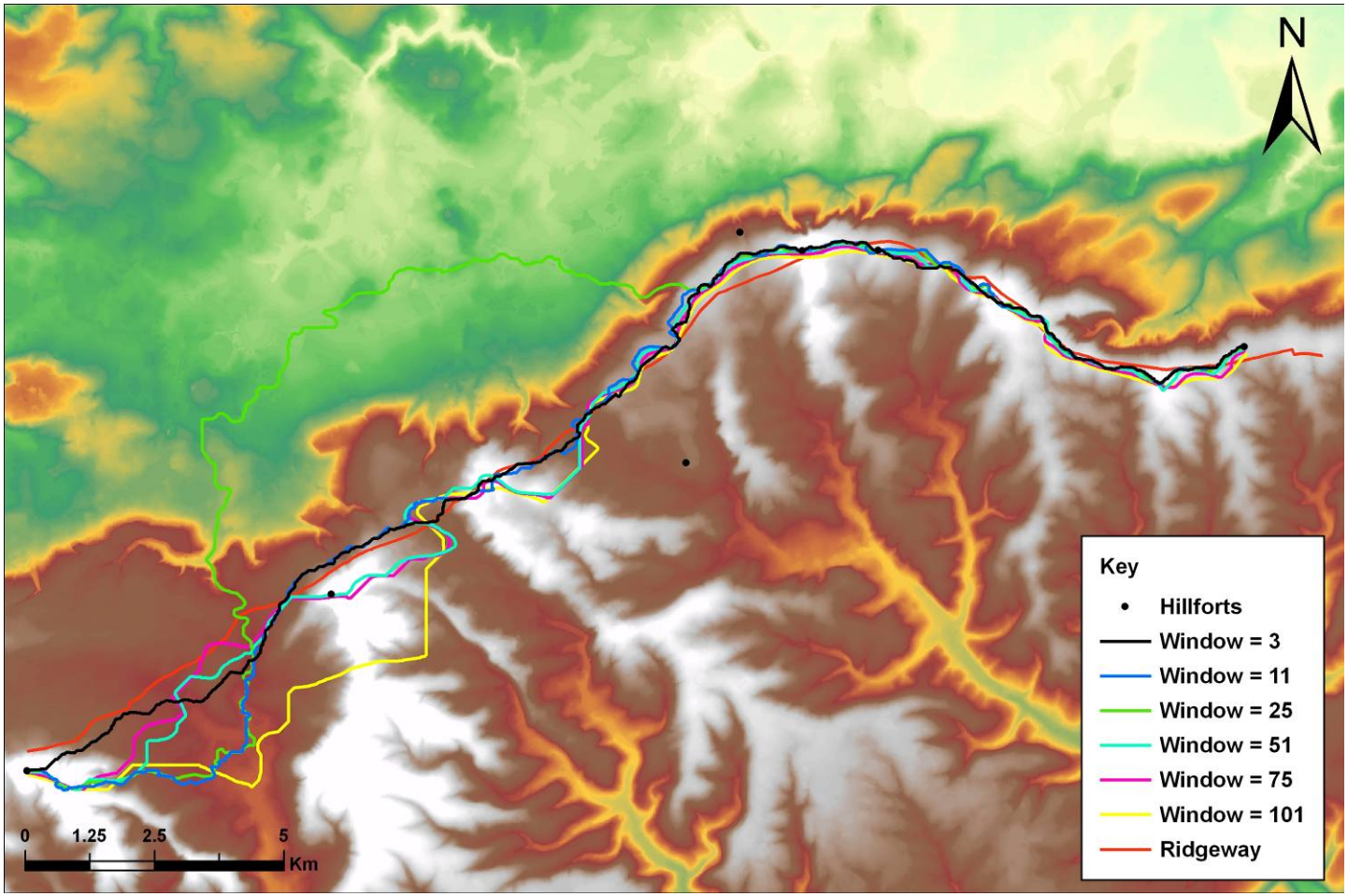
Intentionality

- Corridor of intentionality
  - Long distance aim (A to B)
  - Intermediate waypoints (via C)
  - Topographic features – definition at different scales
  - Cultural landscape - directional viewsheds (not 360º spinning on a point)
- Perceptual Systems
  - Gibson 1970s - movement and visibility are interlinked
  - Look at sense organs working with the moving, active observer
  - ‘Affordance’ – dependent on the perceiver and the environment
- Affordance of topographic features

DEM ‘quality’

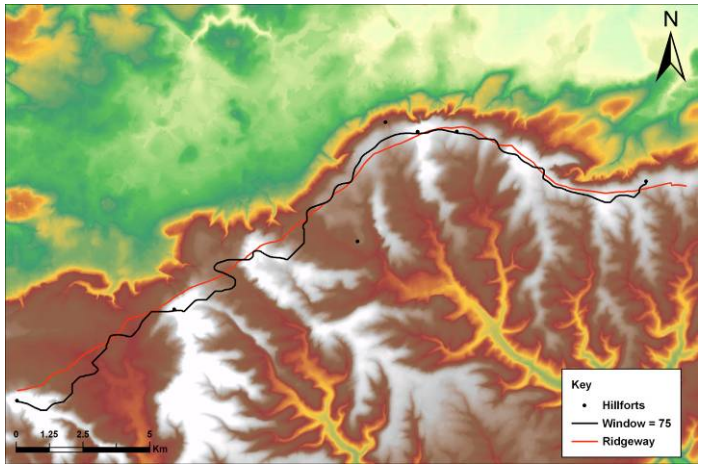
- Maximising the resolution of the DEM is counter-intuitive to the act of walking and intentionality
- Looking at one’s feet – the mid-distance – the long distance – the known destination
- Modelling through different sized cell windows

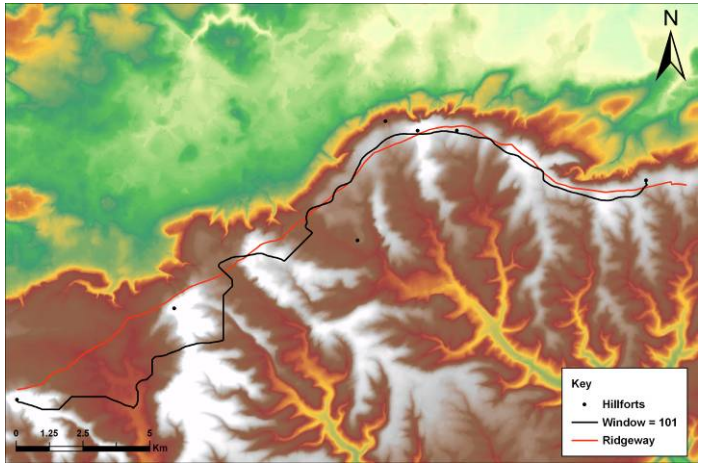
Least Cost Pathways



Implications

- Relationship to topographic features
- Close match
  - High confidence in corridor of movement
  - Corresponds to well-defined topographic features
- Poor match
  - Isolate points where deviations occur
  - Pick out different features – pass or peak
  - Deviations occur at different points
  - Scale dependent - dynamic
  - Arbitrary
- Optimal scale <1km





Directional Viewsheds

- Additional complexity

  Better understanding of relationship between movement and topography

  Factor in ‘cultural landscape’ through use of **intermediate waypoints**

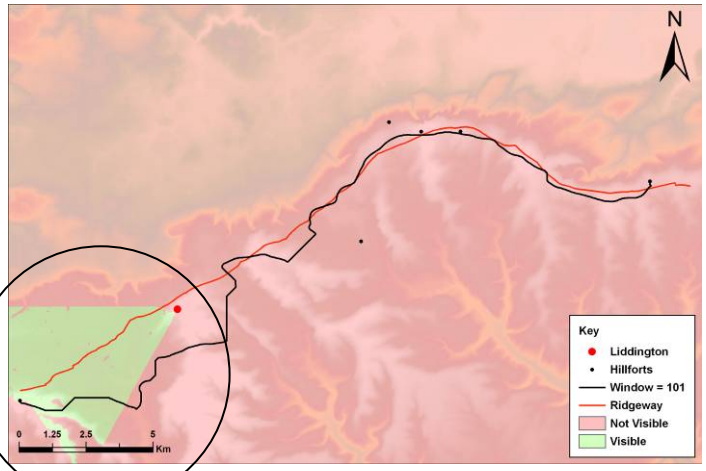
- Binary viewshed

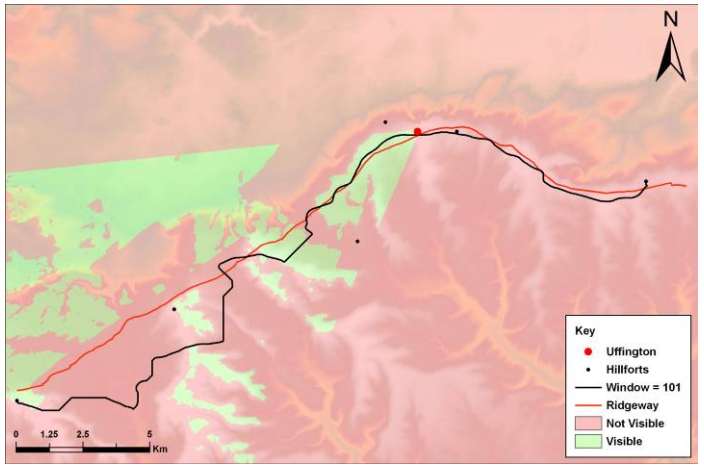
  Polylines defining ramparts of hillforts

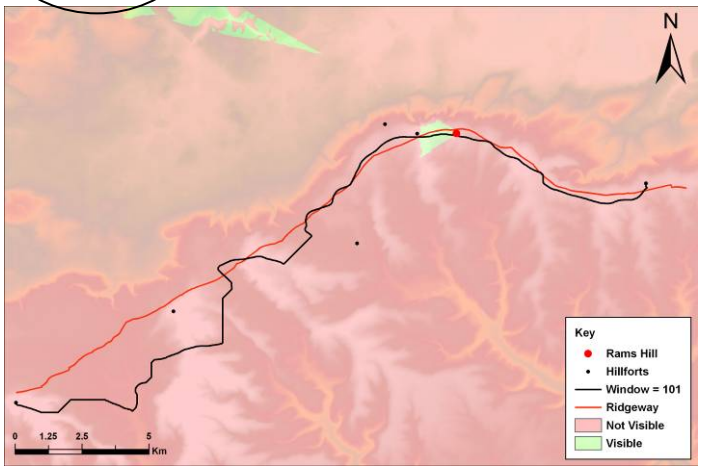
  Reclassified by distance

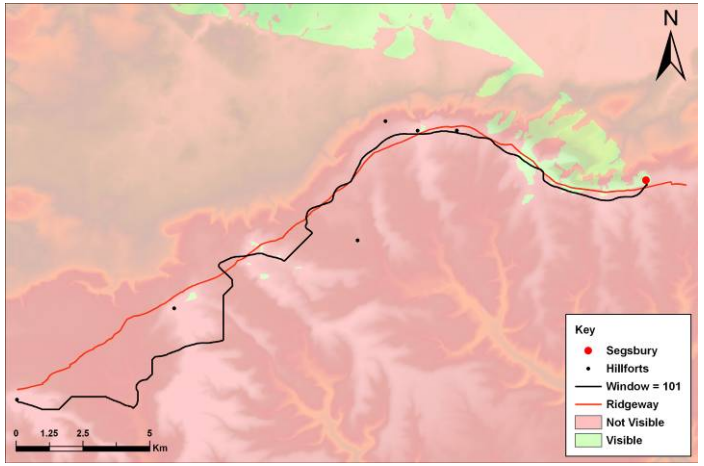
  Direction determined by direction of movement along corridor of intentionality

Intermediate Waypoints and scale

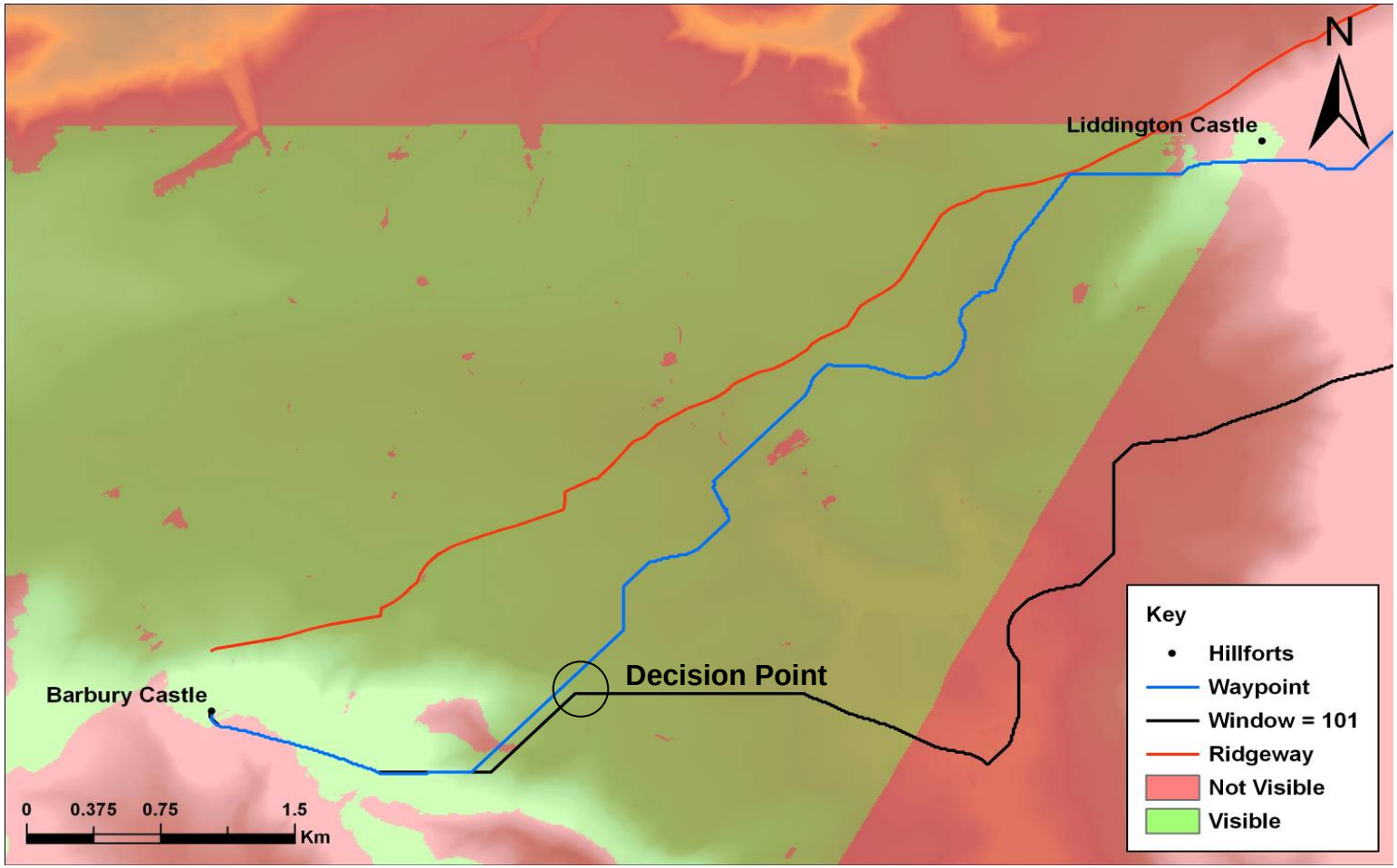








Intermediate Waypoints and scale - again



Final thoughts

- Spatial technologies – a critical engagement
- Archaeological questions that push the boundaries of the technology
- The scale of reasoning is central
- A qualitative understanding of quantified data is possible e.g. moves towards deconstructing knowledge of the landscape and refuting van Leusen's statement