Rivers and Waterways in the Roman World

Empire of Water

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15 Rivers and Walls

The Materiality of Roman Frontier Waterscapes on Hadrian's Wall and the Lower Danube

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Introduction

The frontiers of the Roman Empire left a lasting impression on the landscape that continues to define physical and conceptual divides across Europe, the Near East, and northern Africa. At its greatest extent, the Roman frontier stretched over 7,500 miles and took differing forms, reflecting the varied geographies and social-political groups living at the fringes of the empire (Breeze, 2018, p. 1). These included natural boundaries such as mountains or deserts as well as built structures like Hadrian's Wall. Many of these borderscapes incorporated waterways that have been discussed, both in antiquity and in more recent scholarship, as shaping the boundary zones between the empire and *barbaricum*; rivers operated as the most common demarcation of Roman borders and as communication and trade routes (Breeze, 2018; Feuer, 2016, p. 103; Ingate, 2019; Tacitus, 2010; Whittaker, 1994, p. 56). However, waterways generally are viewed as natural features in the landscape and have not been examined using cultural theories applied to artefacts, features, and/or the archaeological landscape. Recently, some scholars have argued that waterways were not just aspects of the natural landscape, but were liminal, multivocal spaces that both separated and united groups of people and were incorporated into human activities and experiences (Rogers, 2012; 2013; Strang, 2008; 2014). Edgeworth (2011b, p. 15) argues that rivers are entanglements of nature and culture and exist as both natural elements of the landscape and as artefacts. Likewise, Rogers (2012, p. 17) notes that waterways have a materiality due to their physical characteristics affecting how humans utilise, interact with, manage, and distribute water. Waterways in frontier settings therefore need to be understood as mediating human-environment relationships and helping to shape how these frontiers were developed and exploited. It is vital that we consider the agency of non-human entities like waterways, thereby extending post-humanist ideas to Roman frontier studies – an area where, perhaps, they merit more discussion (exceptions include Fernández-Götz, Maschek and Roymans, 2020). After all, recognising material agency alongside human agency represents a 'potentially shifting balance of power' (Strang, 2014, p. 141), which is crucial within a landscape that continues to be embedded with imperialist and nationalist power relations like the Roman frontier.

Examining the material agency of waterways enables a better understanding of how waterways were incorporated into daily Roman life, thus allowing us to consider the long-term effects of these features on the landscape. Broadly speaking, materiality focuses on how materials mediate the relationship between humans and things. Water is particularly good at this, given Edgeworth's (2011a) 'Manifesto for Archaeology of Flow' (adapted into a book, *Fluid Pasts*, 2011b), which argues that rivers are the 'dark matter' of landscape archaeology. Here, we use geographical information system (GIS)-based analyses to investigate the eastern portion of the Roman frontier at Hadrian's Wall as well as along the Lower Danube to demonstrate that waterways have their own materiality (Figure 15.1). This enables a recognition of both the relativity and the constants of relations on the frontier: the material quality of the water can also provide a constant in "an evolving 'flux' of emergent relations" between humans and things (Strang, 2014, p. 140).

By using waterways as integrated components of the empire's frontier, the Romans altered the meaning and agency of water in the frontier assemblage. Humans have always used and modified waterways for a variety of reasons. These processes affect not only human practice around waterways but also the perception of how these features shape societies. Waterways like the Danube were perceived differently before, during, and after the Roman era due to their often-monumental demarcations of waterways to become part of boundary fortifications (Mihajlović, 2018). Due to the activities surrounding them, Roman waterways had inherent social significance and served more than one purpose (Rogers, 2012). In addition to acting as barriers, waterways operated as routeways for people and things. They were also crucial in supplying a variety of natural resources, although waterways could also have a detrimental impact on a community through flooding or other environmental hazards. The multiple functions and meanings ascribed to waterways is reflected in their attributed symbolic importance during the Roman period, with temples and votive deposits reinforcing the importance of waterways for personal and religious views (Edlund-Berry, 2006; Ingate, 2019).

Although waterways are important due to their multiple functions and meanings, frontier studies rarely discuss them as having their own materiality. The materiality of water has started to gain traction in cultural anthropology, and Edgeworth (2011b, 2014) in particular has noted how rivers actively affect human societies from an archaeological perspective, alongside a recent debate series in *Archaeological Dialogues* (Strang, 2014). Studies of the Roman frontier have not fully engaged with theory when examining waterways, and when they are discussed, the focus tends to be on rivers as features of the natural environment devoid of their own agency and identity. For example, the River Tyne, in what is today northern England, is generally discussed as the terminus of Hadrian's Wall, ending at Wallsend along the northern bank of the river. Traditional studies of the wall have both ignored the waterways bookending the wall and not explicitly engaged with theoretical advances in archaeology and associated disciplines, with analysis generally focusing on the properties and functions of the built frontier.
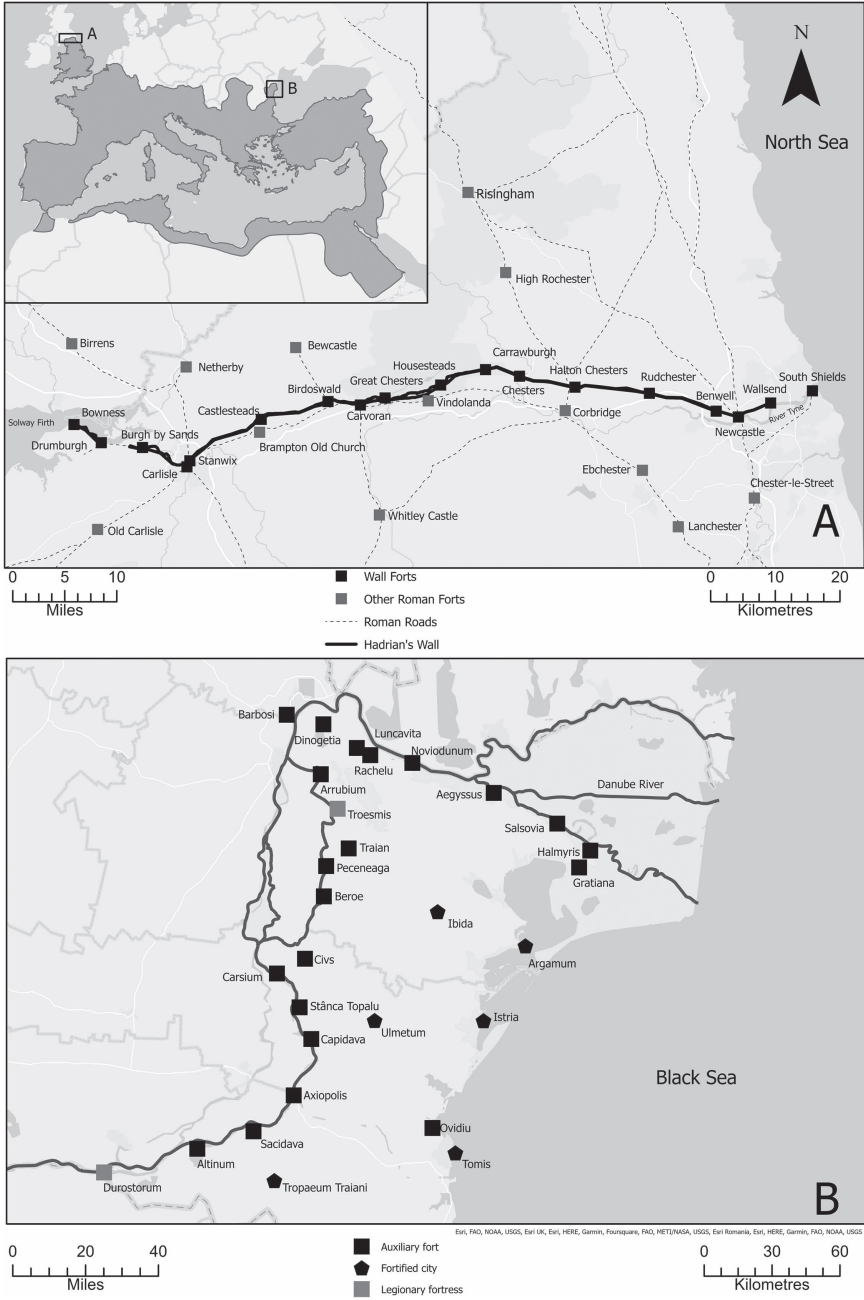
Figure 15.1 Map of Roman fortifications along Hadrian's Wall (A) and the Roman Lower
Danube Frontier (B) (*Source:* B. Buchanan.)

Elsewhere in Roman studies, researchers are considering how the materiality of water might aid the understanding of how Roman society was impacted by waterways providing specific affordances. According to Rogers (2013, p. 175), water in Roman urban contexts had a materiality marked by the construction of revetments and other waterfront structures, transforming them from a natural state into a humanly altered feature. The Romans shaped waterways to enable the growth of settlements and the expansion of their empire. For example, the Tiber, which flows through the city of Rome, was frequently altered in response to threats of flooding. Embankments and dredging were employed to reclaim land along the river, altering the topographic landscape of Rome in direct reaction to the river's activities (Rogers, 2013, p. 20). Mastery of water flow is often linked to Roman imperial control of a landscape, as the monumental construction of aqueducts feeding public fountains and baths are essential components of many Roman urban centres. The multiple potential understandings of waterways lends credence to the argument that "water has a materiality through its physical properties and through the human use, experience, control, management, and distribution of water" (Rogers, 2013, p. 17). Because waterways were important aspects of Romano-British settlement, Rogers (2012, 2013) argues that theoretical approaches must be used to examine them, like all aspects of archaeological study. Similar to this, we contend that Roman experiences and concepts of waterways in more central or urban areas of the empire differed from those of Roman waterways linked with borderlands, as their unique materiality affected and afforded frontier interactions.

Materiality of Waterways

Materiality is a post-humanist concept seeking to overturn the Cartesian dualisms embedded in Enlightenment-era thought, recognising that objects, like humans, have agency. Through materiality, we can develop a less anthropocentric understanding of 'human-environmental interactions' in all contexts (Strang, 2014, p. 135). We can acknowledge the fluidity and dynamism of relationships between humans and things, where the agency of things, or Bennett's (2010) 'vibrant matter', is key, in part because of their material properties. Within archaeology, Post-humanism has inspired new ways of thinking about the past, although there are many different paths this has taken (see Fernández-Götz *et al*., 2021). Symmetrical archaeology and New Materialism are two such paths, using different terminology, that try to 'level the playing field' between 'science' and 'theory' (Harris and Cipolla, 2017, p. 131).

Generally, materiality theories argue that the material culture of a society not only reflects the lives of persons or societies but also constitutes and is constituted by individuals' thoughts and activities (Tilley, 2007a). Johnson (2019, p. 132) notes "First, (that) things are important; but second and equality, that figuring out how and why they are important is not obvious or straightforward at all". Materiality revolves around different ideas, with scholars focused on the material form of artefacts (Boivin, 2008; Conneller, 2011; Ingold, 2007), the relationships between humans and non-human things (Miller, 2007; Tilley, 2007b), or even pushing

archaeology's focal point away from humans and towards things (Olsen, 2010; Olsen and Witmore, 2015).

Materiality has refocused archaeological attention on *things* and how they inform our understanding of the past by demonstrating that objects actively affect how societies operate. Accordingly, materiality demonstrates that things afford particular practices and responses by individuals and societies. Materiality has been critiqued as overly focused on objects and turning away from the human perspective (Barrett, 2016; Ingold, 2007). Such a dualism between natural and human is rightly argued against, but this dualism can be seen as a product of western modernist perspectives and how we privilege one over the other in archaeological studies (Jervis, 2019, p. 14). The ontological turn attempts to move beyond dualisms such as natural vs. cultural (Johnson, 2019, p. 136) and to be aware of the multiple ways the world might exist beyond our own preconceived notions and ideas (Jervis, 2019, p. 5). In this way, we can focus on the 'processes of becoming' and the active nature of materials in a society (Jervis, 2019, p. 15).

Waterways are highly active, unstable elements of the environment due to natural processes of erosion, transportation, and deposition that are accelerated or halted by agriculture, canalisation, and damming. Thus, it can be difficult to study a waterway from the Roman period, as the banks, flow rate, and path of these waterbodies have dramatically changed from antiquity. However, by thinking of waterways as having their own materiality, we can alter our understanding of how Romans interacted with and were affected by waterways based on the built environment remains and artefactual evidence. Water is characterised by movement and instability, defying control, but also intersecting with other social and material processes to create new arrangements (Krause, 2021). Humans interact with watery contexts through a variety of behaviours that disrupt both the physical nature of the waterways and how they are perceived. The idea that waterways have materiality has recently gained traction in social anthropology (Bowles, Kaaristo and Caf, 2019; Krause and Strang, 2016) but is outside the normative framework of most archaeological studies, and especially, Roman frontier studies (see Strang, 2014 as an exception). Given that archaeologists are trained to look at how people created and interacted with objects, or controlled environments, it can be challenging for us to understand that waterways might have their own materiality and agency. It is nonetheless important to recognise that while the material qualities of water may attract similar human responses, linking cultures and peoples across time and space, there is also a risk of universalism in theories of materiality (Alberti, 2014; Davies, 2014). Here, we limit our analysis to water as part of Roman frontiers.

Waterways are significant places in a landscape because they attract and repel human activity. Many archaeologists that examine waterways in the Roman period focus on how Romans manipulated waterways. Dams, bridges, channelisation, irrigation, and other activities reflect both an interaction with waterways and that these have their own agency in the landscape. Although humans attempt to control them, waterways are not only affected by human practice but also influence human activities. Waterways enable and prohibit movement and, thanks to erosion and flood events, can breach and alter human impacts to the landscape without warning.

Actions to mitigate these risks such as diverting rivers, channelising irrigation, and constructing bridges required careful planning. Waterways were also spiritually important places in the landscape, as well as functional. As such, archaeologists must begin considering Roman frontierscapes and their associated waterways as part of a broader assemblage (cf. Harris, 2017), acting as important components of how frontier zones were shaped, interacted with, and thought about.

It is increasingly apparent that the Roman Empire's frontiers affect our own understanding of modern boundaries and divides across Europe and beyond (Hanscam and Buchanan, 2023). Roman frontiers and boundaries are still used as national borders (i.e. the Rhine forming the boundary between *Germania* and *Gallia* and modern Germany and France) or as imaginary, conceptual divides. Hadrian's Wall operated as the northern frontier of Rome and was popularly imagined as the divide between Scotland and England in discussions during the Scottish Independence Referendum of 2014. Hingley (2012, p. 327) notes that Hadrian's Wall has had a long effect on British identity, as successive generations following the Roman development of the frontier in Britain changed the meaning of the wall based on their own social circumstances. By demarcating the frontier and border zone, Hadrian's Wall monumentalised how this region near the modern England/Scotland border is viewed to this day (Hanscam and Buchanan, 2023; Hingley, 2012). It is vital for archaeologists to critically examine our perspectives on past frontiers by engaging with the entirety of a borderscape that includes waterways. Bringing waterways into the wider discussion of how frontier complexes were developed and used in antiquity enables us to engage with waterways as critical components of these assemblages and to better understand their long-term impact on the landscape.

The Waterways of Hadrian's Wall

After the initial invasion of Britain in 43 CE, Roman forces spent almost a century expanding northward. In 122/3 CE under the rule of Emperor Hadrian, the military began to consolidate a frontier by building a wall complex at the Tyne/Solway isthmus, with the eastern and western termini of the border aligned with waterways (Collins, 2012, p. 11). The wall complex operated intermittently as the northern boundary of the empire for the next three centuries. Far more than a single linear barrier, this complex was an integrated assemblage of stone and turf curtain walls, fortifications and gateways, related settlements, ditches, roads, and the large earthen ditch known as the *Vallum* located south of the wall complex (Mattingly, 2008, p. 156; Symonds, 2021, p. 51). We argue here that the waterways were integrated into and served as essential components of the frontier border assemblage now known as Hadrian's Wall.

To better grasp how waterways had their own materialities and were part of the frontier assemblage, it is instructive to understand how the wall complex is thought to have functioned throughout the Roman period and beyond. Not only did Roman frontiers develop differently based on their time and place of construction, our understanding of these frontiers furthermore varies depending on the scholars

undertaking the research. Breeze (2018, p. 3) notes at least twenty-one theories on the function of the Roman frontiers, many of which relate to the potential use of Hadrian's Wall. First, it has long been argued that the frontier had a military, defensive function. This idea was viewed as the obvious purpose of Hadrian's Wall and is still acknowledged today as one of the primary reasons for its construction. Indeed, many of the physical properties of the complex support the idea that a small defensive force could have delayed an invasion until a larger force could be mustered (Hodgson, 2017, pp. 165–166).

Over time, scholars have questioned if there were other reasons for the construction of the wall beyond acting as a barrier between invading armies and the empire. One argument put forward is that the wall complex was designed as a hindrance and preventative force to stop small groups raiding, rather than to stop invading armies (Symonds, 2021, p. 84). Beyond a purely defensive function, scholars have also argued the wall was built for observation and control over the landscape, deterring the free movement of individuals through the region. Finally, scholars have argued that the wall was a statement of Roman power and prestige, demarcating not only a border but also signalling the power of the empire. Regardless of the functional argument, some things are agreed upon. First, that the wall complex restricted access and movement from the north to south (and vice versa) (Symonds, 2021, p. 57). Second, that the wall complex has had a long-lasting socio-political effect, impacting both the region and the much later states of Scotland and England (Breeze, 2018; Collins, 2012; Hanscam and Buchanan, 2023; Hingley, 2012, 2022; Symonds, 2021). Investigations of Iron Age settlements north of the wall appear to have been abandoned following its construction, while at the same time settlements expanded to the south (Bruhn and Hodgson, 2022, pp. 152–153; Symonds, 2021, p. 169). Bruhn and Hodgson argue these changes to settlement patterns may reflect a Roman policy of favouring groups to the south of the wall and excluding peoples living to the north (2022, pp. 152–153).

Throughout the many discussions of the wall's purpose, construction, and use, it is generally taken for granted that the location of Hadrian's Wall was chosen to correspond with one of the narrowest points of the island. The wall furthermore followed the Stanegate frontier, a network of patrolled routes and fortifications running through a gap in the Pennines formed by the Tyne and Irthing valleys that predated Hadrian's Wall (Breeze and Dobson, 2000, pp. 16–19). This provided practical social advantages besides the environmental advantages of the wall's location (Breeze, 2019, pp. 61–62; Collins, 2012, p. 13; Hingley, 2022, p. 202). Another point rarely discussed is the probable importance of the waterways bookending the location of Hadrian's Wall for its development, construction, and use. The waterways may have served as useful entry points into the island interior for moving troops, foodstuffs, and materials. If we continue along this line of reasoning, the proximity of the Stanegate's infrastructure and the navigable waterways enhanced the allure of the location while also highlighting the value of the geographic location for the development of Hadrian's Wall.

When discussing Hadrian's Wall, scholars note how the waterways served as endpoints to the walls and rarely include them as part of the wall complex. For

example, the eastern terminus of Hadrian's Wall was located at a spur of the River Tyne, 4 miles west of the mouth of the river at Segedunum, commonly referred to as Wallsend (Figure 15.1; Rushworth and Croom, 2016, p. 2). Although Wallsend is discussed here as the termination of the wall, a short continuation extended southeast to the River Tyne. Bruce (1867, p. 113) noted this continuation was extended to the low-water mark of the Tyne, but this is difficult to verify, as the regions south of the fort have been heavily truncated by later activities (Rushworth and Croom, 2016, p. 562). Wallsend was laid out in a similar manner to the fort at South Shields that sits almost directly south of the mouth of the Tyne (Rushworth and Croom, 2016, p. 21). Both forts presumably had commanding views of the Tyne, whose width and path differed in antiquity as it has been channelised since the industrialisation of the region began in the 18th century. The pertinent question here regards the gap between Wallsend and the mouth of the river; popular perception is that east of Wallsend, the River Tyne was too wide and/or fast flowing and thus acted as a natural barrier and negated the necessity of extending the wall to the sea. If so, the river effectively acted as part of the wall border complex, and as such, we should examine how the populace living at and along the border used it. Here, we contend that if waterways served as components of the frontier complexes, whether intentionally or unintentionally, they had their own materiality and were seen as such by the various groups that lived along the frontier.

Viewshed Analysis and Waterways

In order to better investigate the materiality of waterways and as part of Hadrian's Wall, GIS-based viewsheds were modelled from the remains of Wallsend, South Shields, and Newcastle forts along the eastern terminus of the frontier. Viewsheds have become increasingly important in landscape studies to investigate intervisibility between sites and monuments (Gillings, 2015, 2017; Rennell, 2012). Although they have been critiqued as deterministic due to past examples of poor modelling, they have great potential to investigate past experiential practices. We employed viewsheds to test our hypotheses of the forts' visual control over the landscape and how this potentially links to the materiality of the River Tyne. The rationale was that if the forts commanded views of the broad landscape and each other, the river's importance was potentially minimal, as the forts focused on viewing and controlling other aspects of the landscape. However, if the views were directed along the river, it suggests that the river was a crucial part of the frontier that the Roman military needed to control, supporting the idea that the river acted as a medium between the landscape and people's perceptions and actions.

Viewshed analyses were conducted using ArcGIS Pro 3.0 and modelled with the OS Terrain 5 metre (m) digital terrain model of Great Britain, a type of digital elevation model (DEM) raster dataset, which is a type of GIS layer interpolating a topographic ground surface. All viewsheds used an offset of 7 metres above the ground surface, representing an estimate of the potential height of an individual standing on one of the forts and viewing the landscape, based on an estimate of the height of the curtain wall and parapet (Hodgson, 2017, p. 10).

Woolliscroft (2010) modelled the height of signal towers and the distance that could be seen from these, which Tibbs (2022, p. 66) has used to good effect in his GIS analysis of viewsheds from Roman fortifications in the Scottish landscape. ArcGIS Pro's Earth curvature corrections were used to limit the visibility to the horizon to represent the maximum possible visibility, with the idea being large troop movements or ships would be visible long before detailed identification would be possible. These viewshed models do not account for past vegetation, climate, the visual acuteness of the hypothetical viewer standing at the forts, or the major alterations to the landscape from antiquity. However, the findings present an interesting starting point to demonstrate the potential agency of the river in the borderscape.

One of the main justifications for the terminus of Hadrian's Wall at Wallsend is that the river was impassable east of this location due to its width. Graafstal (2021, pp. 138–139) argues the unique turning of the wall at Newcastle towards Wallsend, and the odd spacing between these forts suggests Wallsend was a later addition to the frontier. He argues that the wall may have originally been developed to cross at the *Pons Aelius* bridge and continue along the southern bank of the river eastwards towards an earlier but as yet unlocated fortification, near the later fortification at South Shields (Arbeia) (Graafstal, 2021, pp. 131, 139). Instead, a small addition, with a narrow course of wall, was extended to Wallsend along the northern bank of the Tyne. If we accept this information, the fort at Wallsend served two purposes: it ended the wall, and it guarded the entrances to the area's interior along the River Tyne. We can better understand this hypothesis by modelling how people could view the river and region from the fort itself.

Figure 15.2 shows the results of the viewshed analysis along the eastern edge of Hadrian's Wall. The views from Wallsend, highlighted in the bottom image on Figure 15.2, are intriguing, as they demonstrate that remarkably little can be seen of the surrounding landscape except views upriver and downriver. Similarly, the views from South Shields cover the mouth of the Tyne and views upriver, with little visibility extending south. The views from Newcastle are more varied, but again focus on the path of the river. Based on the viewshed analysis, the three analysed fortifications appear more visually focused on the river than the surrounding landscape. This suggests that the visual control and monitoring of the waterway was of great importance for the development of the eastern termini of Hadrian's Wall, and the river itself was thought of as part of the frontier landscape. One way we can see the agency of the river is in how it forced a reaction by the Roman army. First, visually controlling the river was important, whether to manage incoming trade or protect from raiders crossing the river – the fort's views overlap, covering much of the river. Second, the river was not exclusively a barrier. If it was such, it would not be necessary to establish forts in such a way to protect large, controlling views of the river's path. The viewsheds demonstrate that the built fortifications not only brought the waterway into the assemblage of the wall but also had to contend with viewing and controlling it.
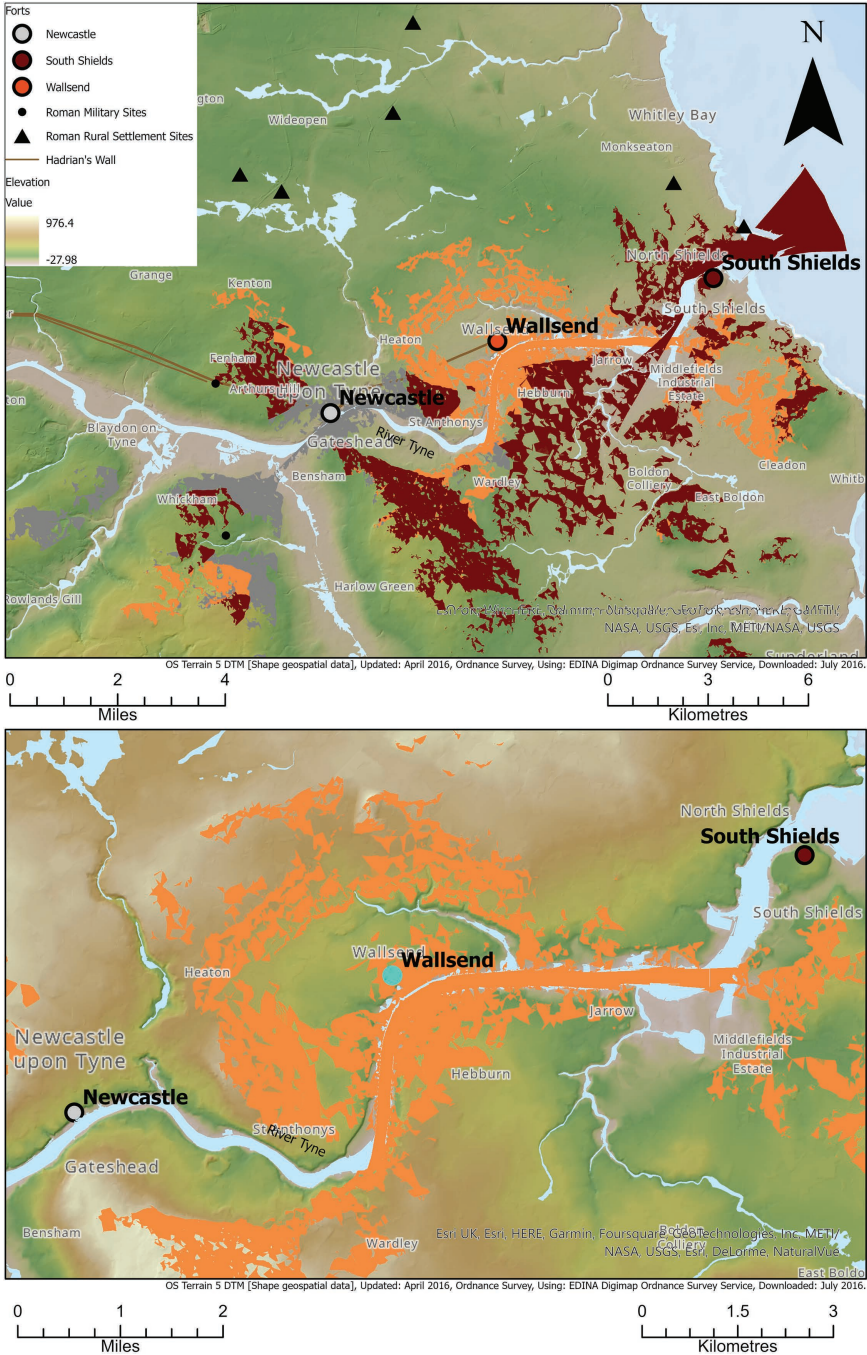
Figure 15.2 Viewsheds modelled from South Shields, Wallsend, and Newcastle Roman forts, showing their views along the River Tyne and the surrounding landscape. (*Source:* B. Buchanan. Mapping data © Crown Copyright and Database Right [2020] OS [Digimap Licence].)

Waterways on the Lower Danube

To better understand how waterways may have been incorporated into the Roman frontier, we now turn to the lower reaches of the Danubian frontier. The Lower Danube was one of the most densely fortified regions of the Roman Empire, with over 180 fortifications located along the natural boundary provided by the Danube (see Figure 15.4; Karavas, 2001, p. 5). To briefly summarise a region of the Roman frontier that is not as well-known as Hadrian's Wall, the Lower Danube frontier was constructed during the 1st to 3rd centuries CE, although there is a lack of archaeological evidence for this period due to the reconstruction of many of these sites in later periods (Wilkes, 2005, p. 132). Much of the evidence for these centuries comes from inscriptions and military diplomas, which are fortunately plentiful. This section of the frontier includes the legionary bases of Oescus, Novae and Durostorum (located in modern Bulgaria), and Troesmis in modern Romania. Additional fortifications such as Iatrus and Dinogetia were potentially built during the late 3rd or early 4th century; Poulter (2010, p. 16) notes that they all contain common architectural characteristics and are built on an exceptional scale. The Lower Danube faced numerous incursions throughout the 3rd and 4th centuries, with notable events like the death of the emperor Decius in battle against the Goths in 251 CE at Abritus (modern Razgrad, Bulgaria). The frontier, while garrisoned, was clearly permeable at this time, given the Visigoths could move south of the Danube and eventually kill the emperor Valens in 378 CE at Adrianople (modern Edirne, Turkey). In the 5th century, the frontier was reorganised, with excavations showing forts like Iatrus were transformed and others like Dichin were newly built potentially for Gothic *foederati* (Poulter, 2010, p. 31). The Eastern Empire would maintain control throughout the first half of the 5th century, although they ceded the Lower Danube to the Goths during the second half (Poulter, 2010, p. 33). One final period of reconstruction occurred during the early 6th century, before Byzantine control over the frontier ceased in the 7th century with the latest coins dating to the reign of Heraclius (Poulter, 2004, p. 249). The Danube has always been central to this part of the frontier, with its long and fraught history.

To better compare how waterways were used on the Lower Danube, viewsheds were conducted at the mouth of the river from the fortifications of Aegyssus (modern Tulcea), Salsovia (modern Mahmudia), and Halmyris (near modern Murighiol). The viewsheds were also conducted in ArcGIS Pro 3.0, using the +/– 15 m EuroDEM Open Gazetteer dataset, with a similar observer height of 7 m and using the Earth curvature correction to match the viewsheds undertaken along Hadrian's Wall.

The viewsheds modelled from each fort collectively cover large portions of the Delta north of these sites (Figure 15.3). Aegyssus, Salsovia, and Halmyris were positioned in such a way that their views are almost entirely directed northwards, towards the Delta, rather than southwards towards the interior of Moesia Inferior (later Scythia Minor). The views from these forts can be regarded as controlling the visual spaces of not only the frontier but also the waterways that were central to this landscape. This supports our understanding of the Lower Danube frontier as a
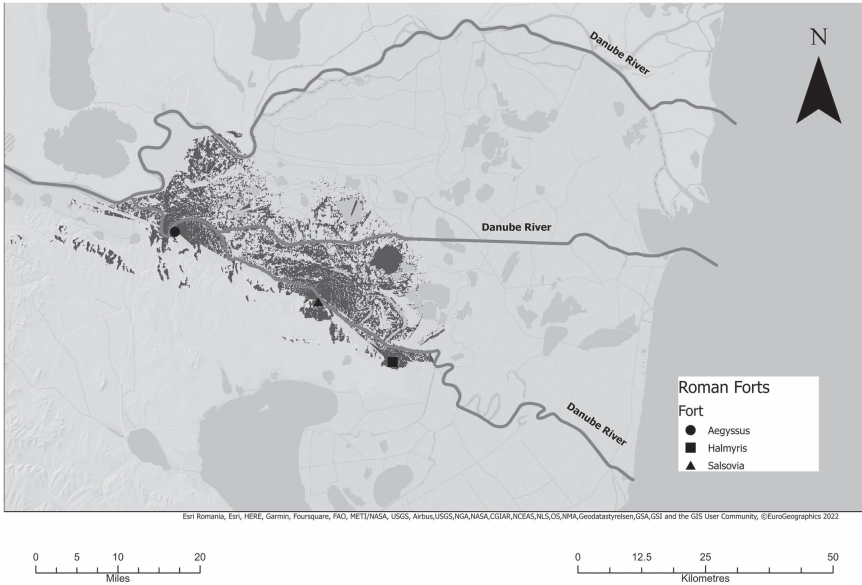
Figure 15.3 Viewsheds modelled from Aegyssus, Halmyris, and Salsovia showing their views across the Lower Danube Delta. (*Source:* B. Buchanan. Mapping Data ©EuroGeographics 2022.)

system primarily concerned with defence. It is unclear, however, whether the view is oriented towards the river intentionally or if it is fixated on the delta area and the river is coincidental.

This does not preclude other functions for the Danube – while it was an important element of defence in this area of the empire (for example, Halmyris was attacked in 384/5 CE when the Danube froze, Philost. *Hist.Eccl*. X.6, Zahariade and Karavas, 2015, p. 582), the waterway also facilitated connection and encounter by providing a riverine highway from the Black Sea to the interior. Unlike the waterways associated with Hadrian's Wall, as suggested by its very name, the Danube has always been central to our understanding of the Lower Danube frontier. This is undoubtedly also supported by our understanding of the Danube as a modern boundary. The river forms much of the border between modern Romania and Bulgaria, with the Danube Delta divided between Romania and Ukraine. In this region of the empire, we have understood the agency of the water as something that inhibits movement across, rather than facilitates movement along.

It is apparent in the large-scale map of Halmyris (Figure 15.4) that its viewshed does not cover the Danube River, which today has meandered away from the remains of the fort. However, the traced paleochannel (Giaime *et al.,* 2019) shows that the historic path of the river is entirely within the modelled viewshed, demonstrating that visual control of river access was similarly important. The
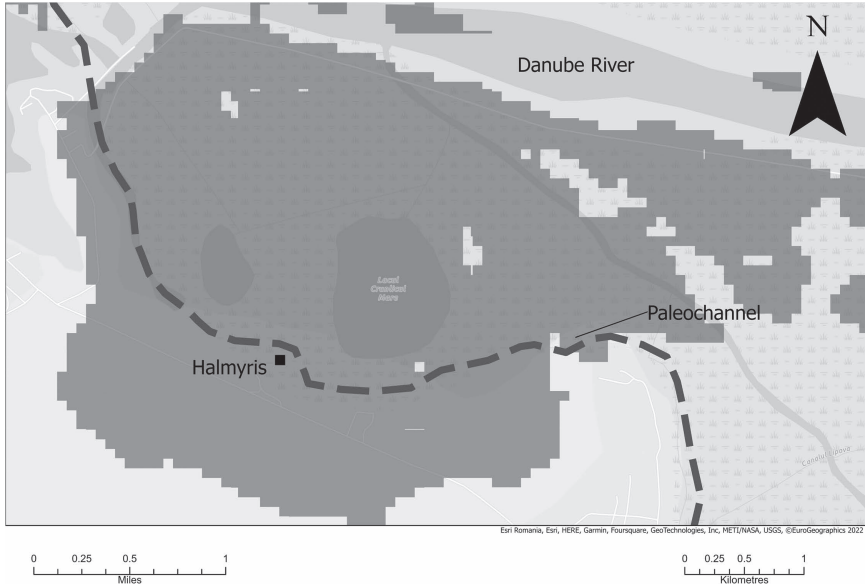
Figure 15.4 Viewshed modelled from Halmyris, showing its views across the Lower Danube River delta and the ancient pathway of the river. (*Source:* B. Buchanan. Mapping data ©EuroGeographics 2022.)

archaeological evidence also attests that Halmyris featured an active harbour in antiquity (Zahariade and Karavas, 2015). The fort was forced to adapt to changes in the water level and river path, just as it was potentially at risk when the river froze. Urban life likely ended at Halmyris in part due to the shifting of the Danube and loss of access to the river; geoarchaeological research has confirmed that the proposed final occupation of the site in the 7th century CE is contemporaneous to the loss of access to the Danube (Giaime *et al.*, 2019). The Danube played a significant role in the history of Halmyris; constantly shifting, it reinforced an understanding of the highly active nature of waterways and how they influenced the lifespan of sections of the frontier. It is a certainty that the Danube was a key part of the assemblage of the Lower Danube frontier, which precludes the question of how our knowledge of this relationship can improve our understanding of the agency of rivers in other Roman frontier assemblages, like that on Hadrian's Wall.

Viewing Waterways as *Things*

How does our understanding of the complexity of Roman frontiers improve when we consider the materiality of the associated waterways? Unlike other material objects, waterways are marked by fluidity and transformation. The water within rivers, sometimes hourly, can be present or absent depending on tides or flooding events. They are undeniably a natural force in the environment, but waterways also have an agency. Edgeworth (2014, p. 158) notes that unlike material

artefacts, rivers' agencies exert a physical force on humans that results in 'action and counter-action' activities. When people make material interventions in rivers, that often leads to unexpected responses such as when damming a river leads to overwhelming flooding when the bank breaks, forcing a larger dam and potentially even larger flood events. Edgeworth (2014, p. 159) argues that while humans actively shape rivers, these rivers retain their own agency and actively shape the human-environment relations. If the Roman army was actively using waterways like the Tyne or Danube to formulate their borders, the waterways afforded unique interactions due to their unpredictability.

Considering the various functions scholars have proposed for the frontier, we can expand these ideas to critically examine waterways as important aspects of the Roman frontier assemblage. These waterways potentially acted as barriers as well as networks for movement, trade, and raiding. Water transport has not featured as prevalently in scholarship on Roman Britain compared to road networks for understanding transportation and settlement (Wintjes, 2013). This contrasts with early medieval studies, where scholars have demonstrated that inland navigation of Britain's waterways was essential for movement in the landscape (e.g. Edwards and Hindle, 1991; Ferguson, 2011; Langdon, 2000, 2007; Jones, 2000). Ferguson (2011, p. 287) notes that in the early medieval period, boats could have sailed as far inland as Prudhoe on the River Tyne, linking coastal communities with inland settlements. Rollason (2003, pp. 49–51) argues that the Tyne and Wear rivers acted as the foci for one of the heartlands of the early medieval kingdom of Northumbria. Rather than acting as a barrier, the inland waterways were important access corridors for movement, settlement, and the eventual growth of kingdoms. It is therefore plausible that the Tyne was equally navigable during the Roman period and, while perhaps being a barrier for terrestrial movement, could have been used as an inland throughway for transportation and trade beyond Wallsend.

As such, Wallsend served as the termini of the wall and as a control point of the river. The viewsheds taken from the fort demonstrate a concentrated view upriver and downriver. The river mediated the reactions of the Roman army to the construction of the wall. Regardless of the function of the wall, the river played an active role in these activities. By thinking of the waterway as having its own materiality, we can shift our understanding of waterways along the Roman frontier as not separate from the archaeological landscape, but active components shaping and being shaped by human activity. In this case, the viewsheds suggest that the River Tyne can be seen as a cultural artefact, given the construction of the forts' to maintain visual control of the river, thus demonstrating how human and waterway activity were intertwined and are part of this frontier complex's story.

We can better recognise the agency of the Tyne in consideration alongside the Danube – a river more widely acknowledged as a key part of the frontier complex. While we cannot be sure if the view from the Lower Danube forts angles towards the waterway or the region north (the delta), on Hadrian's Wall the viewsheds appear to be focused on the river. We believe that this suggests more work needs to be done incorporating waterways into frontier studies, not just as a natural aspect of the landscape, but as an agentive part of the frontier system.

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