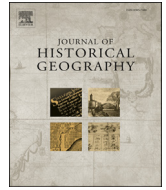




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# An explosive landscape: Arranging the barnacle goose on the Solway Firth

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## ABSTRACT

By the end of the Second World War, the Svalbard barnacle goose population had dwindled to a couple of hundred birds. Flying in from the Arctic to spend the winters on the Solway Firth (the estuary that separates England from Scotland), they were a favourite target of wildfowlers in the area. Since then, a ban on shooting and the Solway goose management scheme that pays farmers to maintain a goose friendly habitat has seen the barnacle goose numbers increase. Today, an uneasy truce has formed between conservationists, farmers and wildfowlers who have different and often conflicting interests in the goose. Adding to that is the Solway's rich military history: once host to huge munitions factories during the First and Second World Wars, this now derelict military infrastructure curates the tidal landscape through awkward access zones, barbed wire fences and secretive burial sites. In this article I argue that the military infrastructure of the Solway, particularly that of the explosive propellants produced in the factories, have left resonances that not only inflect the land itself, but also the trajectory of the barnacle goose. Explosive propellants are used in different ways by the goose's stakeholders: cannon nets by conservationists, bird bangers by farmers, and explosive shot by wildfowlers. Yet this is a dynamic situation that must account for goose agencies and complex entanglements of human, nonhuman, and technology: an explosive landscape that arranges goose life along the flyway.

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The first barnacle goose I ever saw was dead. She was lying on the beach at Powfoot, surrounded by shells and bricks stamped with the name of the local terracotta works (Fig. 1). These bricks had once formed part of a now defunct and derelict Second World War munitions factory that had made nitrocellulose – a type of gun cotton used in explosive propellants. All along the Solway – the estuary that separates northwest of England from Galloway in the south of Scotland – there are signs of military infrastructure: abandoned warehouses, chainlink fences, signs that tell you in no uncertain terms to stay off Ministry of Defence (MOD) lands. Just recently, an unexploded bomb had been found at a farm near Gretna, having been dropped by a Luftwaffe bomber some eighty years ago. All throughout the grounds of the Wildfowl and Wetlands Trust centre at Caerlaverock – a place founded for the conservation of geese – there are long, straight, concrete tracks which have remained since munitions transportation during the First World War. Don't try and access the beach if the red flags are flying outside Kirkcudbright: army training drills are taking place. To walk

the entire Solway coast, as I did, is to be keenly aware of a landscape curated by military infrastructure and explosive ordnance. Yet it is also a place with an abundance of wildlife: the entire population of the Svalbard barnacle goose winters here on the Solway.

I came to the Solway to find out about the barnacle geese and their often difficult history with the land, the sea, and the human activities – the military in particular – that take place there. This estuary landscape has always been one of change, from the Roman settlements on the English side that gave way to mines, to the farmland on the Scottish side that was turned into wartime factories, shaped and moulded by the swell of the tides. The story of the barnacle goose is also one of change, of shifting fortunes. After the Second World War, the barnacle goose population was down to a few hundred, largely due to the popularity of the Solway with wildfowlers, who took advantage of the salt marsh and estuary habitat beloved of geese and ducks to shoot them for sport. Conservation measures were implemented to stop the goose going extinct. A barnacle goose hunting ban was introduced to Scotland in

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Fig. 1. The dead barnie (author's own, 2022).

1954, and in 1970, the conservationist (and former keen wildfowler) Peter Scott set up the reserve at Caerlaverock with the express aim of protecting the geese of the Solway.<sup>1</sup> Over time, it worked, and the barnacle goose is now considered one of conservation's big success stories. By 2021, the barnie population was over forty thousand.<sup>2</sup>

Not everybody was pleased that the barnacle goose rebounded so successfully. Geese are notoriously damaging to agriculture, particularly drawn to crops and grassy fields for dairy cow grazing. Solway farmers began complaining that they were losing revenue to the destructive behaviour of the geese, and in 1994 the Goose Management Scheme was introduced by the Scottish government which compensated farmers for the damage, whilst also requiring farms in the vicinity of the barnie feeding zone to provide fields for the geese to forage in.<sup>3</sup> The Scheme has been largely successful, but as barnie numbers have rapidly increased since its implementation, the uneasy truce between farmer and goose is in constant renegotiation. Bird scaring methods are highly regulated: farmers resort to chasing them physically off their land until April 1st when the scaring ban is lifted, then immediately place explosive-propellant fuelled 'bird bangers' (a type of gun that produces a loud bang to scare birds) on their land. There are now too many geese, they say.<sup>4</sup>

I don't know how the goose on the beach died, but a reserve manager at Caerlaverock Wildfowl and Wetlands Trust later tells me it is rare to find a barnie dead from natural causes; it is more

likely that this particular bird died from avian influenza. Avian flu has devastated wild bird populations in the past two years, and has hit the sociable, densely flocked barnacle goose hard. An estimated one third of the entire Solway population has died from the disease; that is, almost sixteen thousand individuals. The huge numbers of deaths lay bare the fraught relations between goose, other birds, human activity, and landscape. Whilst much of the media reporting around the avian flu outbreak has been one of helplessness, categorising it as a 'disease of wild birds',<sup>5</sup> the disease first emerged out of a commercial goose farm and spread to the wild population. Not confined by fences or cages, avian flu could spread rapidly amongst populations, crossing borders and travelling thousands of miles on migratory routes. But to blame the inability to control, or cull, wild birds to stop infections glosses over how capitalism and commodifying nature produces enclosures of nonhumans for profit, but also how the barnacle goose, despite being a wild bird, is also subject to practices of attempted control. More often than not, this involves explosives.

Explosives have long been a part of the barnacle goose's history on the Solway, from the early days of wildfowling, through early conservation measures that used rocket nets to ring geese, and finally to the current situation of intermittent bird scaring and other practices of control. Wildfowling is still a popular activity on the Solway, despite the barnie's protected status, and whilst the munitions factories have been mothballed,<sup>6</sup> the Ministry of Defence (MOD) still maintains a presence in the region. This is a

<sup>1</sup> *Protection of Birds Act 1954*, UK Public General Acts, c.30 (1954).

<sup>2</sup> 'Barnie' is an affectionate nickname for the goose used amongst birdwatchers.

<sup>3</sup> *Solway Barnacle Goose Management Scheme 1994*, Scottish Natural Heritage (1994).

<sup>4</sup> 'Cull of Barnacle geese gets go-ahead on the Solway', *Shooting UK*, 3 December 2012.

<sup>5</sup> Phoebe Weston, 'Deaths of thousands of wild birds from avian flu is 'new Silent Spring'', *The Guardian*, 23 December 2022.

<sup>6</sup> The largest munitions factory, code name Moorside, stretched 9 miles from Longtown to Dornock during the First World War. The Ministry of Defence still owns the entire site.

landscape saturated with explosives in one form or another, and such a landscape necessarily generates questions regarding space, access and control. The material space of the land itself has been partitioned throughout the twentieth century through policy documents, land deeds, evictions, cartographic practices, ordnance, field boundaries and physical fences.<sup>7</sup> The barnacle goose is folded into this spatiality, feeding in the designated feeding zones, roosting on the salt flats, and corresponding to population counts at certain times. Yet look a little closer, and this carefully arranged landscape is rather one of dynamism, unpredictability, and change.

The barnacle goose today is a beloved resident of the Solway, and locals track the seasons by their arrival and departure. Yet their entangled relations with the military and explosive history of the area, alongside the ways their presence is mediated through methods of spatial control, is frequently obscured. Through a sustained engagement with the barnacle goose's conservation trajectory, this article offers a multispecies reading of critical military and historical geographies, arguing that the curated – and resisted – arrangements of geese, people and technologies produce what I'm calling an 'explosive landscape'.

### From military landscape to explosive landscape

Landscapes are dynamic and complex, comprising relations between humans and other actors, enrolling multiple ways of being and seeing.<sup>8</sup> Walking around the Solway allowed for me to practice what Anna Tsing calls 'arts of noticing', which enrolls the methods of natural historians in sensing, experiencing, and viewing landscape through more embodied and careful engagements with other beings and phenomena.<sup>9</sup> I went to the Solway to follow the geese as they flew in from Svalbard; after a difficult previous winter, ravaged by avian flu, what would they be like upon their return? How would the landscape be different, with fewer birds, but many more than before? How would the geese make themselves known, flying overhead in vast V formations, congregating on the merse, their shit staining paths, or their bodies littering the beaches? The story of the geese does not exist in a vacuum, but is rather made tangible and visible by their relations with both the Solway and its other inhabitants – however transient, as I was, they may be. Thom van Dooren states that '[p]laces emerge here as storied landscapes: remembered, reinterpreted, and imbued with a changing value and significance' throughout the lifespan of a bird that returns year after year to the same spot<sup>10</sup>: how, then, is the landscape of the Solway curated by the barnies and their co-evolution with the measures and infrastructures that seek to control them?

To understand the Solway in this way is to notice its military history and geography. By engaging bodily with its particular morphologies, topographies, or disturbances, what emerges is a distinctly lively configuration of place; one which recognises that military landscapes are 'simultaneously material and cultural sites'.<sup>11</sup> Work in both environmental history and geography calls

for a deeper understanding of how military structures, practices, and ideas inflect spaces beyond the battlefield<sup>12</sup>; historicizing the Solway's military past can help us understand how goose lives have been arranged across time and space. This is a place particularly defined by its munitions factories that became vital to the First and Second World Wars: what is now the Devil's Porridge museum in Annan was once the largest munitions site in the world and at the height of World War One was producing eight hundred million tonnes of cordite – a smokeless powder that was easier to transport than traditional gunpowder. Whilst the majority of the factory has closed down,<sup>13</sup> there remains miles and miles of military infrastructure in the form of buildings, fences, and other no-go areas. Barbara Bender argues 'although our engagement with the land is subjective, the land itself, because of its materiality, "talks back" – it sets up resistances and constraints'.<sup>14</sup> The specific materiality of the Solway landscape makes its talking back known through its awkward tidal zones, mud flats and salt marshes, but also the military spaces that litter the land: spaces of inaccessibility or unpredictability, curtailing or enabling my ability to walk or access them (Fig. 2).<sup>15</sup>

The conservation of the barnacle goose since the end of the Second World War is enfolded into the post-military landscape of the Solway through a concentrated strategy of equipment, zones and policy. The geographer Rachel Woodward identifies a need to broaden the scope of military studies to incorporate 'militarisation': something she describes as 'a multi-faceted set of social, cultural, economic and political processes by which military approaches to social problems and issues gain both elite acceptance'.<sup>16</sup> Rather than a focus on warzones and battlefields, military landscapes can be seen as a heterogeneous patchwork of processes, infrastructures and histories that bleed across boundaries.<sup>17</sup> Indeed, in the case of the military infrastructure of the Solway coast, the landscape has not stopped being a military one with the closure of the munitions factories; rather, these military traces produce not only a particular spatiality through the no-access zones of MOD land, but also inflect the way social practices are enacted.<sup>18</sup> This includes extending the remit of militarisation into the nonhuman world – something that might, at first, seem at odds with the seemingly anthropogenic structures of conflict. Whilst the militarisation of nature and the detrimental effects of war on wildlife and habitats have been well documented,<sup>19</sup> processes designed to protect nature, such as conservation, can also reflect military applications.

Astrida Neimenis states that 'militarisation worlds a tentacular existence ... war is not an event with a clear beginning and end, but

<sup>7</sup> Ronan O'Donnell, 'Conflict, agreement and landscape change: methods of enclosure of the Northern English countryside', *Journal of Historical Geography* 44 (2014): 109–121.

<sup>8</sup> *Imagining Landscapes: Past, Present and Future*, ed. by Monica Janowski and Tim Ingold (Abingdon: Ashgate, 2012); John Wylie, *Landscape* (London: Routledge, 2007).

<sup>9</sup> Anna Tsing, *The Mushroom at the End of the World* (Princeton: University of Princeton Press, 2015).

<sup>10</sup> Thom van Dooren, *Flight Ways: Life and Loss at the Edge of Extinction* (New York, University of Columbia Press, 2014).

<sup>11</sup> *Militarized Landscapes: From Gettysburg to Salisbury Plain*, ed by Chris Pearson, Peter Coates and Tim Cole London, Continuum Books, 2010.

<sup>12</sup> Isla Forsyth, 'A Genealogy of Military Geographies: Complicities, Entanglements and Legacies', *Geography Compass* 13 (2019), e12422; Rachel Woodward, 'From Military Geography to Militarism's Geographies: Disciplinary Engagements with the Geographies of Militarism and Military Activities', *Progress in Human Geography* 29 (2005), 718–740.

<sup>13</sup> The factory at Longtown remains in operation as a storage depot.

<sup>14</sup> Barbara Bender, 'Place and Landscape', in *Handbook of Material Culture*, ed. by Chris Tilley, Webb Keane, Susanne Kuechler, Mike Rowlands and Patricia Spyer (Thousand Oaks: Sage, 2006) pp. 303–314: (p. 303).

<sup>15</sup> Laura Bissell, 'Tidal Spaces: Choreographies of Remembrance and Forgetting', *Cultural Geographies* 28 (2021), 177–184.

<sup>16</sup> Rachel Woodward, 'Military Landscapes: Agendas and Approaches for Future Research', *Progress in Human Geography* 38 (2014), 41.

<sup>17</sup> Forsyth, *A Genealogy of Military Geographies*.

<sup>18</sup> Jennifer Wenzel, *Bulletproof: Afterlives of Anticolonial Prophecy in South Africa and Beyond* (Chicago: University of Chicago Press, 2009).

<sup>19</sup> Derek Gregory, 'The Natures of War', *Antipode* 48 (2016), 3–56; Isla Forsyth, 'A Bear's Biography: Hybrid Warfare and the More-than-Human Battlespace, Environment and Planning D 35 (2016), 495–512.



Fig. 2. The boundary between estuary and MOD land (author's own, 2022).

a process'.<sup>20</sup> Here on the Solway, I want to think about the 'tentacular existence' of military technologies not merely through their afterlives or resonances, but rather through their more dynamic, active state of being explosive. An explosion is an expansion of energy that produces the ability of a propulsion; in short, it generates the movement of something to somewhere else. The technological evolution of explosives took place in no small part on, and because of, the Solway landscape: as a reaction to world war, far enough away from German air strikes, bolstered by the region's access to materials and water, to fulfil a requirement for transportable, stable, less visible gunpowder.<sup>21</sup> The particular materiality of cordite,<sup>22</sup> giving way to nitrocellulose, and further development of smokeless powders is indicative of the applicability of these new explosives to processes beyond the battlefield, but these processes never quite leave the designs of militarisation<sup>23</sup>: securitising territory, spatial control, and violence. However, the very nature of explosions and the energy they generate mean they cannot be completely controlled. Things can, and do, go wrong. Something is always at the same time *being* exploded, and will necessarily produce new and unpredictable relations.

To define the barnacle goose's conservation as a process of 'militarisation' does not quite capture the specific ways in which explosives of non-military application are used in different spatial and political arenas. It is important to maintain a distinction from

specific military technologies, which Woodward describes as 'simultaneously recognising distinctions between civilian and military phenomena, whilst also recognising that they are entangled, co-constituted and co-dependent'.<sup>24</sup> To address that, I am proposing the term 'explosive landscape' as a way to account for both the militarized approach of organising goose life through explosives, but also the ways in which this organisation is often subverted and broken down by the dynamic qualities of a multi-species Solway milieu.<sup>25</sup> I take my inspiration for the Solway's shifting identity from the tidal waters that act as a porous boundary between the land and the sea. Young Rae Choi, writing on slippery tidal ontologies, speaks of the 'in betweenness of tidal flats'.<sup>26</sup> Such in between zones are difficult to formally spatialise through cartography, and are experienced very differently in person; my walk followed no official path, choosing rather to hug the coast as best I could – a task that seemed simple on a map, but my body in the material environment found the shifting and often unpredictable tides, as well as unnavigable pieces of land, difficult to manoeuvre through.<sup>27</sup> Access was tricky and, like the geese, I was often unsure if I was 'allowed' to be there.

The estuary itself is characterised as something that sweeps away, covers up, but is certainly not separate from the military activity in the region; factory waste from Moorside was dumped untreated into the Solway Firth, and munitions have also ended up in there, either by accident through careless measures, or purposefully through dumping. It was suggested to me that a large

<sup>20</sup> Astrida Neimenis, 'Held in Suspense: Mustard Gas Legalities in the Gotland Deep', in *Blue Legalities: The Life and Laws of the Sea*, ed. by Irus Braverman and Elizabeth Johnson (Durham: Duke University Press, 2020), pp. 45–62 (p. 54).

<sup>21</sup> Richard Rice, 'Smokeless Powder: Scientific and Institutional Contexts at the End of the Nineteenth Century', in *Gunpowder, Explosives and the State*, ed. by Brenda Buchanan (London: Routledge, 2006), pp. 355–366.

<sup>22</sup> Cordite was so volatile that several munitions factories exploded during the First World War.

<sup>23</sup> Rachel Woodward, 'Militarisation and the Creation of Place', in *The Routledge Handbook of Place*, ed. by Tim Edensor, Ares Kalandides and Uma Kothari (London: Routledge, 2020), pp. 377–388.

<sup>24</sup> Woodward, *Militarisation and the Creation of Space*, p. 378.

<sup>25</sup> Sarah Whatmore and Steve Hinchliffe, 'Ecological Landscapes', in *The Oxford Handbook of Material Culture Studies*, ed. by Dan Hicks and Mary Beaudry (Oxford: University of Oxford Press, 2010), pp. 440–458.

<sup>26</sup> Young Rae Choi, 'Slippery Ontologies of Tidal Flats', *Environment and Planning E: Nature and Space* 5 (2022), 340–361.

<sup>27</sup> Stephanie Springgay and Sarah E. Truman, *Walking Methodologies in a More-than-Human World: Walkinglab* (London: Routledge, 2018).

reason for the dwindling population of barnies between the world wars was due to munitions testing. Later, in the 1980s, the Ministry of Defence fired thirty tonnes of explosives containing uranium into the sea off the coast of Kirkcudbright, their excuse for this illegal act being that the explosives were placed there, rather than dumped. In her sound art piece on the event titled 'the sea cannot be depleted', the artist and scholar Wallace Heim states 'The firings were a rehearsal and were hostile fire on a homeland ... How can one understand the slow corrosion that remains? What does it mean for a place, a people, to cohere with the unseen objects of war?'<sup>28</sup> I want to extend this thinking to encompass the more-than-human. How, exactly, does the Solway's history of explosives cohere with the story of the barnacle goose and what can this tell us about the militarisation of multispecies landscapes?

This article seeks to understand the trajectory of the barnacle goose's conservation through an analysis of three types of explosives: first, through the guns used by wildfowling that were instrumental in bringing the Solway barnie to the brink of extinction; second, through the rocket nets invented by the Wildfowl and Wetlands Trust (WWT) founder Peter Scott used for attaching rings to the legs of the geese; third, through the explosive 'bird bangers' used by farmers to drive geese away from their fields. These three methods encompass different ways of organising both goose life and landscape since the Second World War; taken together, I argue that they constitute a particular 'explosive landscape' of the Solway – one that is constantly changing, both spatially and materially. By exploring the histories of the co-evolution of the barnacle geese and explosives, a story emerges that initially promises control over goose numbers and lives, but this is quick to break down. Geese have created their own histories against a backdrop of distinctly human infrastructures; they are, like the landscape itself, neither purely natural nor social beings. When considering the question posed by Heim, the Solway's explosive landscape might be said to encompass the 'unseen objects of war' she references – not directly, perhaps, but through an application of strategic explosive devices that dictate where and how goose life can flourish. But as with radioactive dumps that, whilst covered by the sea, are not going away, so too do the geese transgress the boundaries mapped out for them.

### Wildfowling and their guns

Wildfowling on the Solway has a long history, on both sides of the estuary divide. Whilst hunting or poaching geese for food has been practised out of necessity by the working or peasant classes since medieval times, wildfowling as a sport emerged largely as Victorian gentleman's pastime through a concentrated effort to unpeopled natural landscapes.<sup>29</sup> Scotland in particular became a sort of upper-class playground; wealthy aristocrats, mostly from southern England, began buying up large swathes of the Highlands that had become available due to the clearances and converting the land into sporting estates.<sup>30</sup> Whilst the majority of these provided stag and grouse shooting, the Solway attracted the attention of wildfowling who were drawn to its abundance of birds – particularly as it was the only spot on mainland Great Britain to hunt the barnacle goose. Wildfowling infrastructure such as the Nith Hotel emerged during the late 1800s to cater for shooting parties visiting the area. WWT founder Peter Scott's wildfowling diaries document

a trip he undertook with several friends in 1928, with much of their time dedicated to seeking out barnacle geese.<sup>31</sup> Whilst he writes that the barnies were elusive at first, he and his group managed to shoot twenty-two with the shotgun and seventeen with the punt gun.

Wildfowling appeared to be the young Peter Scott's main pastime, particularly during his years at Cambridge University when he would document trips to the surrounding fens almost weekly. Indeed, it is common for wildfowling to express a deep love of the natural world<sup>32</sup>; Scott himself began a degree in natural sciences, before switching to art history, and eventually became a wildlife illustrator known for his paintings of geese. In 1946 he founded the WWT, with the first reserve located on the Severn Estuary. It is unclear what exactly caused Scott to turn his back on shooting geese and switch to their conservation instead,<sup>33</sup> although his diaries reveal an understanding that wildfowling should not upset the balance of nature, and in one section writes of his disdain towards a shooter who was not obeying the rules of the sport. Nonetheless, Scott abandoned wildfowling completely when he realised the precarious position many of his favourite species were in. In a 1951 article he states: 'I have been fascinated by them these twenty years. To me they are the most romantic and fascinating creatures in the world.'<sup>34</sup> In 1970, the WWT bought land at Caerlaverock, the exact site Scott himself had shot barnacle geese several decades previously.

By the end of the Second World War, the barnacle goose population had suffered massive losses due to the wildfowling activity in the region, as well as the disruption across the two world wars; in 1948 only an estimated 300 birds arrived from Svalbard.<sup>35</sup> In 1954, the 'Protection of Birds Act' was introduced to the UK which limited the killing of wild birds, and restricted wildfowling to certain areas and certain times of the year.<sup>36</sup> Wildfowling clubs and organisations had already started to limit their own shoots as a response to dwindling numbers, but the new law placed further limitations around what was already becoming an anachronistic pastime. The barnacle goose was added to a list of species for which a total hunting ban was applied; Norway followed suit two years later, meaning the barnie was now protected all along its flyway. The numbers began to rebound. In response to the increased scrutiny around the legislation, wildfowling associations began to emerge as a way to both protect their hobby and also to handle the often confusing administration pertaining to new rules and issuing of permits.

Scott's correspondence throughout the 1970s and 1980s regarding Caerlaverock reveals a fraught tension between his designs for the reserve and the demands made by the local wildfowling groups.<sup>37</sup> A fight between the two factions emerged largely through a dispute over what constituted the particular landscape topography of the Solway. By law, the wildfowling were allowed access to – and to shoot on – the Solway's foreshore, defined as the edge of the shore that was periodically covered and revealed by the tides; in legal terms, it is neither

<sup>28</sup> Wallace Heim, 'The Sea Cannot be Depleted', <https://theseacannotbedepleted.net/> last accessed 20 February 2023.

<sup>29</sup> David Matless, Paul Merchant and Charles Watkins, 'Animal Landscapes: Otters and Wildfowl in England 1945–1970', *Transactions of the Institute of British Geographers* 30 (2005), 191–205.

<sup>30</sup> Hayden Lorimer, 'Guns, Game and the Grandee: The Cultural Politics of Deer-stalking in the Scottish Highlands', *Ecumene* 7 (2000), 403–431.

<sup>31</sup> Peter Scott, Wildfowling diaries, 1951, Peter Scott papers, University of Cambridge [hereafter PSP], A.621–A.626.

<sup>32</sup> Eric Begbie, *The New Wildfowler* (London: Stanley Paul, 1989).

<sup>33</sup> One rumour goes that Scott shot one of a pair, and watched as the dead goose's mate circled down in pursuit. To Scott, this was proof that geese were just the same as humans and should be treated accordingly.

<sup>34</sup> Scott, Catching Wild Geese with Rocket Nets, 1951, PSP, E.71, 1.

<sup>35</sup> Ian Bainbridge, 'Goose Management in Scotland: An Overview', *Ambio* 46 (2017), 224.

<sup>36</sup> *Protection of Birds Act 1954*, UK Public General Acts.

<sup>37</sup> Scott, Caerlaverock Correspondence, 1970–1985, PSP, C.88–C.92.

land nor sea.<sup>38</sup> Given that the foreshore cannot be ‘owned’ due to its awkward definition, the public are legally permitted to use the foreshore for recreational purposes.<sup>39</sup> The WWT, therefore, could only control what happened on their land up to the foreshore (see Fig. 3); however, where the foreshore began and ended was bitterly contested between the WWT and the wildfowlingers, with Scott demanding a ‘cordon sanitaire’ to provide a buffer for the geese, and advocating that any wildfowler found on the merse (grass) be subject to an ‘armed trespass’ charge (a charge refuted by the wildfowling associations). The director of the Nature Conservancy Council in a letter to Scott states ‘the situation becomes very confused by misinterpretation of the exact legal status of the boundary line in estuarine situations.’<sup>40</sup> The Solway wildfowling associations threatened to exercise their full legal rights to shoot along the foreshore, even if it threatened the cordon sanitaire, unless a more diplomatic solution could be found. To that Scott retorted: ‘The shore is an integral part of conservation representing future generations. Times change.’<sup>41</sup>

Times change, tides change. Whilst the wildfowlingers were not (officially) hunting barnies, they were still permitted to shoot other geese; given that Caerlaverock contained the densest goose flocks and had been used for hunting for centuries, the situation was an intensely personal one for both sides. The Scottish Conservative MP Hector Munro intervened in the spat,<sup>42</sup> threatening that if Scott did not back down to the wildfowlingers, he would consider repealing the hunting ban on the barnacle goose.<sup>43</sup> Unsurprisingly, this did not go down well with Scott, and he doubled down on his efforts to limit wildfowling at Caerlaverock by attempting to mobilise the law in his favour. Not content with enforcing the cordon sanitaire, he claimed that the Solway waters also constituted the WWT reserve as a way to bar punt gunning – a type of fowling that involves mounting a large, heavy gun on a boat and is far more destructive than a shotgun.<sup>44</sup> He mobilised an obscure bye-law to be used in conjunction with a no armed trespass charge that stated any land or sea that was ‘ex-adverso’ (opposite) from the reserve could also be considered its territory; this included the foreshore and the estuary itself.<sup>45</sup> In November of 1981, one of the building managers at Caerlaverock informed Scott of a ‘serious and sinister development’ on the land: a shooting hide had been illegally set up on the merse by a ‘well known anti Barnacle man’, who was known to the WWT for filing bogus reports on the agricultural damage caused by the barnies.<sup>46</sup> The WWT took the man to court for trespass but, although the judge ruled that the merse could not be considered the foreshore, found the defendant not guilty.<sup>47</sup> Scott was furious. Despite the shooting ban, barnies continued to be hunted illegally, and in 1976 Caerlaverock reported that out of all the barnacle geese they ringed that year, 20% contained lead shot.<sup>48</sup>

Today, in an example of brutal irony, it is Caerlaverock WWT reserve that issues permits for wildfowling, both with shotguns and

punt guns, to shoot on the estate. They do this to monitor and control the way wildfowling is done, and there are strict regulations on shooting duration and bag size, but it still rankles some of the wardens that they are enabling a practice that is detrimental to the birds’ wellbeing. Wildfowling associations also self-monitor and report exactly what has been shot on what day, and there are regular meetings between them and Caerlaverock.<sup>49</sup> The system largely works, although one of the wardens I spoke to revealed a large part of his job was keeping the more over-exuberant shooters in check. Whilst there are less wildfowlingers now than in Scott’s day, modern shot is more destructive: lead shot was banned in Scotland in 2000 and now many wildfowlingers self-load their shells with more steel shot than is necessary to increase their chances of a kill, but this also increases the chance of hitting other birds. The wildfowlingers’ main defence of their sport is that it is part of the cultural heritage of the Solway, and although its popularity is nowhere near that of previous decades, the circulation of guns and gunners along the foreshore, scattering out into the Firth by way of punts, blurring the boundaries of trespass onto the merse, has meant that explosives saturate the landscape across time and space.

Wildfowling is not exactly a fair fight, but the geese are active participants in curating the explosive landscape of the Solway. They congregate around Caerlaverock, drawn to its wide, grassy spaces and mudflats, generating the tension between conservation and killing. Their increasing numbers since the hunting ban in 1952 and the concentrated efforts of the WWT to protect them produced new spatialities that organised not only goose life, but accessibility as well, both legal and material. By following the fraught history of wildfowling on the Solway, it becomes clear that *both* geese and shooters have been spatially arranged by explosive technologies. Where guns are allowed to be on the Solway, and what they are allowed to shoot, is a complex negotiation between the land itself and the vested interests of geese, conservationists and wildfowlingers.

### Conservationists and their rocket nets

As the churn of the Solway’s munitions factories slowed down at the end of the Second World War, barnacle goose conservation began in earnest. Whilst I am not advocating for causality or correlation, the landscape itself, curated by a particular spatiality of factories, fences and other military infrastructures, cannot be separated from the conservation activities that took place in the decades following wartime. Because the munitions sites have remained off-limits to human development, they have become havens of wildlife. Both Moorside and Powfoot formed landscapes of a huge area relative to their size: sheds storing cordite or nitrocellulose had to be spaced far enough apart that any explosion would not cause any of the other sheds to ignite, and a perimeter fence that endures to this day prevents access. When interviewing Gordon, the former floor supervisor at the Longtown factory, he speculated that the reason why nothing had ever been built on the mothballed site was due to unexploded ordnance and other forms of explosive waste being buried in the ground. Explosives here literally make the landscape.

The Powfoot munitions factory has become a Site of Special Scientific Interest and is a stronghold for the natterjack toad. As for the Moorside site, Gordon revealed he frequently saw wildlife during his time working at the factory:

The good thing about these military sites and these shooting ranges and places, there is a lot of conservation goes on by the

<sup>38</sup> Derek McGlashan, Robert Duck and Colin Reid, ‘The Foreshore: Geographical Implications of the Three Legal Systems in Great Britain’, *Area* 36 (2004), 338–347.

<sup>39</sup> McGlashan, Duck and Reid, *The Foreshore*.

<sup>40</sup> Letter from the Nature Conservancy Council, 22 July 1981, PSP, C.90.

<sup>41</sup> Note from Peter Scott, n.d., PSP, C.91.

<sup>42</sup> Munro was also president of the Scottish Solway Wildfowlingers Association so this seems to be a gross conflict of interest.

<sup>43</sup> Letter from Hector Munro to Peter Scott, 26 May 1981, PSP, C.90.

<sup>44</sup> Whilst punt gunning has largely fallen out of fashion, it has continued in small pockets on the Solway since the Second World War.

<sup>45</sup> Letter from Peter Scott to John Morton Boyd, 8 August 1981, PSP, C.90.

<sup>46</sup> Letter from Colin Campbell to Peter Scott, 15 November 1981, PSP, C.91.

<sup>47</sup> The Kerr Case, 3 August 1981, PSP, C.90.

<sup>48</sup> Report from Wildfowl Trust Reserve, Caerlaverock, 24 March 1976, PSP, C.89.

<sup>49</sup> Scottish Government, National Goose Forum Minutes 2021, *Environment and Forestry Directorate*, 2022.

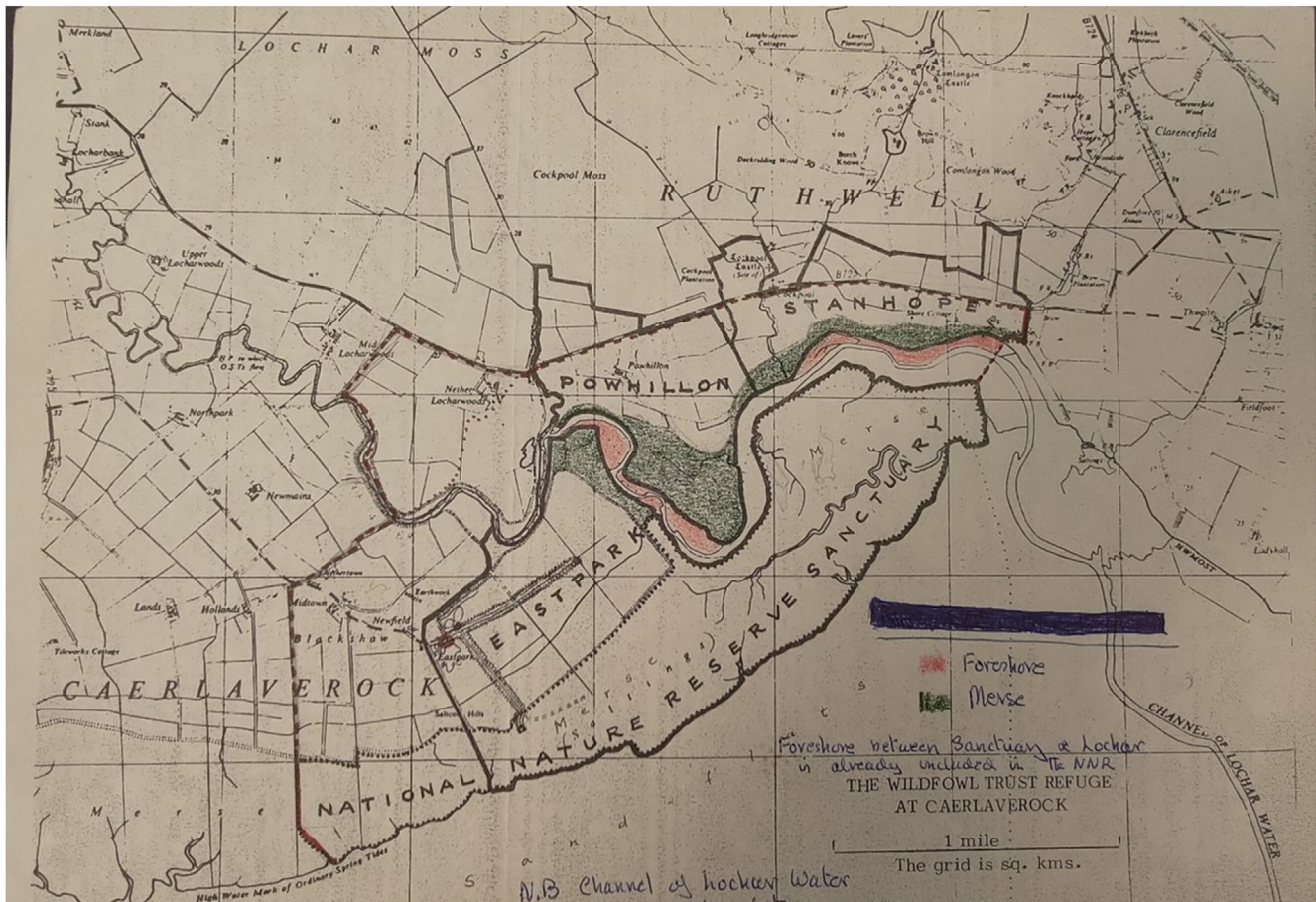


Fig. 3. Caerlaverock estate attempt to map the foreshore. Reproduced with permission from the University of Cambridge, PSP, A.708, n.d.

shore - although it was an ammunition depot, we used to feed deer and wild birds and things. So even though there were shooters at the time, there was also some conservation. The foundations of the old laboratories were flooded, and there was fish in there, there were all sorts of butterflies, birds nests everywhere so it was ideal for conservation. The ammunition business didn't really disturb the wildlife - they could survive next to each other.<sup>50</sup>

My walk around the Moorside perimeter revealed glimpses of deer, foxes, rabbits and all manner of birds; whilst no direct conservation takes place there, its inaccessibility due to the fence and incoming tides mean it is an in-between space, its boundaries between land and sea, permissible land and MOD land frequently transgressed by wildlife. There is a long history of post-military spaces either being 'reclaimed by wildlife' or being purposely turned into refuges. David Havlick writes on this phenomenon: 'As landscapes that in various ways can be considered both militarized and natural, sites of military-to-wildlife conversion emerge not as simple natural or social spaces but as blended sites with natural, social, and technological elements.'<sup>51</sup> Acknowledging these sites as neither purely natural nor social makes it possible to view both the munitions factory and the barnacle goose refuge at Caerlaverock

not as distinct opposites, but rather as entangled topologies that form part of a dynamic explosive landscape.

In 1948, Peter Scott and his team at the Severn Wildfowl Trust invented the rocket propelled net for conservation purposes (Fig. 4). Having established that many wildfowl species were declining in number, he set up the first WWT sanctuary near Bristol as a way to do something about it. But as the majority of geese and ducks his refuge catered to were migratory, Scott knew more needed to be done: 'We realised that we needed to know a good deal more about the birds themselves, about their behaviours, their breeding habits, their movements and migrations' he stated in 1951.<sup>52</sup> Ringing - a process by which a small aluminium ring is attached to a bird's leg containing its location data - is the main tactic for monitoring bird behaviour, and Scott's rocket net was designed to make it easier to catch the notoriously skittish ducks and geese so they could be ringed. Although he acknowledges that the chances of the ring being found and returned to the accompanying address is very slim, the fact that wildfowl are so frequently shot makes them ideal candidates for ringing. Indeed, he rapturously praises his own achievements upon receiving four recovered rings from the Kanin Peninsula and Kursk in Russia. Given that Scott was writing in the early days of the Cold War, his exuberance is perhaps understandable: 'We may look back to this as a happy break in the clouds, through which there flies ... not a

<sup>50</sup> Gordon Routledge, interview with Charlotte Wrigley (Longtown, October 14, 2022).

<sup>51</sup> David Havlick, *Bombs Away: Militarisation, Conservation, and Ecological Restoration* (Chicago: University of Chicago Press, 2018), p. 2.

<sup>52</sup> Scott, *Catching wild geese*, 1951, PSP, 1.



Fig. 4. Peter Scott (second from right) and his ringing team. Reproduced with permission from the University of Cambridge, PSP, A.708, n.d.

dove carrying an olive branch, but a wild goose carrying an aluminium ring.<sup>53</sup>

Scott's prototype rocket net was an unwieldy, expensive piece of equipment that was liable to fail. He and his team first tested the nets on the Solway and attempted to catch pink-footed geese that had recently arrived from Svalbard. He details the laborious process, from setting the 30-yard-long nets, attempting to hide them under grass, and then waiting in an excited tension for the geese to settle in the right place. With a 'teasing calico noise of rushing wings and a great babel of goose talk',<sup>54</sup> they circle down into the field until there are around a thousand geese clustered together. Fire! The net shoots outwards at a 45-degree angle and, whilst most of the geese take off at the loud bang, the trajectory and speed of the net means that some are caught beneath it; the average over 14 attempts that day was 28 geese.<sup>55</sup> The process of disentangling the geese without hurting them is also a laborious one, and the geese are hooded to prevent panic, before being ringed and their tails dipped in paint. There was also a distinct possibility the explosives could fail, which the team found to their frustration after two days waiting for the geese to settle, only to discover the explosive powder used to propel the rockets had become saturated with water.

It is pertinent that the rocket net was first used on the Solway. Whilst not directly related, the fact that tonnes and tonnes of explosives had been produced in factories a few miles away from the main wildfowl areas forms a major component of the patchwork explosive landscape. Whilst the explosive has been updated – once the cordite used in Scott's early prototypes became scarce, it was replaced with more modern explosives – the rocket nets used in conservation today has remained largely the same. The evolution of explosives that are easy to transport has meant that rocket net ringing can take place in more isolated regions of the planet. Whilst Scott's expedition to Iceland in 1951 to ring pink-footed geese did not take rocket nets – the team rounded the geese into nets using Icelandic ponies<sup>56</sup> – the first student expedition to Svalbard did. In 1962, seven students from Oslo University travelled to Spitsbergen and used Scott's invention to capture and ring several hundred barnacle geese; out of an estimated 1100 barnies, the team managed to ring 685 of them.<sup>57</sup> It is these geese who would have made the one thousand kilometre flight back to the Solway for the winter, and no doubt Peter Scott would have captured some of them himself.

Ringling as a method of conservation might be understood as a form of control. Whilst the use of explosives through shotguns and

<sup>53</sup> Scott, *Catching wild geese*, 1951, PSP, 7.

<sup>54</sup> Scott, *Catching wild geese*, 1951, PSP, 3.

<sup>55</sup> Scott, *Catching wild geese*, 1951, PSP, 4.

<sup>56</sup> Peter Scott and James Fisher, *A Thousand Geese* (London: Collins, 1953).

<sup>57</sup> Thor Larsen and Magnar Norderhaug, 'The Ringing of Barnacle Geese in Spitsbergen, 1962', *Wildfowl Trust Annual Report* 14, 98–104.



punt guns administers violence, using explosives for benign reasons does not fully sever the attachment to military practices that foreground security and control of the unit as standard. Through ringing, the netted geese become augmented and defined through explosive technologies, becoming forced to relinquish their individual lives in favour of the good of the species.<sup>58</sup> As Mark Barrow puts it: 'endangered species must in effect become partially domesticated, subjected to continued human surveillance, manipulation, and control to ensure their continued perpetuation.'<sup>59</sup> Of course, as with any explosive, the practice of ringing can also be violent. Whilst Scott detailed the great care he and his team took in disentangling the geese, the fact is they are powerful devices that can sometimes kill. Steve, one of the farmers on the Caerlaverock site, revealed that 'they used to rocket them to catch them for tagging and they used to kill half a dozen every time they set the rockets off'; on one of these occasions, he admitted to trying to cook and eat one of the casualties, but pronounced it 'bloody awful'.

Yet to define ringing as an uninterrupted manifestation of human control over nature would be incorrect, and denies the active refusals and transgressions practised by the geese.<sup>60</sup> Rather, what the practice of ringing through explosives captures is the inherent dynamism present in both attempting to control the barnie's conservation trajectory through surveillance, but also how a bird might thwart such attempts. Put simply, the geese might just not be there. That the rocket net followed the barnie along its flyway demonstrates how an explosive landscape is not a static one, nor is it fixed in place; just like the geese themselves. That military technology is used in conservation is indicative that explosive landscapes are a complex milieu of socio-natural processes that can not be contained by fences, land ownership patterns, or other boundary making practices; they are formed of dynamic relations that resist separated spatial orderings of nature, culture and technology. The cordite made on the Solway may not have ended up in the cartridges of Scott's nets, but its production in the factories of Moorside and its importance to explosive technological evolution is inextricably linked to other applications, both on the Solway and beyond.

### Farmers and their bird bangers

There has been agriculture on the Solway for as long as there has been wildfowling. Whilst much of Dumfries and Galloway is only suitable for forestry and sheep hill farming, the Solway coast is a unique landscape of marsh, merse and estuary. In the medieval period, the need for farmable land meant that the local monks drained the wetlands to form fields. Today, the agricultural terrain largely comprises meat and dairy farms. Cows were frequently encountered on my walk, often wandering along the foreshore without the need for fences; as well as sources of milk and beef, they are important for controlling the vegetation that grows on the saltmarsh – a traditional form of grazing that has been done for a thousand years.<sup>61</sup> Saltmarsh is a particular ecosystem that only occurs next to estuaries, and is shaped and produced by the coming and going of the tides, an correspondance of covering and revealing a patchwork of mud and vegetation. The specific plantlife that grows on saltmarsh provides a thriving habitat for birds and other creatures. Geese, in particular, love it.

<sup>58</sup> Jenny Isaacs, 'The "Bander's Grip": Reading Zones of Human-Shorebird Contact', *Environment and Planning E: Nature and Space* 2 (2019), 732–760.

<sup>59</sup> Mark Barrow, *Nature's Ghosts: Confronting Extinction from the Age of Jefferson to the Age of Ecology* (Chicago: University of Chicago Press, 2009), p. 344.

<sup>60</sup> Charlotte Wrigley, 'It's a Bird! It's a Plane! An Aerial Biopolitics for a Multi-species Sky', *Environment and Planning E: Nature and Space* 1 (2018), 712–734.

<sup>61</sup> Ann Lingard, *The Fresh and the Salt: The Story of the Solway* (Edinburgh: Birlinn, 2017).

One of Peter Scott's first acts when he bought the land at Caerlaverock was an attempt to evict a tenant farmer who still had several years left on his lease. In the early days of the takeover, the reserve were careful to claim they would not overly affect the agricultural activity in the area, stating they 'felt it was important that the Wildfowl Trust did not leave themselves open to criticism in respect of the misuse of valuable agricultural land'.<sup>62</sup> However, it was clear that Scott resented the farming activity around Caerlaverock and saw it as detrimental to the geese, and he stated that 'the major disturbance to wildfowl was not due to stock [cows] but to stockmen'.<sup>63</sup> Grazing cows eating grass on the merse produces a shorter sward (the height the grass grows to) which is beneficial for goose feeding; however, if the geese eat too much grass, there is less available for the cows, and if the cows eat too much grass, there is less available for the geese. The spat between the WWT and the tenant farmer James McRae emerged because the latter's farming practices were considered destructive by the former, and in 1975 the Trust tried a number of tactics to encourage McRae to give up his tenancy: they included increasing the rent, offering him a settlement to leave, and demanding that he change his farming activity.<sup>64</sup> It doesn't appear that McRae responded positively to any of these tactics and the situation was described as 'unworkable' in 1976.<sup>65</sup>

As the geese numbers increased, the complaints from the farming community increased with them. A rather terse meeting between Caerlaverock and the National Farmers Union (NFU) saw the Trust offering to provide bird scaring bangers to surrounding farms, but it was noted that 'no requests for bangers had yet been received, despite the claims of goose damage by certain farmers'. According to the WWT, they regarded any further meetings to be useless – reading between the lines, it seems that they thought the farmers were making a fuss out of nothing. Nonetheless, geese numbers continued to rise throughout the 1980s and 1990s and after targeted lobbying from farmers the Scottish government decided that something had to be done. A National Goose Forum for Scotland was established in 1997,<sup>66</sup> and the government also asked organisations such as the WWT and Scottish Natural Heritage (now NatureScot) to produce reports on the relationship between geese and agriculture.<sup>67</sup>

The Solway's goose management scheme was introduced in 1994, alongside similar schemes in other parts of Scotland that were experiencing goose-farmer tensions. These schemes were managed locally and although they largely followed the same strategy of financially compensating farmers for agricultural damage, there were regional differences: for example, on the Hebridean island of Islay, the wintering grounds of the Greenland barnacle goose population, it is permissible to shoot them despite the national hunting ban. On the Solway, dispensations to shoot are rare, farmers must allocate some of their land for goose feeding, and bird scaring devices are tightly controlled: only non-lethal, quiet scaring (no bird bangers) is allowed in the feeding zone and buffer zones, and only when the field in question is in a reseeding state.<sup>68</sup> However, on April 1st, as the geese are

<sup>62</sup> Minutes from Solway Wildfowling Association, 12 November 1970, PSP, C.88.

<sup>63</sup> Letter from Peter Scott to James McRae, 18 November 1970, PSP, C.88.

<sup>64</sup> Modifications to Eastpark Farm, Caerlaverock, 20 December 1975, PSP, C.89.

<sup>65</sup> Letter from Colin Campbell to Peter Scott, 29 March 1976, PSP, C.89.

<sup>66</sup> Scottish Government, National Goose Forum, 2000.

<sup>67</sup> Bainbridge, *Goose Management in Scotland*; David Cope, Juliet Vickery and Marcus Rowcliffe, 'From Conflict to Coexistence: A Case Study of Geese and Agriculture in Scotland', in *People and Wildlife: Conflict or Coexistence?*, ed. by Rosie Woodroffe, Simon Thirgood and Alan Rabinowitz (Cambridge: Cambridge University Press, 2010), pp. 176–191.

<sup>68</sup> *Solway Barnacle Goose Management Scheme 1994*.



**Fig. 5.** The barnacle geese feeding on farmland at Caerlaverock (author's own, 2022).

preparing to leave on their migration to Svalbard, audible scaring is permitted. The most common methods are bird bangers, which is a gun that fires a non-lethal cartridge, and gas guns which use pressurised air to periodically produce a loud bang. Usually, at least one bird banger per affected field is needed, and it is down to luck whether the birds will move on for the day, or come back when they perceive the danger to be over. However, they are much more effective than quiet scaring, and there are rumours they are used outside the official window; some days explosions can be heard across the fields, according to a local resident.

For the farmers on the Solway today, the goose management scheme rescued their livelihoods, but they know the scheme likely cannot last forever. Recently there have been rumblings in the Scottish government that the money could be put to better use, and that the payments should be wound down; as it stands, there are only two years left on the current goose scheme, and the likeliest outcome is that it would get folded into a more general agrarian-environment strategy that would level out compensation (the goose scheme currently pays four times the rate of other agricultural compensation payments). Meanwhile, barnacle geese – the devastating impact of avian flu notwithstanding – numbers are at their highest ever recorded. To lose the goose scheme now would send many farms under. It isn't that farmers hate the geese; they do, however, recognise the delicate situation that now exists on the Solway. The farm next to Caerlaverock has been run by the same family since 1944 and has experienced every stage of the barnacle goose's Solway history. Its current owners both sit on the goose management scheme steering committee and rely on the payments in order to get by; indeed, given the proximity of their farm to the reserve, their fields are by far the heaviest used – and thus most damaged – by the geese (Fig. 5). Steve tells me how his grandfather would think nothing of taking a shotgun out to his fields in the 1940s, despite

the barnies at the time only numbering a few hundred<sup>69</sup>; by way of defending this act, he dubbed Peter Scott 'the biggest bloody murderer of the lot!'. According to Steve, his grandfather was not too impressed when Scott decided to reinvent himself as the "saviour of the geese".

Steve considers the problem to be one of balance. When the geese numbered around ten thousand, he claims, everybody got on. A reserve warden at Caerlaverock privately admitted he felt the same, stating that the special protections for the barnies on the Solway has over-inflated the numbers. He cited a scientific study that puts the peak barnie population at around 16,000 geese, given the relatively limited breeding area on Svalbard. When barnie watching with a local enthusiast, he remarked how skittish the geese are when they first arrive on the Solway, having spent the last few months avoiding predators; on the Solway, by contrast, they are subject to very little disturbance, and by the end of the winter have grown in confidence. This, understandably, is frustrating to farmers who have no desire to hurt the barnies, but want to remove them from their fields. Quiet scaring like scarecrows doesn't work with a bird as clever as the barnie. Bird bangers and gas guns work but would have to be placed in every field because the geese learn where they are and react accordingly. The best method according to Steve is simply firing rockets into the air; set them off just right, and the geese will move along for the day. This, of course, does not address the main problem of there being too many geese.

The goose management scheme represents a messy combination of different political interests, agencies, spatialities, economies and values. The barnies flying in for the winter is a beloved sight for many people who live on the Solway, and the geese themselves have

<sup>69</sup> Steve admits his father shot the barnies on his land, despite the hunting ban being in force, as a way to force the goose scheme into law.

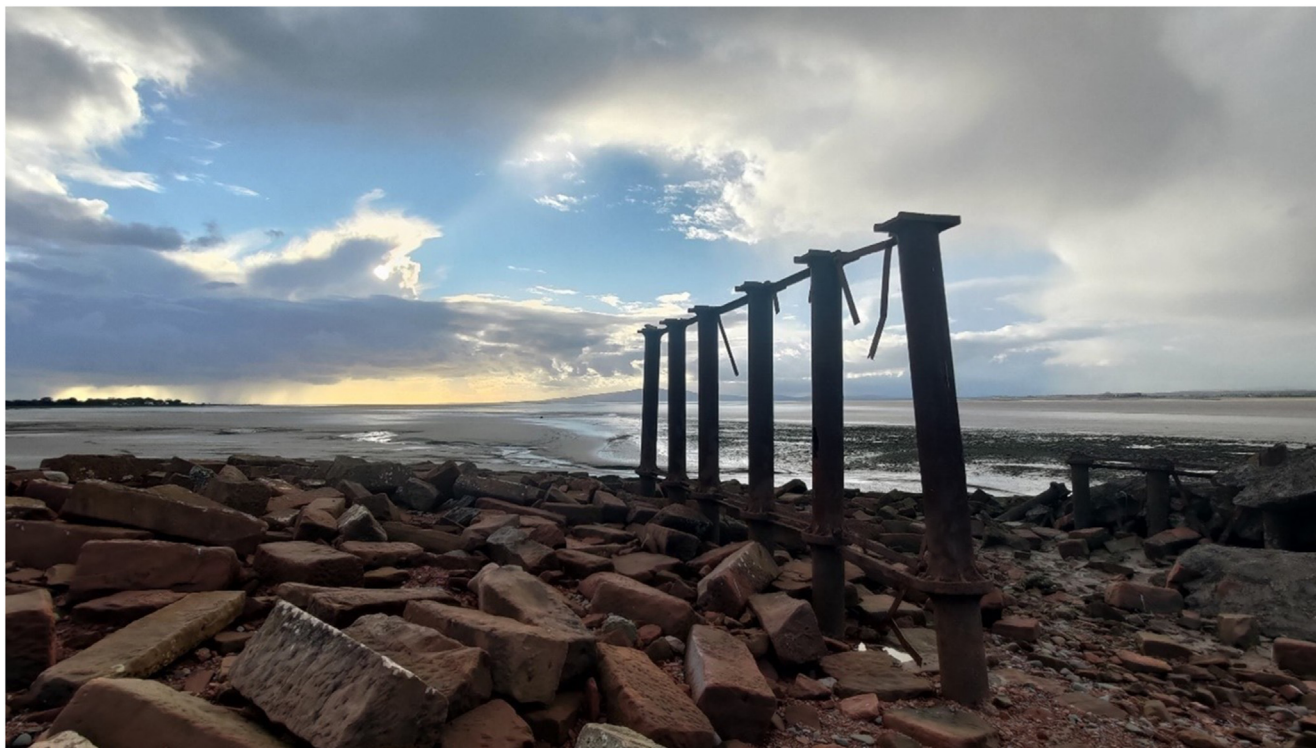


Fig. 6. What is left of the Solway viaduct (author's own, 2022).

benefitted hugely from both the shooting ban and the protected feeding grounds. The farmers are largely happy with the compensation payments they receive, but with the end of the goose scheme approaching, this could soon change. Steve puts it: 'If they go tomorrow 'right that's it' [regarding ending the goose payments] we'll scare the geese with rockets and gas guns and shooting and we'll keep the geese off cos we'll have to, but that's going to upset everybody.' This is an explosive landscape marked not only through the use of various explosive devices for keeping birds at bay, but also as a delicate situation with the *potential* to explode. A complex set of political and organisational structures are in place through meetings, committees, designated zones for scaring and feeding, goose counts (an ecologist visits every Solway farm in the scheme to count goose numbers twice monthly), and compensation payments; these must be kept finely balanced for the scheme to work. How much money awarded is dependent on how many geese are in a particular field during the count; this could be zero if the barnies decide to stay away. Thus, farmers must also finely balance their scaring so as to keep birds on their fields when the counts take place.

It is becoming clear to all involved that governmental decisions made thirty, or even seventy years ago, cannot account for such a rapidly shifting situation. As much as the goose management scheme attempts to keep all sides happy, the dynamic qualities of goose life and its refusal to stay put mean that the complex entanglement of different actors on the Solway is in constant and unpredictable tension. An explosive landscape emerges as both a material transgression and an administrative infrastructural breakdown.<sup>70</sup> Goose agency, as much as it might be mediated (or not) by different forms of scaring, dictates how a field might look

and how much grass will be eaten, prompting farmers to either take matters into their own hands or demand the goose management scheme addresses the problem. However, the liveliness of the geese also curate how the scheme is distributed or what scaring methods are permitted. The forms of enclosure and control meted by the Goose Scheme and its scaring guidelines are broken down, with the unpredictability and dynamic quality that the geese engender on the Solway producing a landscape that is constantly being remade, transgressed, and rendered explosive.

## Conclusion

The Solway Firth cuts so deeply into the landmass of England and Scotland that it almost completely isolates the headlands of northwest Cumbria and Galloway. Any transportation, of raw materials from the mines of Maryport say, would have to take a not insignificant detour through Carlisle. It made sense, therefore, to propose a bridge across the Solway where the channel was narrowest, from Bowness-on-Solway in England to Annan in Scotland. In 1869 the Solway Junction Railway was officially opened with the ability to cross the Solway by way of a 1.8 km long viaduct.<sup>71</sup> The viaduct proved invaluable for transporting munitions from the Moorside factories during the First World War but debts from almost constant repair began to spiral and the railway was closed for good in 1921.<sup>72</sup> Dismantling it proved dangerous, with explosives used to dislodge many of the more stubborn pillars, and three workers lost their lives in the process. Today, only a few scant girders and brick piles remain of the attempt to span the estuary,

<sup>70</sup> Andrew Barry, 'The Material Politics of Infrastructure', in *TechnoScienceSociety: Technological Reconfigurations of Science and Society*, ed. by Sabine Maassen, Sascha Dickel and Cristoph Schneider (Basel: Springer, 2020), pp. 91–109.

<sup>71</sup> Whilst the viaduct worked well at first, the Solway itself had other ideas. One particularly cold winter saw icebergs drift down the estuary from the North Sea and crash into the viaduct, almost destroying it.

<sup>72</sup> Gordon Routledge, *Gretna's Secret War* (Carlisle: Bookcase, 1999).

yet they are remnants of a patchwork explosive landscape that continues to actively shape the Solway (Fig. 6).

The Solway is a landscape that enfolds both material and cultural facets, yet at the same time remains beholden to none of them. The shifting tides mean that any attempt to 'capture' it through formalised methods such as mapping, policy, infrastructure and land ownership will very likely come undone; it is an in-between zone that refuses to stay still.<sup>73</sup> Attempting to place the Solway is what has produced the situation with the barnacle goose throughout its long, entangled history with the area: wildfowling led to record-low numbers, resulting in a patchwork of protection orders, management schemes and conservation practices. Bringing the Svalbard barnie back from the brink of extinction necessitated various spatialising practices that involved knowing where the goose was, and where it would go, at all times. Allowances for shooting were made dependent on cartographic definitions, allowances for scaring were made dependent on feeding zones and buffers, whilst allowances for rocket netting and ringing were made dependent on goose density and movements. All these devices are used under the guise of curating a particular spatiality where goose life is either allowed or disallowed. This constitutes, I have argued, a militarisation of the Solway landscape; a set of practices that are defined by a regimented ordering and control.

Yet this does not quite capture what is a dynamic, shifting and ongoing situation. Military studies in historical geography has revealed the long arm of military infrastructure and practices into civilian arenas, but this article has sought to enfold more-than-human agencies into a place both anchored by its military history but also constituted by lively multispecies entanglements. Just as the Solway tides produce an in-between zone that is neither land nor sea, the fraught relations between the different methods used to arrange the geese and the geese themselves are constitutive of what I'm calling an explosive landscape. It is impossible to pull apart the histories of explosives and munitions on the Solway and their application in the various devices used in the context of the barnacle goose, be they the shotgun shells used to blast them from the sky, the cordite filled rocket nets used to monitor their flight-paths, or the smokeless powder fuelled bangs that scare them – potentially – from the fields. The barnacle goose cannot be defined as a purely natural being, but rather a techno-natural hybrid co-produced alongside explosive infrastructure<sup>74</sup> – an entity that transgresses its expected trajectory and spatiality, yet at the same time is inseparable from the various methods used to contain it. There can be no Solway barnacle goose without the legacy of

explosives, yet these explosive devices are similarly mediated by the geese themselves. This is a constantly changing state of in-betweenness, of being out-of-control, just as the estuary tides are. It is this instability that produces the excess to militarisation, imploring military histories and geographies to attend to the ways nonhumans are either enfolded into or resist post-military landscapes.

Up to a third of the Svalbard barnies died during the winter of 2021 avian flu outbreak, and the disease has shown no signs of going away. However, the initial reports coming off the Solway for 2022 are hopeful: wardens at RSPB Mersehead are tentatively optimistic that the population has avoided a flock-wide infection.<sup>75</sup> As I write this, the geese still have four months on the Solway before they make their journey back to Svalbard, where once there they will face other challenges such as a climate-altered habitat and an increase in hungry predators. Their lives on the Solway are transient, as all migratory birds' are. When they leave, the fields are silent, and the cows are free to graze; when they return, visitors flock to Caerlaverock and Mersehead. The town of Dumfries hosts the 'wild goose festival' to celebrate how the region has been shaped by the temporalities of goose migration, culminating in a local composer presenting the final iteration of a five-year multi-form project on the barnies titled 'From Solway to Svalbard'.<sup>76</sup> Throughout my walk, crossing from England to Scotland, directed by the whim of tides, the geese are everywhere, even if they are not necessarily visible. My friend, nature writer and Solway resident Stephen Rutt once said 'I find hope in the borderless world of birds'; to that, I agree.

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<sup>73</sup> Choi, *Shifting Ontologies*.

<sup>74</sup> Damian White and Chris Wilbert, *Technonatures: Environments, Technologies, Spaces, and Places in the Twenty-First Century*, (Waterloo: Wilfried Laurier University Press, 2010); Adam Searle, Jonathon Turnbull and William Adams, 'The Digital Peregrine: A Technonatural History of a Cosmopolitan Raptor', *Transactions from the Institute of British Geographers* 48 (2023), 195–212.

<sup>75</sup> RSPB video, Bird Flu Update – geese at Mersehead, Youtube, <https://www.youtube.com/watch?v=qy9yHbnZ6to>, last accessed 21/02/2023.

<sup>76</sup> Stuart Macpherson, 'Solway to Svalbard', <https://www.stuartmacpherson.net/solway-to-svalbard>, last accessed 21/02/2023.