Hidden Maps, Hidden Landscapes: A Report on Fieldwork in Vatnhverfi, Greenland

Rowan Jackson

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Cover Photograph: The cover image shows Vatnahverfi in Southwest Greenland. The image looks southeast over the lakes and upland pastures towards the Greenland Ice Sheet in the distance. Photograph taken by Rowan Jackson in 2016.

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Hidden Maps, Hidden Landscapes: A Report on Fieldwork in Vatnhverfi, Greenland

Archaeological survey work in the Vatnahverfi district of Southern Greenland was conducted in July 2016. Archaeological surveys are conducted to identify human activity within the landscape, such as dwellings, worked materials and modified landscape features. This article covers a ground-truthing exercise where predicted pathways between existing Norse farm sites in southern Greenland were followed and key landscape features and sites observed. This method discovered new sites, though predictive models were limited by inclusion of vegetation data and knowledge of local livestock management practices.

Geographical information systems (GIS) are an essential tool in archaeology. Spatial analysis allows the reconstruction of sites and landscapes (Madsen 2014), georeferencing site surveys in online databases (Strawhacker et al. 2015), and the modelling of movement, trade, and mobility across landscapes of the past (Conolly and Lake 2006, d'Alpoim Guedes et al. 2016, Gillings and Goodrick 1996). Settlement and topographic data provide archaeologists with the opportunity to estimate the boundaries of, and pathways between, farms where there is little physical or historical evidence available. A common method uses least-cost analysis to predict pathways between farms and sites between farms, such as sheilings, cairns, waypoints, and other artefacts (Howey, 2011).

High-resolution topographic data is imperative for predicting mobility dynamics as well as field-based observation of landscape characteristics and local and traditional knowledge (LTK) for interpreting human and animal mobility. In Vatnahverfi, LTK provides essential insights in the absence of historical information about transhumance, which refers to the seasonal movement of people with their livestock between grazing areas (Ledger et al. 2017). This landscape has been farmed since the late 10th century, following the Norse settlement in c. 985 CE (Arneborg 2003), with a hiatus between the 15th and 18th centuries when the Norse farmers disappear from the archaeological record (Jackson et al. 2018). Inuit farming in Greenland first commenced in 1783, including the Vatnahverfi district of southern Greenland (Gad 1970, Madsen 2014). In the absence of historical record evidence prior to the 18th century, reconstructing movement across the landscape in the Medieval period is reliant on the combination of archaeological, environmental, and comparative evidence from historical and ethnographic analogy and LTK (Jackson et al. 2020).

Background

The Norse colonisation of the North Atlantic between the 9th and 10th centuries CE introduced farming and transformed sub-arctic environments into cultural landscapes suitable for livestock grazing (Dugmore et al. 2005, Ledger et al. 2017). The *landnám*—or land-taking—transported an extensive, low-density farming economy, supplemented by hunting and gathering, extending this Scandinavian society to the limits of the known world (Jackson et al. 2018). Expansion westward, from the British Isles and Ireland to the Faroes, Iceland, Greenland, and Newfoundland, pushed this flexible economy to its extreme (Dugmore et al. 2006), with cereal cultivation limited in Iceland and absent in Greenland (McGovern et al. 1994, 2007). In Greenland, dental calculus from human remains and archaeozoological (animal remains) evidence both point to an economy dependent on animal husbandry to support a dairy economy (Arneborg et al. 2012, Warinner et al. 2014). Survey data has also reconstructed groups of ruins across the

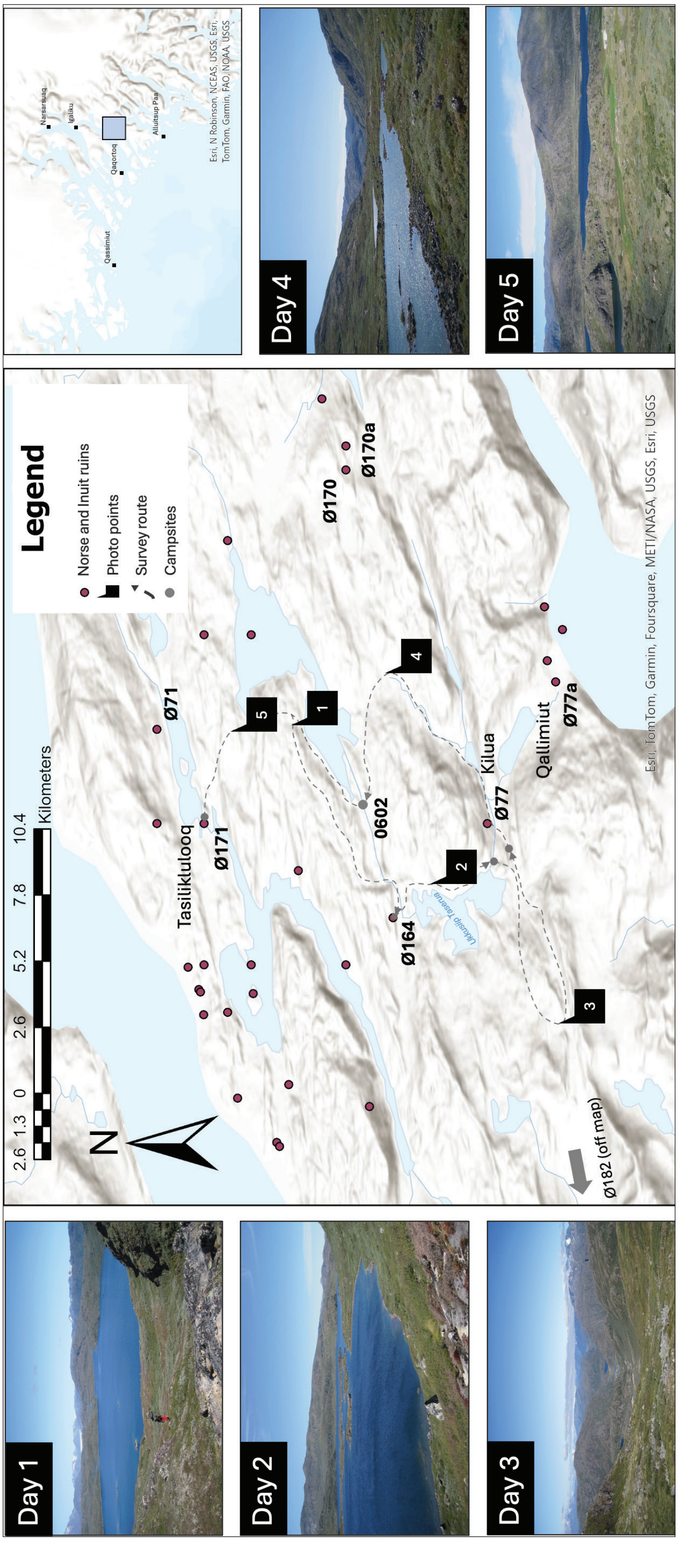

Image 1. Map showing the archaeological survey route to and from Tasiliklulooq. This survey route follows modelled routes between Ø164 and Ø77a. Landscape features are numbered on the map in correspondence with the survey days on the left and right of the survey map. Photos: authors own.

Eastern and Western Settlement areas, providing information about settlement structure, land-use and livestock management patterns, and organisation of seasonal activities that reveal a complex local economy balancing a small labour pool between farming the land and hunting marine resources (Madsen 2014; Jackson et al. 2018).

Vatnahverfi was—and still is—amongst the most productive areas for pastoral agriculture in the Eastern Settlement of Greenland (Fig. 1) (Dugmore et al. 2005). This landscape includes multiple types of ruins, ranging from farmsteads to upland sheilings and perennial summer farms. Since the mid-18th century, archaeological surveys have been conducted across this region (Madsen 2019), and systematic archaeological surveys have documented sites since the 1880s (Bruun 1881, Madsen 2014). More recently, geographical information systems have allowed sites to be documented via geo-spatial software where economic pathways of travel and trade between farms can be predicted, and with this there is the potential for long-lost outbuildings, such as shielings, to be rediscovered. This article focuses on a model developed by Nera Šegvić (2015) that used topographic (elevation) and vegetation datasets to predict the relative roughness of terrain between farms in central Vatnahverfi. A Digital Elevation Model (DEM) with a resolution of 25 meters and vegetation data were used to determine the most likely routes taken when travelling between Norse farm sites. The routes predicted in the model provide a visual hypothesis representing the economic networks branching from farms across the landscape. Surveying Vatnahverfi for shielings (summer dwellings) between identified farm sites provided a practical basis to test the model hypotheses. Survey work was conducted over five days between the 18th and 22nd of July 2016. Survey work observations are presented in the section below.

Survey Observations

Survey work commenced from an archaeological excavation of the medium-sized Norse farm Ø171, located at present day Tasilikulooq, in Northern Vatnahverfi. This provided a practical base camp and starting point for survey work in central Vatnahverfi where multiple Norse farms and sheilings have been documented between the late 18th century and Christian Madsen's most recent survey work for the National Museum of Greenland (Madsen 2014, 2019; Madsen and Lennert 2022). Before joining the routes mapped using GIS, the survey team travelled between Tasilikulooq and Ø164, as shown in Figure 1.

Though no GIS routes were followed on the first day, the journey between base camp, at Ø171, and Ø164 provided a good indication of the topography, vegetation, and climate of the Eastern Settlement inner fjord biome. The inner fjord provides refugia from the otherwise harsh conditions of Greenland (Arneborg 2005). Sheltered from high winds that scour the coastal fringe, this area is relatively warm for livestock grazing between lush lowland pastures (infield settled areas) and more extensive mountain pastures for summer grazing (Fig. 2).

Moving southwards from Tasilikulooq, the survey team passed along the northern shore of Tasikuuoq lake, joining a ridge at the southern portion of the lake (Fig. 1). Following this ridge, the team were able to follow sheep trails, providing easy routes through what is, for the most part, infrequently visited agricultural land. Sheep can be considered the primary agents determining the pathways of least-cost throughout the landscape, which could explain the correlation with sheep trails. The role of domestic livestock in shaping present-day landscapes across the North Atlantic has been described by Dugmore and Buckland (1991) as 'ovigenic landscapes.' Ovigenic, referring to influence of the *Ovis* genus (sheep) across the landscape, describes the shaping of vegetation and soil erosion by seasonal grazing patterns of sheep herds. This has formed the cultural landscapes across much of Vatnahverfi—a consequence of several centuries of environmental impact between the late 11th-14th CE and 18th CE to present (Dugmore et al. 2005). However, it should be noted that although sheep trails provide some indication of transhumance, where both humans and animals move together, they do not indicate the real pathways used between the 11th and 14th centuries (Madsen 2014).

At the northern shore of two small upland lakes, a small shieling was located that was surrounded by high quality grazing land (Fig. 3). Following a ridge to the south of Tasikuuoq lake, and north of Ø164 ruin, two cairns were identified: one Norse and one Inuit (Fig. 4). The area covered on the first day was all within 8km of Tasilikulooq farm and provides high-quality upland grazing for sheep and horses throughout the summer months. For the Norse, cairns and sheilings demarcated physical and seasonal boundaries between activities in the spring and autumn months nearer the homestead and summer pastures and dwellings (Madsen 2014, Ledger et al. 2017). Vegetation throughout this area was largely high-quality mountain pasture, with patches of willow and birch scrub along the steep valley sides and rocky outcrops. Well-worn sheep trails provided highly mobile routes through the landscape between basecamp and Ø164.

The second day followed a modelled path along the eastern shore of Ukkusiip Taserua Lake, between Ø164, to the north, and Ø77 to the south. Approximately 2km south of Ø164, a shieling was identified on a small headland on the northern shore of Ukkusiip Taserua Lake (Fig. 5). This shieling probably marked the boundary between the home pastures of

Image 2. High-quality mountain pastures located to the east of Tasikuuoq lake and west of Ø164.

Image 3. Shieling located in gully between grazing land on northern shore of Tasikuuoq lake and southern shore of Naasaanngitsup Tasi lake.

Image 4. Top: Norse cairn located on northern ridge of Tasikuuoq lake. Bottom: Inuit, modern cairn 100 yards west of Norse cairn.

Ø164 and common upland pastureland. The route along the lakeshore was characterised by dense scrub consisting of willow and birch. This made the 4.5km hike along the lakeside extremely difficult (Fig. 6). A further 2 km along the lake we located a small shelter, which could be of either Norse or Inuit origin. From field observations it was clear that while the topography of the lakeside was flat, the extent of willow scrub would have caused travellers a significant loss in journey time. Furthermore, the combination of boulder fields and willow scrub made navigation and mobility challenging. The combination of boulder fields and dense willow and birch vegetation are unlikely to be captured in lower resolution DEMs, though higher resolution DEM and LiDAR datasets could improve the accuracy of least-cost surfaces. The southern shore of the lake represents a significant pathway junction in the model suggesting the likely presence of sites (Fig. 1). Hillsides were surveyed along the southern shore though no shielings were identified across the valley. This valley was also characterised by thick willow vegetation and limited grazing pressure. No sheep trails were present beyond the southern reaches of the valley.

The third day followed a pathway onto the uplands to the west of Lake Ukkusiip Taserua. Following the modelled pathways west of Ø77, this route climbed to the highest elevation between Ø77, to the east, and Ø182, to the west (Fig. 1). The first half of the ascent crossed thick, low-lying birch and willow scrub reaching patchy grassland at the highest elevation of the route. No shielings were located in this area. Despite the presence of a moderate quality of grazing land along the shores of small lakes at higher elevations (Fig. 7), the high variation in pasture quality and infrequency of such pasture would have

Image 5. Shieling located on northern shore of Ukkusiip Taserua lake.

made this area an unlikely area for seasonal grazing—possibly explaining the absence of summer dwellings such as summer farms and sheilings. Following another modelled pathway back towards Ø77, further patchy grassland was located though no shielings marked this route. The full pathway down could not be traced as the modelled route attempted to cross several small cliffs (most likely due to the low resolution of the DEM used to generate the model). No livestock were identified grazing on this land, indicating that it lies beyond the maximum extent of sheep grazing on mountain pastures.

The fourth day followed a stream east from camp on the southern shore of Ukkusiip Taserua towards Ø77 adjoining a valley extending northeast towards Tasikulooq Lake. The pathway to Ø77 was relatively easy with low-lying scrub along a well-worn sheep trail. This route followed a mixture of pastureland and low-lying birch and willow scrub. The GIS modelled pathway ended at Ø77 but the team followed a valley between Ø77 and Ø170, turning midway towards Lake Tasikulooq. Beyond the home field pastures of Ø77, vegetation became increasingly dense and difficult to cross. As the valley opened out onto a system of small lakes, a modified Norse cairn and an Inuit fox trap were identified. Lake shores and valley sides were surveyed for shielings though none were identified. Several modern fox traps were identified on boulders across the lake shorelines. Crossing into the next valley, leading onto the shore of Tasikulooq Lake, the landscape opened out onto high-quality mountain pastures grazed by sheep today. Camp was made at shieling 0602 before following the Lake Tasikulooq shore to basecamp at Tasilikulooq.

Image 6. Dense willow and birch scrub along eastern shore of Ukkusiip Taserua lake would have significantly reduced mobility of human population.

Image 7. High elevation modelled pathways were characterised by varied quality land for summer grazing and an absence of sheep.

Discussion and Conclusions

Least-cost paths provided an important experimental design to reflect mobility and economic networks between farms in Norse Greenlandic pastoral economies (Šegvić 2015). Least-cost pathways therefore have a great potential for reconstructing the mobility dynamics between farms and identifying potential sites connecting these dispersed settlements in an economic network (Vésteinsson et al. 2002, Vésteinsson 2009). Fieldwork in Vatnahverfi served as a preliminary test for understanding efficient pathways and reconstructing speculative economic networks. This fieldwork identified a number of features, including a shieling, cairns and fox traps. Detailed vegetation and higher resolution DEM datasets are required to accurately model pathways of least-cost between farms and to calculate the relative roughness of different pathways (i.e., combination of thick scrub, cliffs, and boulder fields).

Further research that incorporates a task-landscape focus and geospatial modelling would expand knowledge of mobility in these unique cultural landscapes (Ingold 1993, 2000). Future methods to identify potential ruins not yet known within the landscape are expected to include examining aerial photographs to identify changing patterns of sheep trails within the landscape, analysis of historical and contemporary records of sheep herding to improve understanding of animal herding, and participatory mapping with local farmers.

Author. Rowan Jackson[1,2]
[1]Global Academy of Agriculture and Food Systems, University of Edinburgh, Easter Bush, Charnock Bradley Building, EH25 9RG, Scotland, UK. [2]Geography, School of Geosciences, University of Edinburgh, Drummond Street, Edinburgh, EH8 9XP, Scotland, UK.

Literature Cited

Arneborg, J. 2003. Norse Greenland: Reflections on settlement and depopulation. In J. Barrett (ed.), Contact, continuity, and collapse: The Norse colonization of the North Atlantic. Turnhout, Brepols.

Arneborg, J. 2005. Greenland irrigation systems on a west Nordic background. Water Management in Medieval Rural Economy. Ruralia V: 137–145.

Arneborg, J., N. Lynnerup, J. Heinmeier, J. Møhl, N. Rud, and Á.E. Sveinbjörnsdóttir. 2012. Norse Greenland Dietary Economy ca. 980-ca. AD 1450: Introduction. Journal of the North Atlantic 3:1-39.

d'Alpoim Guedes, J., S.A. Crabtree, R.K. Bocinsky, and T.A. Kohler. 2016. Twenty-first century approaches to ancient problems: Climate and society. Proceedings of the National Academic of Sciences 113(51): 14483-14491.

Conolly, J., and M. Lake. 2006. Geographical information systems in archaeology. Cambridge University Press.

Dugmore, A., and P. Buckland. 1991. Tephrochronology and late Holocene soil erosion in south Iceland. In C. Caseldine and J. Maizels (Eds.) Environmental change in Iceland: past and present (pp. 147-159). Dordrecht: Springer Netherlands.

Dugmore, A. J., M. J. Church, P. C. Buckland, K. J. Edwards, I. Lawson, T. H. McGovern, E. Panagiotakopulu, I. A. Simpson, P. Skidmore, and G. Sveinbjarnardóttir. 2005. The Norse landnám on the North Atlantic islands: An environmental impact assessment. Polar Record 41(216): 21–37.

Dugmore, A.J., M.J. Church, K.A. Mairs, T.H. McGovern, A.J. Newton, and G. Sveinbjarnardóttir. 2006. An Over-Optimistic Pioneer Fringe? Environmental Perspective on Medieval Settlement Abandonment in Þórsmörk, Southern Iceland. In. B. Grønnow, J. Arneborg, and H.C. Gulløv. (Eds.) The dynamics of Northern Societies. PNM, Publications from the National Museum, Studies in Archaeology and History, 10. Copenhagen: National Museum of Denmark.

Gad, F. 1970. The History of Greenland: Earliest Times to 1700. London: C. Hurst and Company.

Gillings, M. and G.T. Goodrick. 1996. Sensuous and reflexive GIS: exploring visualisation and VRML. Internet Archaeology 1. https://doi.org/10.11141/ia.1.2

Howey, M. C. 2011. Multiple pathways across past landscapes: circuit theory as a complementary geospatial method to least cost path for modeling past movement. Journal of Archaeological Science, 38(10), 2523-2535.

Ingold, T. 1993. The Temporality of the Landscape. World Archaeology 25(2): 152-174.

Ingold, T. 2000. The perception of the environment: essays in livelihood, dwelling and skill. London: Routledge.

Jackson, R., J. Arneborg, A. Dugmore, C. Madsen, T. McGovern, K. Smiarowski, and R. Streeter. 2018. Disequilibrium, adaptation, and the Norse settlement of Greenland. Human Ecology, 46, 665-684.

Jackson, R. 2021. Natural experimental approach to vulnerability, resilience and adaptation in historic Greenland. University of Edinburgh. Doctoral Thesis.

Ledger, P. M., K.J. Edwards, and J.E. Schofield. 2017. Competing hypotheses, ordination and pollen preservation: landscape impacts of Norse landnám in southern Greenland. Review of Palaeobotany and Palynology, 236, 1-11.

Lucas, G. 2001. Critical Approaches to Fieldwork. London: Routledge.

Lucas, G. 2005. The Archaeology of Time. London: Routledge.

Madsen, C.K. 2014. Pastoral Settlement, Farming, and Hierarchy in Norse Vatnahverfi, South Greenland. PhD Thesis. University of Copenhagen.

Madsen, C.K. 2019. Marine Shielings in Medieval Norse Greenland. Arctic Anthropology 56(1): 119-159.

Madsen, C. K., and A.E. Lennert. 2022. Behind the Ice: The Archaeology of Nunatarsuaq, Southwest Greenland. Journal of the North Atlantic, 2022(42), 1-32.

McGovern, T. H. 1994. Management for extinction in Norse Greenland. In C.L. Crumley (ed.), Historical Ecology: Cultural Knowledge and Changing Landscapes, University of Washington Press, Washington.

McGovern, T. H., O. Vésteinsson, A. Fridriksson, M. Church, I. Lawson, I.A. Simpson, A. Einarsson, A. Dugmore, G. Cook, S. Perdikaris, K.J. Edwards, A.M. Thompson, W.P. Adderley, A. Newton, G. Lucas, R. Advardsson, O. Aldred, and E. Dunbar. 2007. Landscapes of Settlement in Northern Iceland: Historical Ecology of Human Impact and Climate Fluctuation on the Millennial Scale. American Anthropologist New Series 109(1): 27–51.

Rockman, M. 2003. Knowledge and learning in the archaeology of colonization. In. M. Rockman and J. Steele (Eds.) Colonization of Unfamiliar Landscapes: the archaeology of adaptation. Routledge: London.

Šegvić, N. 2015. Where should I put my shieling? Master of Science Dissertation. University of Edinburgh.

Strawhacker, C., Buckland, P., Palsson, G., Fridrikkson, A., Lethbridge, E., Brin, A., Opitz, R. and Dawson, T., 2015, September. Building cyberinfrastructure from the ground up for the North Atlantic Biocultural Organization introducing the cyberNABO Project. In 2015 Digital Heritage (Vol. 2, pp. 457-460). IEEE.

McGovern, T.H. and Keller. 2002. Enduring impacts: Social and environmental aspects of Viking Age settlement in Iceland and Greenland. Archaeologia Islandica 2: 98–136.

Vésteinsson, O. 2009. Parishes and communities in Norse Greenland. Journal of the North Atlantic 1: 138–150.

Warinner, C., J. Hendy, C. Speller, E. Cappellini, R. Fischer, C. Trachsel, J. Arneborg, N. Lynnerup, O.E. Craig, D.M. Swallow, and A. Fotakis. 2014. Direct evidence of milk consumption from ancient human dental calculus. Scientific reports, 4(1), p.7104.