

## Sand dunes, mobility, and cultural heritage



Sand Dunes — Terence Philip Flanagan.\*



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## Executive Summary

During the summer of 2018 I was fortunate to be able to pursue a sabbatical researching sand dunes, their mobility (past, present, and future), and impacts on cultural heritage. My travels took me from the Atlantic coast of South West France, to the Low Countries, around the UK and the island of Ireland.

My research theme centred on the idea that dune landscapes are rich in cultural heritage, yet their inherent dynamism and potentially increased future mobility, driven by climate change, may present new challenges for dune managers and dune stakeholders — challenges that need to be better understood.

The word cloud on page two of this report illustrates the diverse cultural heritage interests associated with dunes, a diversity that I have been able to bring together, under 11 broad thematic headings in Part Two of this report.

Through conversations with dune managers, academics, and dune stakeholders it became clear that cultural heritage stories and associations offer a way to engage with and capture public interest in dune landscapes. This approach is perhaps more easily accessible than the often technical narratives of the natural sciences.

In addition to cataloguing the cultural heritage interests I also researched the topic of physical dune mobility based on historic, contemporary, and projected future dune behaviour. Over the coming decades we will need to get used to the idea of shorelines changing rapidly in response to climate change. Dune coasts are no exception, and indeed we are already seeing evidence of this during storm events with beach lowering and cutting back of foredune features.

The impact of climate change on dune landscapes is however likely to be mixed. On the one hand dune fronts and beaches are likely to become increasingly mobilised in response to storm events, and correspondingly the cultural heritage features within this zone will be impacted first and worst. In marked contrast the dune hinterlands are likely to maintain their stability, due to the protective mantle of sand binding vegetation and processes of ecological succession, meaning that any onset of greater mobility could be delayed for decades. There will be exceptions to more stable dune hinterlands where for example mobility already exists, such as at Formby on the Sefton coast.

Whilst the impacts of climate change at the coast may vary, what is certain is that at a site-based scale the likely impacts will need to be taken into account by those managing sand dunes, for nature, for cultural heritage, for recreation, or as sea defence structures. For the Trust this will mean committing resources to understand and record change on beaches and in foredunes, not just in reaction to individual storm events but as part of a regular regime of monitoring that provides an evidence base to show how sand dunes, and their mobility, are impacting on cultural heritage over time. To this end I offer the following recommendations:

1. Recognise that cultural heritage features associated with sand dunes are of significant value in providing a tangible way to better understand shoreline change and engage with stakeholders

2. Pursue a proactive programme of monitoring coastal change on sand dune sites in partnership with relevant agencies and research establishments with a specific emphasis on historic environment interests, adopting the SCAPE model from Scotland, and as appropriate linking to region and country Coastal Monitoring Observatories.
3. Put in place a more fleet-of-foot approach to achieving preservation by record that can be rapidly mobilised by having in place 'call-out contracts' to enable additional external expert help to be deployed in response to a storm event.
4. Review Trust sand dune locations to determine where, through acquisition or partnership working, it is possible to provide accommodation space for dune evolution inland or along the shoreline.
5. Contribute to the Dynamic Dunescapes project workstream 'Sand dune management handbook' to develop contemporary guidance for site managers that includes geomorphological, historic, and natural environment interests, climate change impacts and access issues.
6. Maintain and/or establish broad ranging sand dune management research partnerships with Universities and other research bodies for key Trust sand dune locations.

As a parallel output from my summer in the dunes and this report I have sought to use my rudimentary skills as an amateur potter to bring together arts, cultural heritage, and natural science interests. The pieces I have thrown were informed by the things I observed, and my responses to the people and places I visited on my travels. A 'Catalogue' of these ceramic pieces called 'Sand and Clay' can be found in Annex 3 at the end of this report.



## Preface

More than half a century ago, as a young boy growing up in the land-locked English midlands, the thrill of being unleashed during school holidays into the marram scented dunes on the coast of Wales was eagerly anticipated, and marked the start of my sand dune journey.

At this time, not too distant from the end of the Second World War (that last mass disturber of UK dunes), and before today's atmospheric nitrogen fuelled vegetation took hold of our dunes, my abiding childhood recollection is of towering bare sand dunes. A memory that may in part be influenced by scale when viewed from a small boy's end of the telescope but even allowing for this distortion evidence abounds that in many of our dune systems in the 1960s bare mobile sand was king, and I confess to playing my part in maintaining this mobility through burrowing and sliding. A favourite was to find an isolated platform of marram close to a dune crest, dig away to expose its downhill edge and as the last roots were severed jump aboard and ride the clump down into the dune hollow.



After school and college, the latter giving me an education in the emerging discipline of countryside management, I found myself in the early 1980s as Area Warden for The National Trust on the south and east of the Isle of Wight. St Helen's Duver, a pocket handkerchief sized dune near Bembridge, was part of my patch. Duver is the Isle of Wight word for sand dune and in accordance with my training I spent my time confining walkers to the board walks we installed, and halting the progress of cars into the dunes with rows of angry dragon's teeth.

By 1996 and now working in Cornwall I was fortunate enough to travel to Lithuania and visit the Curonian Spit near Klaipeda as part of a small National Trust team commissioned by the European Union to assess the cultural and natural heritage preparedness of the Baltic States in their bid for EU accession.

Out on The Spit, and under the watchful gaze of the armed guards just over the border in the Russian enclave of Kaliningrad, I was overwhelmed by the scale and magnificence of this vast, dynamic, almost living and breathing, mobile dune landscape. Our guide, Professor Ramunas Povilanskas, led us through and around the margins of the dune system and from time to time we'd

stop to observe a small cemetery of intricately carved, and naturally sand blasted wooden headstones, or a pine plantation slowly succumbing to the suffocating shifting sand. Both these sights were clear references to human interactions with dunes, telling stories of people living in and deriving a livelihood from these marginal lands.

The vast mobile dunes of the Curonian Spit like those to the west along the Baltic coast of Poland in the Slowinski National Park are both the keeper and revealer of secrets amongst the shifting sands. Along the dune front at Slowinski periodic storm events reveal the riddles of past ecology in the form of amber, occasionally containing the entombed remains of an unfortunate insect that met a sticky end. Inland the great sand sheet gradually, almost imperceptibly, journeys landwards quietly smothering all it encounters.

Closer to home and back in Cornwall shifting sands have also made their mark on coastal communities. St Gothian's Chapel at Gwithian, was buried by sand in the 13<sup>th</sup> Century. In his survey of Cornwall (1602) Richard Carew reported "*Gwithian, a parish standing near St Ives Baye, much annoyed with sea sande, which flyeth at lowe water with the winde out the choked haven into the Lande, swallowing up muche of the lande of the inhabitants, to their great impoverishment*"<sup>[1]</sup>.

Dune landscapes are rich in cultural heritage, yet their latent dynamism and potential increased future mobility will present new challenges for dune managers and dune stakeholders — challenges that in relation to cultural heritage need to be better understood if we are all to avoid further "*impoverishment*".

What became clear to me as I have pursued my summer's research through conversations with dune managers, academics, and dune stakeholders is that cultural heritage stories and associations offer a way to engage with and capture public interest in dune landscapes, in a way that is more easily accessible than the sometimes unfathomable narratives of the natural sciences.

Yet conversely attention in dune landscapes tends to default to natural science interests, and nature conservation in particular, a sentiment expressed by my colleague Andrew Brockbank at Formby, a National Trust dune site on the Sefton coast in Lancashire. Andrew has had a close involvement in developing a major dune management project at Formby. In reflecting back he felt that within this project cultural heritage often felt misunderstood and has not gained the attention it deserves.

In my own reflections I sense this oversight might in part be because, unlike dune nature conservation practice, which neatly catalogues dune habitats into ten categories<sup>[2]</sup>, cultural heritage interests remain dispersed. And, as I have found, cultural heritage interests in dunes are varied. Based upon this sentiment one of my intentions for this report is to corral together, under broad thematic headings, the cultural heritage interests of the dune landscapes I visited along the Atlantic coast of north west Europe.

I say more about my fascination with dunes in the introduction but I want to emphasise here that this report is not a study of the geomorphological behaviour of dunes, nor does it examine their nature conservation value, albeit both are important natural science topics. My focus is initially on cataloguing the broad headings of cultural heritage interest in dunes, followed by an exploration of the interaction with dune mobility and stability, past, present, and future. I conclude by giving

consideration to what this might mean for dune managers, wider society and specifically make a number of recommendations for the Trust to consider.

My focus on cultural heritage means this report is as much about people as it is about places. The countless generations of people who have left their footprints, permanent or ephemeral, in dune landscapes. And significantly for me, the people I encountered during the summer of 2018 on my dune journey, the people who shared with me their insights, knowledge, and enthusiasm for sand dunes.

I'd like to thank:

Ian Barnes, Jake Boex, John and Mary Breeds, Patrick Bazin, Andrew Brockbank, Sally Brown, David Brown, David Bullock, Tony Canniford, Tim Collins, Louise Cooke, Andrew Cooper, Rob Cornish, Sue Cornwell, Julie Creer, Tom Cunningham, Céline Damery, Sarah Davies, Tom Dawson, Caitlin Desilvey, Frank Devlin, Robert Devoy, Pascal Dower, Toby Driver, Annabel Drysdale, David Duggan, Corine Dyke, Harry Trebilcock, Laurence Dyke, Hannah Fluck, Tony Flux, Pat Foley, Neil Forbes, Luc Geelen, Andy Godber, Lucie Gonzalez, Loic Gouguet, Ellie Graham, Joanna Hambly, Jim Hansom, Felicity Harris, Charlotte Hawksworth, Jean-Louis Herrier, Derek Jackson, Mark Hipkin, John Houston, Minnie Ingram, Alan Kearsley-Evans, Isabelle Kisielewski, Peter Knight, Mareike Kuipers, Régis Leymarie, Benedict LeMaire, Patrick Lynch, David McNamara, Nathalie Madrid, Helen Mann, Adam Mantell, Kate Martin, Richard Neale, Abigail North, Adrian Olivier, Coen Oosterom, Morwenna Owen, Emma Plunkett-Dillon, Ramunas Povilanskas, Solène Pradel, Simon Pryor, Ken Pye, Shirley Reid, Paul Rooney, Reinhardt Strubbe, Pat Vaughen, Maria De Vos, Jo Whatmough, Graham Williams, and Freek Zwart.



On the Sands — Laurence Stephen Lowry (1887–1976) The Lowry.\*

I am grateful to the National Trust, for enabling me to pursue my interest in dunes, and I hope that the thoughts, findings, and recommendations contained in this report in some way inform the Trust's approach to managing cultural heritage interests in our dunes in the future.



## Introduction — about this report

My fascination with sand dunes is prompted by two of their underlying physical characteristics.

The first dune trait is instability, actual or dormant. This attribute for potential rapid change is rare amongst landforms, other examples perhaps being rivers changing course or major landslip systems. We are more used to thinking about geological change and even geomorphological change on long timescales — dunes have the capacity to change radically, not perhaps in the blink of an eye, but certainly overnight or during the course of a single tide. This potential for change and dormant instability is of course a paradox as sand dunes have a remarkable capacity, given accommodation space, to adapt to change — to form and reform in response to a variety of pressures; man-made interventions, climate change induced impacts or simply the weather in the form of a storm.

The second dune trait relates to the first and centres on the consequences of the simple movement of sand. Given the right combination of wind speed, humidity, and grain size, sand begins to move — an aeolian procession begins. Each grain of sand contained within a dune is a tiny building block, and each grain, once free, has the potential to move and, grain by grain, smother or uncover adjacent land, akin to a flood, but of sand. This smothering and uncovering, or besanding and revealing, is central to my exploration of sand dunes, their mobility, and impacts on cultural heritage.



The building blocks — sand collected from Braunton Burrows, Devon. Photographed under the microscope at Braunton Countryside Centre.

Thirty years ago The Sand Dune Inventory of Europe<sup>[3]</sup> provided a snapshot of the sand dune resource across the continent, and in particular highlighted the importance of dunes as a key component of the Atlantic coastal region. The Inventory was a response to growing concerns amongst conservationists that sand dunes continued to suffer from human depredation; pressure from the planting of trees to slow sand movement, and pressure from tourism and its attendant infrastructure, to name but two. These, and a host of other pressures, often acting in combination, were gradually chipping away at the extent of sand dune habitats along the sedimentary coasts of the Atlantic seaboard, the geographic area that I chose to investigate in part.

From the latter decades of the 20<sup>th</sup> Century to the present-day sand dune conservation thinking and practice has tended to value dunes primarily for the range of habitats they contain; from the

embryonic dunes scabbling landward of the strandline, to the open dunes devoid of vegetation, or the fixed dunes in the form of dune grassland and dune heath, and the much venerated humid dune slacks, as well as various forms of wooded dunes. This emphasis in dune conservation on caring for biodiversity is completely understood and I recognise its importance, indeed it is how I first came into professional contact with dune landscapes. But over time I have become increasingly intrigued by the cultural heritage features of these landscapes, and the way that mobile sand, given the opportunity, can toy with these features, sometimes besanding or revealing at will.

In 2016 I was sent a copy of the draft Dune Roadmap for the Atlantic Biogeographic Region 2016–2020<sup>[4]</sup> by self-confessed dune nerd Paul Rooney of Liverpool Hope University. The Roadmap seeks to reignite knowledge exchange and networking amongst dune managers, particularly those with responsibility for Natura 2000 sites, and was the product of the Atlantic Biogeographic Seminar held in Ennistymon, Ireland. In the words of John Houston, the Roadmap's editor, it describes and sets out the relevance for a series of actions, identifies possible lead bodies, and establishes a target timetable.

Scanning the tables of actions in the Roadmap it was clear to me that the focus of dune managers remains on nature conservation related topics; developing research on nitrogen deposition, early warnings on invasive non-native species, and so on. But a key action also emerged around developing guidelines on how to incorporate dune dynamics into the interpretation of Favourable Condition Status, and this provided something of a bridge across to my area of interest; dune mobility and impacts on cultural heritage.

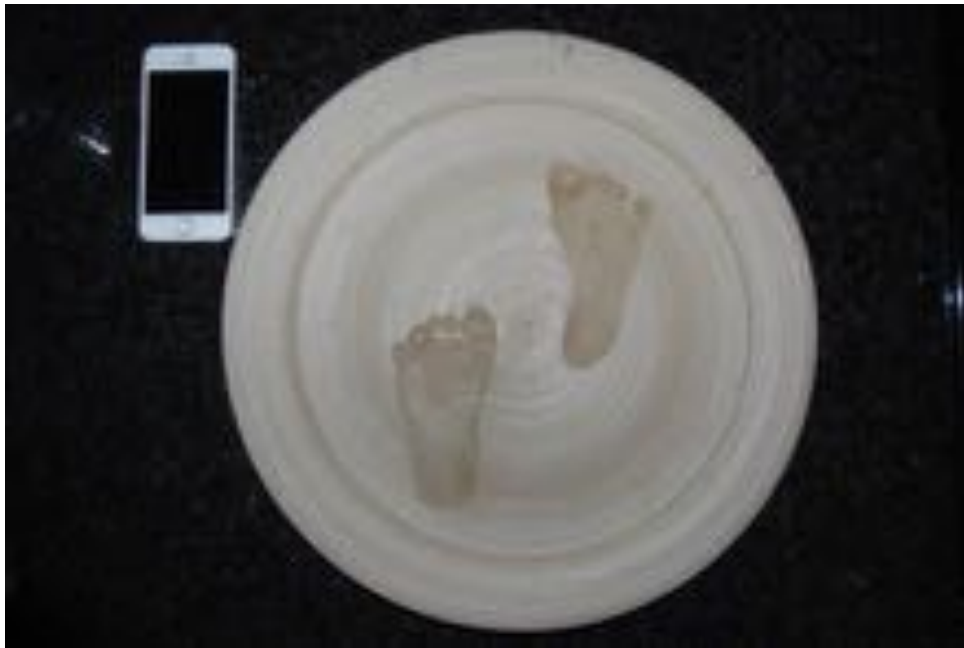
My intention with this report is to balance the attention, quite properly given to nature conservation in dunes, by painting a picture of the range of cultural heritage conservation interests within and on the margins of the dune sites I visited during the summer of 2018. Taking as a starting point the current predominantly stable nature of these systems (albeit with some notable exceptions), I explore the impacts of past, present, and future dune mobility on these cultural heritage features and suggest some actions and approaches that we may need to build in to sand dune conservation, and indeed wider coastal management effort in the future.

The first part of this report sets out the approach to my research, its geographical extent and looks at the physical context of what is happening in both the fixed, and occasionally more mobile dune landscapes of the Atlantic coast. We are arguably currently in a phase of Peak Stability for dunes — atmospheric nitrogen deposition, warmer wetter winters (meaning a longer growing season), lack of grazing management, the demise of the rabbit, and peace in Europe for 70 years have all conspired to encourage the green mantle of dune vegetation and processes of ecological succession to advance. Yet, at the same time, we are moving towards a point where, either through the impacts of climate change, or the actions of dune managers, this phase of peak stability may yield to a new phase of dune dynamism.

The second part of the report is a series of entries based on eleven broad categories of cultural heritage interests in dune landscapes that I encountered on my travels. These illustrate some of the ways people have interacted with sand dunes over the centuries, and continue to do so.

The third part of this report examines our attitudes towards dunes, fixed or mobile. I touch on how attitudes to dune conservation management and public perceptions have changed, and continue to evolve through time.

The final section of the report discusses how well equipped we are within the National Trust to manage cultural heritage interests in the sand dunes in our care as we move, potentially, from peak stability to the possibility of a future characterised by increased mobility. I set out a number of recommendations for the National Trust to consider as a significant dune manager across England, Wales, and Northern Ireland. These recommendations might also be of interest to a wider community of those with responsibilities towards sand dunes.



Formby footprints platter by the author — in the making.

Alongside this report, and as a parallel output from my summer in the dunes, I have sought to use my rudimentary skills as an amateur potter to bring together arts, cultural heritage, and natural science interests in pursuit of my research. On my travels I collected sand samples from many of the sites I visited, and mixed with clay, have thrown and slab-built pots reflecting the things I observed and my responses to these places. I had originally hoped that my ceramic pieces, combined with photography, would form a modest exhibition and provide a point of entry for a wider audience to explore some of the issues in my report in relation to sand dunes, mobility, and cultural heritage. COVID-19 has rather cut across the territory of exhibitions for the foreseeable future. As an alternative I offer a catalogue of photographs in Annex 3 under the title 'Sand and Clay' in the hope that it might be of some interest to readers.

The thoughts in this report are mine, influenced by those I corresponded with and talked to on my travels in the summer of 2018 and in the intervening period. Any inaccuracies, for which I apologise, are also mine.

Phil Dyke  
December 2020

### Physical attributes

Sand dunes form part of a wider geomorphological system in the coastal zone. Pursuing a transect from sea to land the key elements of this wider system include; the subtidal near-shore zone (extending from the outer limits of where waves interact with seabed sediments), giving way to the active surf zone and inter-tidal area. Moving on up the beach we reach the dunes, which extend as far landwards as the historic reach of windblown sand or earlier shorelines. This whole system is characterised by dynamism, and through the combined influence of currents, waves, and wind offers the opportunity for sediment transport and movement on a grand scale. For the dune component specifically, phases of mobility and natural coastal dynamics lead to a sequence of dune ridges, which [generally] increase in stability the further away from the sea they are<sup>[5]</sup>.

In terms of ecological function the littoral zone comprises two distinctive systems; the nearshore and beach areas containing assemblages of marine species and biotopes, and from high tide mark landwards, the dunes, which contain a range of terrestrial habitats and species.

Dune vegetation occurs as a successional development from bare sand to full vegetation cover, its rate is slowed by disturbance (both natural and anthropogenic), but hastened by artificial stabilisation, reduced sediment supply, eutrophication, and climate change<sup>[5]</sup>. There has been a consistent trend in dunes towards increased vegetation cover and over-stabilisation in the UK, and across north-west Europe resulting in the loss of specialised species. Some of the sites I visited have managed to buck this trend, and contain large tracts of open mobile dune, such as the Sands of Forvie in Scotland, Formby on the Sefton coast, and the Dune du Pilat in Aquitaine, France.



Dune du Pilat and Arguin sand bank, Aquitaine — sediment movement on a grand scale.

Dunes form when a plentiful supply of sand, delivered by long-shore processes, combines with high energy onshore winds. The movement of sand above the high tide level is principally driven by aeolian processes. The initial trapping of windblown sand is encouraged by the presence of strandline detritus or pioneer vegetation such as sea couch. As deposition continues embryo dunes form and grow to become a foredune ridge. If the dune continues to receive sand the foredune grows in height providing the ideal conditions for marram and other sand trapping grasses to thrive<sup>[6]</sup>.



Braunton Burrows, Devon — embryonic dune merging to the foredune ridge.

Dunes come in a variety of forms; foreshore dunes are common on spits, nesses, and islands, and typically include embryo dunes, foredunes, and tombolos. Hindshore dunes occupy land behind the beach and can comprise successions of dune ridges, blowouts, parabolic dunes, and dune slacks. Climbing, or perched dunes, where sand is blown up a cliff to settle on higher ground and machair dunes, a flat sand plain developed landward of the dune ridge, are two further variations. The latter restricted to the west coasts of Scotland and the Republic of Ireland.

Sand dunes along the Atlantic coast of Europe are recent arrivals when measured against geological timescales. The Dune du Pilat in Aquitaine, France is Europe's highest dune at ~110 metres above sea level, yet dates from just 4,000 BP. The extensive estuary dune systems of Inch Spit and Rossbeigh in County Kerry, Eire have developed in their current form since the 16<sup>th</sup> Century. However, dunes should not be viewed as permanent structures; the spit system at Rossbeigh is showing signs of rapid deconstruction. Since 2008 the spit has halved in extent, a new tidal channel has punched through the middle of the spit, leaving a sand dune island in the inner-part of Dingle Bay.



Rossbeigh, Dingle Bay — image courtesy of Pascal Dower.

This state of impermanence associated with many dune systems is often masked by a human perception that dunes are in fact permanent. A perceived state of permanence that we have amplified over the centuries by our attempts to modify dunes and beaches through a range of human activities. For example, but not exhaustively; through marram grass and tree planting, beach nourishments, construction of groynes and sand dykes, drainage works, livestock grazing, aggregate and water extraction, and recreation. This ability to modify, and in some senses ‘control’ dunes, strengthens the notion that dunes are permanent. In reality dunes form and build when conditions are right, but should circumstances change dune behaviour also adjusts, and can switch to a phase of deconstruction leading to sand being recycled back into the marine environment, moved laterally along the shoreline, or forced landwards by the wind.

There is historical and archaeological evidence that coastal dunes have at times been more geomorphologically active, either because larger quantities of sand were arriving or vegetation cover was sparser, so that bare and mobile dunes drifted more than they do now<sup>[6]</sup>. Destruction of dune vegetation through the uprooting of marram to provide material for thatching, intensive rabbit warrening, and periods of increased storminess are all examples of the causes of historic dune mobility.

In the historic record the Little Ice Age of the 15<sup>th</sup> to 17<sup>th</sup> Centuries forms a standout period when many dune coasts were either substantially altered, came into being, or marched landwards. At Inch Spit, County Kerry, Eire the historic dunes, dating back millennia, were ‘top-sliced’ during the period

of storminess associated with the Little Ice Age. The precedent dunes, accumulated over previous millennia, were battered and scattered by storms resulting in a gap in the record or sequence of dune development from around 6,000 BP until evidence of a period dune 'building' emerges again after the 17<sup>th</sup> Century.

More recently, activities associated with war, and in particular the Second World War, with the testing of new armaments and techniques of war, led to significant areas of new bare sand and mobile dune being created, such as at Braunton Burrows in Devon.

The publication of UKCP18<sup>[7]</sup> climate change projections, based upon the underlying global scale trend data from the IPCC, reminds us once again of the emergence of a new period of potential rapid change at the coast, as sea levels rise and wave energy reaching the shoreline increases.

## **Climate change**

Climate Change and adapting to its impacts, at the coast or inland, is one of the great challenges of our time.

The National Trust commissioned a Coastal Risk Assessment some 15 years ago and has since then been working to understand better the challenges rising sea levels and increased storminess pose, and is putting in place Coastal Adaptation Strategies for its places based on the principle of working with natural processes. Large parts of the coast of Great Britain already experience a number of problems, including sediment starvation and erosion, loss/degradation of coastal ecosystems, and significant exposure to coastal flooding. Sea-level rise and other potential climate change impacts will exacerbate all of these issues<sup>[8]</sup>.

In the Last Beach<sup>[9]</sup> Orrin Pilkey and Andrew Cooper raise the prospect that if we do not make the switch to managing our shorelines in a way that works with nature rather than against it there is a very real prospect that our beaches will become endangered features on some of our coasts. Impacts on beaches are likely to have knock-on effects on foredunes, and potentially the associated sand dune hinterlands.

Beach lowering is a common storm related phenomenon on dune frontages. As high energy storm waves reach the shoreline the foot of the frontal dunes is cut away and the sediment transported offshore, suspended in the water column. Ensuing calm conditions allow the gradual recovery of the beach profile. On eroding coasts each storm event cuts back a little further into the foredune leading to a gradual recession of the coastline. It can be argued that beach erosion is now a widespread natural phenomenon, and that stable or prograding beaches are anomalous on coasts where a major marine transgression (the sea moving landwards) has been followed by a still-stand<sup>[6]</sup>.

The impact of climate change on dune systems does not however equate simply to a future dominated by instability and increased mobility. An increase in vegetation cover on dunes has been the dominant trend over recent decades. Future climate change and predicted temperature rises (meaning a longer growing season) are likely to further enhance this phenomenon and therefore [continue] moving many of Europe's dune systems into an immobile state<sup>[10]</sup>.

The exception to this is the likely future behaviour of beaches and foredunes in response to individual storm events resulting in rapid recession of the dune front, a trend that is likely to accelerate in the future, perhaps not in terms of an increase in the frequency of storms but through storms that do arise becoming more intense. The trend of bigger waves, resulting in more wave energy reaching the shoreline, looks set to continue, exacerbated by sea-level rise. UKCP18<sup>[7]</sup> reports that annual maximum significant wave height is projected to increase by ~1 m or 20% by the end of the 21<sup>st</sup> Century: increases are found to occur off the south west of the UK, in parts of the Irish Sea and to the north of the UK but reductions are seen off the west of Ireland and in the southern North Sea.

Uncertainties associated with these projections are significant, and in any case the impacts of storms will vary on a site by site basis according to aspect, exposure, and sediment supply.



Inch Spit, Kerry — one consequence of foredune erosion.

Dune sites that are cut off from a replenishing sand supply are the most vulnerable, whilst those in down-drift locations may benefit from an increase in the deposition of new sediment. An example of this can be found at Formby on the Sefton coast of Lancashire. The dunes at Formby Point are eroding back at around 4 metres a year, whilst locations immediately to the north and south of the Point, at Ainsdale and Ravenmeoles respectively, are benefitting from the arrival of new Formby-derived sand. Currently dynamic dunes at locations such as Formby or the Dune du Pilat on the Aquitaine coast of South West France, provide potential insights into dune behaviour that might become more common in the longer term as sea levels rise and the intensity of storms increase.





Figure 1 — Position of NW Europe coastline since end of the Last Glacial Maximum. NGS.

Change at the coast is of course nothing new and shorelines have varied significantly over time — most recently and dramatically in response to the end of the Last Glacial Maximum (Figure 1).

Today's Atlantic coast of northwest Europe is very different from that which existed 18,000 years ago when large quantities of water were locked up on land in ice sheets.

Sea-level rise and periods of storminess are not new to human experience. Overtime, as a species, we have come to think we are in control at the shoreline, not least as a consequence of the civil engineering advances made since the 19<sup>th</sup> Century. The American writer Gary Soucie reminds us however, *“the real conflict at the beach is not between the sea and the shore, but between man and nature. On the beach, nature has achieved a dynamic equilibrium that is alien to man and his static sense of equilibrium. Once a line has been established, whether it is a shoreline or a property line, man unreasonably expects it to stay put”*.

Over the coming decades we will once again need to get used to the idea of shorelines changing as a new period of climate change induced marine transgression takes hold. Dune coasts are no exception and will be impacted by these broad-scale environmental changes, indeed we are already seeing evidence of this during storm events with beach lowering and cutting back of foredune features.



Newborough Warren, Anglesey — storm impacts on a dune frontage.

However, the impact of climate change on dune landscapes is a complex mix, and we should not lose sight of the fact that, in contrast to the prospect of increasingly dynamic dune fronts, our heavily vegetated dune hinterlands are likely to be far more resilient to change. With this picture of differential dune behaviour in mind it is worth elaborating on the need to make a clear distinction about the nature of the changes we are likely to see in dune landscapes, a distinction between the future behaviour of dune fronts and that of dune hinterlands. A distinction that will see sediment dynamics forced to reside more within the beach and nearshore areas, with inland sediment pathways blocked or severely restricted<sup>[10]</sup>.

In other words dune fronts and beaches will become increasingly mobilised in response to storm events, and correspondingly the cultural heritage features within this zone will be impacted first and worst. In marked contrast the dune hinterlands are likely to maintain their stability, due to the protective mantle of sand-binding vegetation, meaning that any onset of greater mobility could be delayed for decades. There will be exceptions to more stable dune hinterlands where for example mobility already exists, such as at Formby on the Sefton coast, or where the impacts of drought on dune hinterland vegetation triggers new blow-outs. There is some anecdotal evidence of the latter in the significantly drier continental climate of the Dutch coastal dunes arising from the drought of the summer of 2018.

Whilst the impacts of climate change at the coast may vary, what is certain is that the likely impacts need to be taken into account by those managing sand dunes; for nature, for cultural heritage, or as sea defence structures.

## Research approach and geographic extent

The research approach I adopted was to select a number of sites in each of the eight countries I visited. Sites were chosen through desk-based research or recommendation from colleagues and associates as having either a history of dune mobility or because they are currently displaying mobile and dynamic characteristics. Each field visit was organised to enable me to meet with a local dune manager and gain their insights into the nature of the location, its physical and cultural heritage, and features of interest. To aid the capturing of information I developed a semi-structured questionnaire that I was able to work through with interviewees (see Annex 1).

This questionnaire-based approach ensured both a consistency of approach and, through some initial analysis, has made it easier to spot significant generic issues, or indeed novel attributes at a particular site. In addition to talking with site managers I spoke with a number of academics and policy makers whose work involves them in issues associated with sand dune conservation, from both a natural environment and historic environment/cultural heritage perspective. A list of the main organisations I was in contact with can be found in Annex 2.

The variation in scale and type of dune landscape I encountered was tremendous; from the flat dune machair landscapes in the wilds of Donegal, to the vast, almost overpowering, highly-mobile Dune du Pilat in Aquitaine, or the pockets of dune nestled, almost covering, amongst the near continuous belt of seaside towns along the coast of Belgium. The variations in characteristics of the sites; area, height, sand type, or climate, are all factors that influence the human use of a site and, as a consequence, the cultural heritage interests that have emerged over time.

Each of the twenty locations I visited across the eight countries had its own particular story or stories to tell by way of cultural heritage interest. Some stories are ancient, such as the shell midden at Forvie in Aberdeenshire, marking the presence of people in this dune landscape since at least the Bronze Age, whilst others are very much of our time.

The buried network of cables running under the dunes at Ballykinler, South Down, visible now in places on the surface, are a relic associated with the ultra-low frequency radio system for maintaining contact with the UK's nuclear submarine fleet during the Cold War, a system that was only recently superseded through technological advance.



Ballykinler, County Down — Ultra-low frequency radio antennae.

My travels took me from the Atlantic coast of South West France, to The Low Countries, around the UK, and to the island of Ireland. Figure 2 shows my field visit site locations.



Figure 2 — Field visit site location map. Bathymetry data are from the General Bathymetric Chart of the Oceans (GEBCO).

Table 1 — Key to Figure 2: Field Visit location map.

Site No	Site Name and location	Country
1	Culbin, Moray	Scotland
2	Forvie, Aberdeenshire	Scotland
3	Tentsmuir, Fife	Scotland
4	Formby, Lancashire	England
5	Newborough Warren, Anglesey	Wales
6	Whiteford Burrows, Gower	Wales
7	Braunton Burrows, Devon	England
8	Terschelling, Waddenzee	Netherlands
9	Zuid Kennermerland, North Holland	Netherlands
10	Zeebermduinen, Oostduinkerke	Belgium
11	Schipgaatduinen, Koksijde	Belgium
12	Dune Dewulf, Leffrinckoucke	France
13	Havre de Vanlée, Manche	France
14	Havre de la Sienne, Manche	France
15	Ile de Glenan, Finistere	France
16	Dune de Pilat, Aquitaine	France
17	Inch Spit and Rossbeigh, Kerry	Republic of Ireland
18	Rosapenna, Donegal	Republic of Ireland
19	Portstewart Strand, Antrim	Northern Ireland
20	Murlough and Ballykinler, South Down	Northern Ireland



Inch Spit, Kerry — a large dune system typical of many of the research sites visited.

## Part Two: Cultural heritage in sand dunes — a categorisation

### Introduction to this approach

Setting out on my research I deliberately avoided adopting a specific definition of cultural heritage, preferring instead, through my conversations with dune managers and stakeholders, to see what emerged as cultural heritage in its broadest sense — enabling these individuals to determine what was in scope. The word cloud on page two of this report summarises the breadth and depth of cultural heritage interests identified in dune landscapes. Subsequently I have distilled these topics down to eleven broad thematic groupings through which the cultural heritage interests of the dune systems observed in my study area are described. There is no science behind this approach. I just listened to what people were saying, using my questionnaire for prompts, and collated these contributions into the following categories:

Agriculture

The Military

Forestry and woodlands

Abstraction, extraction, and stabilisation

Archaeology

Places where people live

Boundaries — ownership, tenure, and designation

Recreation, access and tourism

The Arts

Landfill

Navigation, ports, and harbours

The remainder of Part 2 of this report explores these thematic groupings or categories in more detail.



*“Asparagus inspires gentle thoughts.”*

Charles Lamb.

On the dune and sandflat-dominated coast of the western Cherbourg peninsula agriculture and aquaculture merge seamlessly in this vast land/seascape. Unlike the Bretons to the west, who are noted as great seafarers in pursuit of trade and fisheries, the agriculturally-inclined folk of Normandy simply took what they did best inland, agriculture, and applied it to the coast<sup>[11]</sup>. The dunes at the Havre de la Sienne in Normandy, France illustrate this well as saltmarsh lamb-grazed saltings, merge into a ridge of grazed dunes before transitioning into aquaculture on the sand flats, where mussels are cultivated on an industrial scale.



Havre de la Sienne, Normandy.

This scene of agriculture seemingly operating in harmony within this dune landscape hides the fact that in many instances agriculture in sand dunes can be a marginal activity, often involving niche crops or agricultural products, and all at risk from inundation by mobile sand, marine flooding and erosion, or the harsh growing conditions found in dunes. The historic utilisation of marram grass is one such example of a niche product.



Woven marram — Pritchard Jones Institute, Newborough, Anglesey, Wales.

The women of Newborough (Niwbwrch in the Welsh language), Anglesey, had, since the middle of the 18<sup>th</sup> Century been using the marram grass growing on sand dunes to the west of the village to make mats used to cover hay-stacks in farmyards across north west Wales.



Photographs courtesy of Pritchard Jones Institute, Newborough, Anglesey.

Marram was a valuable resource and carefully managed, harvested each autumn and stored in sheds. The winter was spent weaving the mats to be ready for sale and use the following summer. By the 1930s, demand for marram grass hay-stack covers was falling as alternative materials came into use, and the industry disappeared shortly afterwards.



Exploiting marram in dune landscapes had not always been achieved in the sustainable way practised at Newborough. In many coastal areas, particularly across Scotland and Ireland, marram and heather from dune heaths were used as a thatching material. This often involved the destructive practice of uprooting the marram and heather growing in the dunes, leaving behind extensive areas of bare sand which, in combination with other intensive agricultural activities, such as rabbit warrening, led to large tracts of dune turning to bare mobile sand.

The warrening of rabbits for their skins and meat has occurred in Britain and Ireland since the 12<sup>th</sup> Century following their introduction by the Normans. By the 13<sup>th</sup> Century large warrens had also been established on coastal sand dunes<sup>[12]</sup>. In Ireland by the 14<sup>th</sup> Century production was at such a scale that pelts were being exported to Britain, and by the 17<sup>th</sup> Century this amounted to 2 million skins annually — mainly to satisfy the demands of the hat trade. As industrialisation swelled urban populations rabbits were also in high demand for their flesh — a cheap source of protein for the working classes. Rabbit warrening was a profitable enterprise and supplementary feeding was often practised to maintain productivity as the natural dune vegetation became denuded. Warrening became a significant cause of bare, and thus potentially mobile, sand in many coastal dunes. This is illustrated in the painting below by Anthony Devis of dunes near Port of Newton, Glamorgan.



The Port of Newton — Anthony Devis (1729–1816).\*

The gradual escape of rabbits from warrens into the wider countryside led to rabbits becoming viewed as a pest. In 1953 the highly infectious viral disease Myxomatosis was introduced to Britain, its spread, aided by farmers, led to the removal of rabbits as primary grazers in sand dunes<sup>[12]</sup>. The disappearance of the rabbit had a profound impact on dune vegetation. At Murlough, County Down, Northern Ireland in the decade after Myxomatosis the site was renowned for its suite of rare and specialist flora, many of which flourished in the post-rabbit dune lands.

Activities associated with agriculture, such as warrening and the uprooting of marram and heather to provide thatch are synonymous with the creation of bare sand in dunes. The impact of this human initiated disturbance and the correlation with dune mobility became increasingly understood across Europe during the Middle Ages. From the 14<sup>th</sup> Century onwards, many European countries, and in particular Holland, made coastal protection a major consideration. In 1695 the Scottish Parliament passed an Act in which *“His Majesty does strictly prohibit and discharge the pulling of brent, broom, and juniper of the Sand Hills for hereafter”*.

The understanding of the link between dune vegetation and dune mobility became reflected in agreements entered into by those practicing a variety of forms of agriculture in and on the margins of sand dunes. In the 16<sup>th</sup> Century on the Sefton Coast, Lancashire, sand blow from the dunes (or haws as they are known locally) was affecting agricultural land, and thus landowner income. The normal solution was to plant ‘star grass’ on the dunes and this communal obligation was written into leases and enforced by manorial courts<sup>[13]</sup>. In 1730 Peter Jump was fined 2 shillings by the Court Leet of Formby *“for not setting starr [marram] on two days”* and Watchers (or Haws Lookers) were appointed by the court to prevent the ‘rushes’ being stolen by makers of mats and brushes.

Stable dunes could be used as sheep pasture and for growing rye. Stable dunes and the fields carved out and levelled within, or on the margins, of dunes could also be used for the cultivation of more exotic crops. The cultivation of asparagus became an established part of agricultural practice at Formby on the Sefton coast in the 19<sup>th</sup> Century.

Charles Lamb, the English essayist, remarked that asparagus inspires gentle thoughts, but there is nothing gentle about the attributes plants need to succeed in the hostile conditions associated with sand dunes. Sand, being porous, means that above the water table dunes are inherently arid, and nutrients leach readily away. Temperatures can range from more than 50 degrees Celsius on south-facing dune slopes in the day, to around freezing at night<sup>[14]</sup>.

For plants to thrive in these conditions they need to be specialists, and almost by surprise the tender and *“gentle”* asparagus, has all the rugged qualities required to thrive in sand. A ‘History of the County of Lancaster’ from 1907 details the cultivation of rye, wheat, potatoes, and asparagus *“a speciality in the district”* in and around the dunes at Formby<sup>[15]</sup>. Here the issue of nutrient deficiency in the dune soils for asparagus cultivation was overcome by the arrival of the railway to the Sefton coast in the mid-19<sup>th</sup> Century. The train line was not only solving the growing problem of what to do with Liverpool’s mountain of human excrement but, as the waste was shifted from the city to the dunes at Formby, local farmers were making good use of the readily available, cheap fertiliser. The asparagus crop grew well on its diet of Liverpool ‘night soil’<sup>[16]</sup>.



Asparagus cultivation — Formby 2018.

Today just a few hectares of asparagus remain in cultivation at Formby, a practice quietly slipping into the annals of local history. Modern asparagus production, like many forms of contemporary agriculture, requires economies of scale that suggest the artisanal production at locations like Formby will struggle to continue. Disease too is a factor. Asparagus crowns tend to become infected with a viral disease at around 15 years old, and the ground then needs a period of fallow of up to 20 years before becoming disease-free and viable for replanting. At Formby however the issues of scale of production and disease, leading to the end of asparagus production, may well be preceded by the arrival of mobile dunes and besanding. In the photograph from Formby above, beyond the workers in the field, and just beyond the emerging secondary woodland lies a face of bare sand, the encroaching dune front. The dunes here are some of the most active large-scale mobile dunes in the UK; at some points making a landward progression measured in metres per year. It may be that at Formby besanding will be the factor that seals the fate of asparagus cultivation.

The National Trusts commitment to its Land Outdoors and Nature programme (LON) is seeing a decoupling of land from being used primarily as a means to generate income, towards land being repurposed first and foremost to deliver benefits for nature and people. In this instance, and in pursuit of the objectives of LON, the space to accommodate sand dune evolution at Formby will see a gradual incursion of mobile dunes into the cultural landscape of the asparagus fields.

Like the National Trust, landowners throughout history have sought to maximise the revenues arising from dune related agriculture. In The Netherlands, on the Waddenzee barrier island of Terschelling, Staatsbosbeheer (the Dutch State Forestry Service) acquired 3,800 hectares of dune

landscape in 1910, about 80% of the land surface of the island, including an area known as the Boschplaat. The primary function of Staatsbosbeheer at that time was to derive the maximum economic return from their lands — whether through forestry or agriculture.



Coastal dunes and land reclaimed for agriculture — The Boschplaat looking west, Terschelling, The Netherlands.

The Boschplaat in 2019 forms the extensive eastern end of the island, yet in the 17<sup>th</sup> Century this area comprised an offshore sand bank, separated from the then much smaller island of Terschelling by a navigable channel, the Koggediep. A century later this channel became choked with infilling sand and the island became several kilometres longer<sup>[17]</sup>. During the 19<sup>th</sup> Century the Boschplaat remained largely comprised of shifting dunes through a combination of natural processes (massive incursions of windblown sand from the North Sea), and the over-exploitation of the area by people (grazing, peat extraction, and warrening). During an 80 year period the Witduin, part of the Boschplaat dune complex, shifted 1.5km from northwest to southeast. These dusty dunes were a huge threat to the farmland and villages in the adjacent polder. Between 1885 and 1900 the shifting sands were controlled by large-scale planting of marram grass. After 1910, under the stewardship of Staatsbosbeheer, the dune area of the Boschplaat underwent significant change<sup>[17]</sup>. The dunes were permanently stabilised through the planting of pine trees, and an extensive drainage system enabled significant areas to be given over to agriculture. These new coastal agricultural lands were tenanted to farmers for the cultivation of crops and livestock, safe from the prospect of inundation by sand or sea.

Today in the Netherlands the position of the coast, literally the coast line, is agreed as part of State coastal defence policy and is known as the Basic Coastline. The Basic Coastline is not the position of Mean High Water but is the point at which the interface between land and sea is agreed from an administrative perspective, and forms the baseline for coastal defence planning. On Terschelling it

became clear in the 1990s that the best way to maintain the Basic Coastline along the shores of the Boschplaat was not to have a fixed stable dune ridge, but to enable the dunes to become more mobile, to form and reform in response to coastal change and sea-level rise. This approach was, and to some islanders remains anathema. The agricultural lands, carved out over generations by the taming and draining of the dunes, was key to, or at least was perceived as being key to, the prosperity and security of islanders. Over the past 25 years, and through a long conversation, the views of the majority of islanders have shifted. The benefits of harnessing mobile dunes to maintain the Basic Coastline, albeit with the inherent loss of agricultural land, is now understood. This constitutes a substantial shift in public opinion, and a shift in the approaches of the State coastal defence agency and Staatsbosbeheer — a shift from maintaining dune stability to embracing dune mobility.

The Boschplaat on Terschelling is an example of a carefully planned and orchestrated process of change, from a historic approach based on dune stabilisation and land reclamation for agriculture to an approach now that seeks to harness working with natural processes to manage coastal change. At the Havre de la Sienne in Normandy, France, serendipity, or more accurately the fortunes of war, led to significant changes in the dunes in 1944. As the Allied troops secured the Normandy peninsula and the battles shifted inland, the soldiers left behind the heavy earth moving machinery used to punch holes in the dunes, and secure the initial beachheads at the time of the Landings. These massive abandoned American bulldozers, the like of which had not been seen in Europe at this time, were quickly requisitioned by local farmers and landowners to flatten large areas of coastal dune, levelling fields that for the last 70 years have remained in carrot cultivation.



Carrot fields on former sand dunes — Harve de la Sienne, Normandy.

Whether as asparagus fields, grazing lands, land used for the rearing of rabbits, or come to that the rearing of carrots, it becomes clear that agriculture has had a major influence in shaping the dune landscapes we see today. The cultural heritage footprint of agriculture has left both physical impressions in our dune lands as well as less tangible impressions, such as shaping the acceptability or unacceptability of mobile sand amongst dune communities.

The Haws Lookers of the 18<sup>th</sup> Century, tasked with fixing dunes might be perplexed by attitudes emerging today that see merit, in some dunes, to induce more dynamism. These shifts in the attitudes play out over time, spanning generations and centuries. More rapid changes in human use of dune lands can occur — not least those brought about by war.

## The Military

*“About this coast....In the event of war it seems to me that every inch of it would be important, sand and all.”*

Erskine Childers, *The Riddle of the Sands*.

Set amongst the shifting sands and dune dominated landscape of the German Wadden Sea Erskine Childers spy novel ‘*The Riddle of the Sands*’ reveals a German plan to invade England in the years leading up to the First World War.

Arriving as an invader, by longboat or landing-craft, sand dunes offer both opportunity and challenge in pursuit of war. Having safely navigated the surf zone, the opportunity for the assailant is a beach profile of gentle gradient, perhaps enabling swift progress to be made landward. Assuming that is that your adversary has not taken advantage of the dune hollows and crests to mount a defensive challenge. Many of the dune sites I visited showed some residual evidence of the importance of dunes in times of war, particularly 20<sup>th</sup> Century war.



Concrete landing craft with tank rash — Braunton Burrows, Devon.

During the Second World War sand dunes played a major part in the testing of new military technologies. At Braunton Burrows in Devon the American army were given free reign over this extensive dune system (970 Ha). By the time they left for the beaches of Normandy in June 1944, only a few hectares remained vegetated. A series of replica German pillboxes were constructed of

mass concrete and the US troops, using artillery and aerial bombardment, tested them to destruction, probing to find what it would take to crack Rommel's Atlantic Wall. In the midst of Braunton Burrows, not far from the parabolic dunes where, under licence from the Christie Estate, today's Royal Marines still practice their off-road driving, stand the very solid remains of the concrete landing-craft constructed to prepare GIs for making amphibious landings in France. Time and again tanks, trucks, and artillery were loaded and secured in these concrete hulks. As each simulated landing progressed, and often under live fire, the troops freed the chains securing their vehicles and disembarked. Etched into the concrete sidewalls (below) are signs of tank rash, as drivers honed their skills in close quarters manoeuvring.

Lieutenant Colonel Paul W. Thompson was tasked with training the Americans at Braunton and said of the place *"If Waterloo was won on the playing fields of Eton surely the sands of North Devon beaches contributed importantly to the success of the assault over the Normandy beaches"*. Thompson returned to Braunton in 1992 to unveil a memorial dedicated to the memory of those soldiers who had trained here.



Photographic reproduction by the author of the historic photograph used for the onsite interpretation panel at Braunton Burrows.

In 1947 mine clearance at Braunton was underway, and indicating how rapidly beaches and dunes can change, the British army had to devise a powerful water jet system, strapped to a Bren gun carrier to wash away the 15 feet of sand that had accumulated over the anti-tank mines laid just a few years earlier.

The mirror image of the story of Braunton Burrows can be seen along the Channel coast of France in a string of defences known as the Atlantic Wall constructed under the supervision of Field Marshall Erwin Rommel. Sword, Juno, and Omaha might be the familiar names associated with the Normandy landings but to the east, along the coast near Dunkirk and on into Belgium and The Netherlands, lie



the extensive remains of this section of Rommel's impressive defensive line. Remains that today act as benchmarks that denote the phases of accretion and erosion that occur on dynamic dune coasts.

Situated east of Dunkirk the 270 Ha Dune Dewulf stretches for more than two kilometres. The site is owned by the Conservatoire du Littoral and managed by the Department du Nord as a protected area for nature conservation, recreation, and cultural heritage. The pillbox or blockhouse in the photograph below stood for more than seventy years on the dune crest commanding, as intended, a view across the Channel. In 2015 a rapid recession of the dune front occurred, undermining the several thousand ton block house structure and allowing it to rest now on the beach at a rather jaunty angle.



Dune Dewulf, Dunkirk — WWII blockhouse, part of Rommel's Atlantic Wall.

To the east of the Dune Dewulf across the border on the Flemish coast of Belgium the impact of coastal change on military cultural heritage can also be seen, but this time as a product of an accreting coast. At the Zeeberm Dune, part of the broader Ter Yde Dune Complex, a new dune ridge has formed in recent decades leaving the blockhouse (below) rather confusingly detached from its intended position and without any view of, or line of fire on, would be invaders. The Zeeberm dune is in the care of the Flemish Coastal Agency and in conjunction with volunteers from the Simon Stevin Stichting (an NGO fortress study group) has worked to record and fully-understand the 20<sup>th</sup> Century military archaeology along this coast.



Zeeberm Duin, Belgium — blockhouse detached from the shoreline on an accreting frontage.

A thousand kilometres to the northwest across the North Sea in Scotland on the Moray coast at Culbin, whose fame lies chiefly in the lost village of Culbin, there are also references to the fear of invasion. The arms of Culbin's great barrier dunes, known as Old Bar, enclose vast swathes of flat coastal sand flat and saltmarsh, ideal for landing gliders. The wooden poles installed during WWII have survived well for seven decades (below). Known eponymously as Rommel's asparagus, they were intended to disrupt any attempts at German airborne assault.



Culbin — Rommel's asparagus.

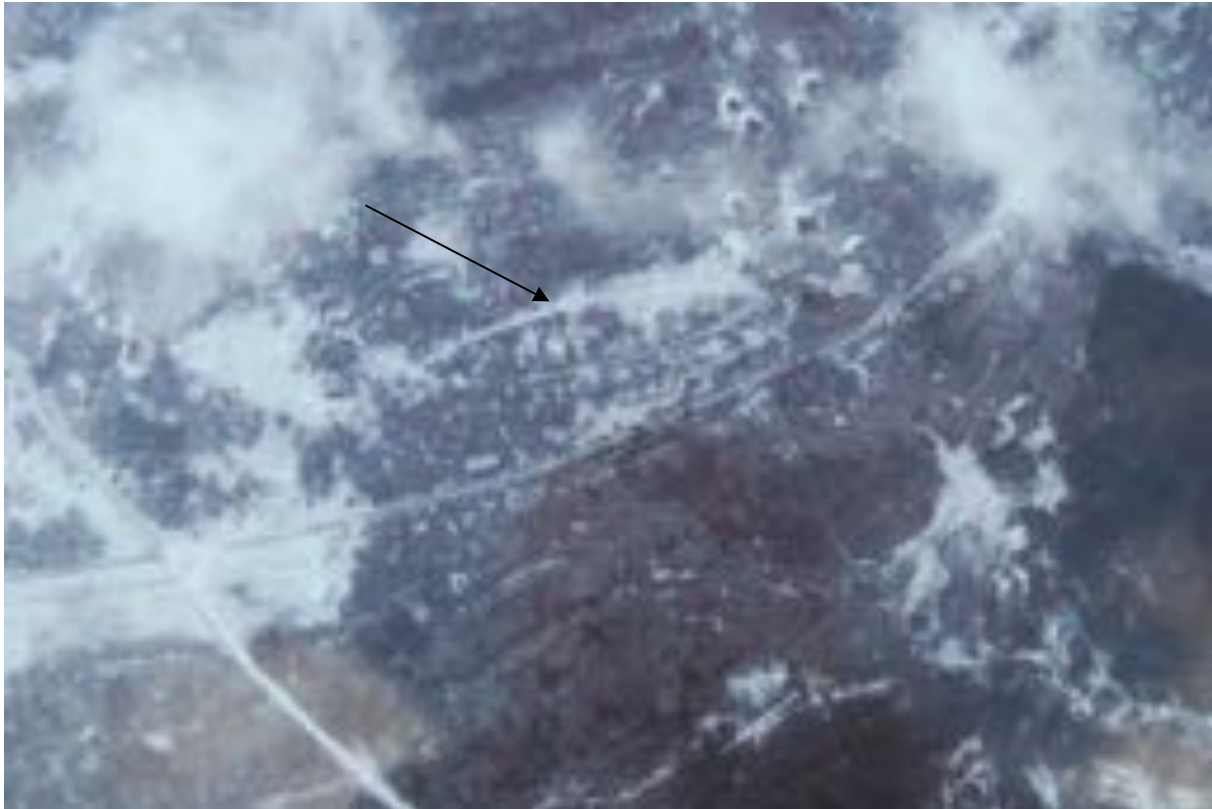
Military structures can also act as markers for the way that the significance of a place or artefact may change over time. The impressive WWII blockhouses at the southern end of the dune du Pilat, Aquitaine, France (below), are a continuation of Rommel's Atlantic Wall, and stood guard over the entrance to the strategically important Arcachon Basin.



Blockhouse — Dune du Pilat.

In the late 1940s these structures, three blockhouses in total, stood on the beach in a line running landwards from the shore to the dunes. Their significance at that time was still clearly rooted in a military function. With time the graffiti artists got to work and the significance shifted from being a reminder of war to a message of peace, much of the lettering and imagery involving anti-war sentiments. As time passed and the shoreline receded the bunkers found themselves variously on the beach and in the intertidal, or as can be seen in the photograph above (centre of the image in the yellow circle), a blockhouse submerged in the sea. The significance of this unexpectedly marine blockhouse today is that it forms a point of interest for marine biodiversity and recreational divers, the concrete structure acts as an artificial reef on this seabed otherwise dominated by soft sediment.

Whether vulnerable to erosion from the sea or threatened by besanding, effective preservation by record is an important part of managing coastal change and impacts on cultural heritage. The illustration below is of a full-sized outline of an Allied battleship set out by German forces in the dunes close to Amsterdam. German pilots honed their aerial bombardment skills, releasing dummy concrete bombs to fall within the outline of the battleship etched in the sand. This engraving is now succumbing to the encroaching dune vegetation, although concrete bombs, and indeed live ordinance, do periodically come to the surface, chiefly as a consequence of efforts to provoke greater mobility in these dunes by conservation managers.



Authors Photograph of part of interpretation panel on site at Zuid Kennermerland.

The cultural heritage interests associated with the military history of dunes are rich and varied and I have only scratched the surface through the examples I have chosen. The often massive construction of a pillbox or blockhouse conceals a fragility when confronted with the forces of nature on a changing coast. The blockhouses at The Dune du Pilat also illustrate how the significance of a place or artefact may change over time, in this instance a shift in significance from war to peace, and from terrestrial to marine. Military structures act as a reference point to measure and understand the dynamic nature of dune coasts over time, and vividly illustrate the role that cultural heritage artefacts can play in telling this story. Preservation by record is key to understanding and maintaining the narrative associated with aspects of cultural heritage that can often prove ephemeral in dunes landscapes.

This short section on The Military highlights the rapid change that war can bring to dune lands, changes marked by destructive forces. In contrast another great use of sand dunes, forestry, can be seen as taking a long view and is recognised by some, if not all, as a constructive force for good.

## Forestry and woodlands

*“Forestry is the work of Nation builders.”*

William Bulfin.

Forestry may indeed be the work of Nation builders but in dune landscapes it remains a contested land use. There is a long history of planting trees in dune lands for the purposes of dune stabilisation and timber production, sometimes with the added benefit of providing employment to the often impoverished communities in or on the margins of the dunes.

The picture below reproduced from Anne Quinn’s report in the 1970s ‘Sand dunes; formation, erosion, and management’ shows one of the more exotic attempts at dune forestry.



*Araucaria araucana* (Monkey Puzzle) being used to afforest dunes at Curraclloe, County Wexford, Eire circa 1970 — reproduced from ‘The manual of dune management’, Planning Division of the Republic of Ireland (1977).

The timber yielding success of this Wexford Monkey Puzzle experiment is not known, but what is clear is that dunes can be a highly-productive forest enterprise. Exposure to salt-laden winds sweeping in of the sea can set the margin of plantations back, but once clear of the spray zone a range of conifers will thrive on the free-draining sands; Scots pine and Corsican pine do particularly well in a UK context.

Further afield, the Dune du Pilat sits on the seaward margin of the densely forested French Département of Les Landes in the region of Aquitaine. The forests surrounding the dunes here

occupy a mosaic of former dune lands and extensive areas of marshland that spanned the coastal plain.

These pine and deciduous forests were planted from the early 19<sup>th</sup> Century onwards to drain the land, with notable success. Where previously only sheep grazed, the tree-drained marshes and afforested dunes grew to support two main industries; timber production and resin extraction.



Resiniers at work in the dune woodlands of Les Landes — note the conical earthenware pot lashed to the tree to collect the resin as it bled.

At the beginning of the 20<sup>th</sup> Century there were still several thousand Les Landes *resiniers* who collected the pine resin manually by slashing the bark of the trunk, allowing the resin to bleed down a metal plate into a conical pot lashed to the tree.

Originally, the resin from the wound dripped into a hole dug at the base of the tree or onto sacking, but this introduced impurities and made the resin awkward to handle. By the mid-19<sup>th</sup> Century, Pierre Hughes, a pottery manufacturer from Bordeaux had developed and patented a small conical earthenware pot, known as a 'Hughes' in French. The Hughes transformed the *resiniers* collection of the raw resin which was primarily refined to make turpentine.

Timber production continues in the forests today but the resin industry finally ended in the early 1990s, unable to compete with synthetic alternatives and foreign competition.



A reproduction of a 'Hughes' thrown by the author in the autumn of 2018.

Just as resin, as a source of chemicals to produce turpentine has changed, so too, albeit gradually, have attitudes towards the appropriateness of the afforestation of sand dunes.

Established in 1964 the Office National des Forêts (ONF) is the body responsible for the management of public forests in France. As part of this portfolio the ONF manages a frontage of some 380 km of sand dunes, predominantly on the Atlantic coast of France. Since the beginning of the 19<sup>th</sup> Century State effort in France has focused on limiting the spread of mobile sand and prevention of besanding in the dune hinterlands where natural vegetation proved unable to fix the dunes<sup>[18]</sup>.

Since the 1980s, influenced by coastal geomorphologists and a greater recognition of the importance of sand dunes as sea defence structures, foresters have changed their management practices in pursuit of multi-functional outcomes. This has resulted in three main benefits; gains for biodiversity, increased public access (with additional benefits for tourism), and a significant contribution to countering coastal erosion and flooding. The latter occurs as material eroded from sand dunes during storms feeds the subsequent recovery of beaches.

This switch to embracing natural processes has been accompanied by a regime of careful monitoring and evaluation to ensure this new approach is delivering the three intended outcomes. Long-term ecological and geomorphological monitoring is in place at five large-scale research locations. Some of these are large enough to include sections of dune which have already been managed for a long period under a regime of 'free evolution'<sup>[18]</sup>, sitting adjacent to areas within the same system where intensive dune management practices have continued.

It remains to be seen how well the free evolution approach equips the ONF to deliver great natural sea defences and gains for biodiversity in the face of sea-level rise and increased storminess. What is

clear however, is that a significant shift has taken place in the organisational culture of the ONF, a public body largely populated by foresters, to a position where experimentation and the delivery of multiple benefits has replaced the urge to simply plant trees or artificially fix sand dunes.

In Wales, at Newborough Warren, a vast dune landscape managed by Natural Resources Wales (NRW) the tension between foresters, nature conservationists, and the general public over the validity of continuing to afforest sand dunes continues. At the time of my visit a PhD research project was underway to understand, specifically in the context of Newborough Warren, the impact of afforestation on the hydrology, and thus ecology of these dunes.

It struck me as odd that something so widely-known and understood as the fact that if you plant forests on dunes the trees will lower the water table, needed re-proving at a site-based scale. NRW is a young organisation, brought about by the merger of the Forestry Commission Wales, Environment Agency (Wales), and the Countryside Council for Wales. It occurs to me that the organisational politics of the fledgling NRW is really what is being tested through the PhD as the competing factions, foresters versus nature conservationists, slog it out to determine whether dune slacks and mobile sand habitat trumps the commercial value of conifer plantations.



Newborough Warren, plantation removal.

More than a decade ago Newborough Warren became one of the first locations in the UK to raise the prospect of large areas of conifers being felled to create new open dune habitat — something necessary if we were to fulfil our commitments under both domestic and EU habitat legislation. The notion of felling trees in the interest of nature conservation stirred up huge controversy locally, not least because of the strong cultural heritage connections when seen in a Welsh context.



The afforestation of Newborough Warren came about immediately following the Second World War driven by the need to provide local employment, pit props for the Welsh mining industry (now defunct), and a sense that the then largely open dune landscape needed its sands to be fixed. Scroll forward two generations and the forests have matured, providing not only a much loved recreational resource, but also a significant source of income for NRW. There is also the added cultural heritage complication that some of the local people employed by 'the forestry' to plant the trees in the 1940s and '50s are still alive — no wonder then that emotions run high when talk turns to the return of an open dune landscape. Oddly though, in 2018 it seemed that the biggest disagreement over the future of trees on Newborough Warren lay within NRW itself, where the opposing factions were reported to be engaged in seeking legal opinion in support of their own positions — do the trees stay or do they go.

Forests modify dunes under a mantle of green plantation but other modifications made by people to dunes can be equally, if not more, dramatic, such as those associated with extraction, abstraction, and stabilisation.

## Abstraction, extraction, and stabilisation

*“Master, I knew you to be a hard man, reaping where you did not sow, and gathering where you scattered no seed.”*

Matthew 25:24.

Human use of the natural resources dunes offer has occurred throughout history. In some instances there are echoes of Matthew 25:24, where a use is clearly exploitative, involving the taking of a finite resource that cannot necessarily be replenished. Sand extraction from dunes is an example of this. In other instances, such as the abstraction of drinking water, the use of the resource is more thoughtful and arguably sustainable. The dunes on the Dutch North Sea coast in the vicinity of The Hague still provide the drinking water supply for the city’s one million inhabitants. The water table in dunes can be many meters higher than that in the surrounding area. As a consequence of capillary action water trapped in sand ‘climbs’ to form a lens, producing a water table higher than the level of groundwater in the surrounding land, and above the level capable of influence through saline intrusion from the nearby sea. This drinking water resource is replenished naturally by precipitation.



Zuid Kennemerland National Park — formerly the drinking water dunes for Amsterdam.

One key reason for the presence of largely undeveloped swathes of coastal dune in Holland, which predates any notion of conservation designation, is as a direct consequence of the dune’s function as a water supply. The Dutch were also quick to recognise the function of dunes as a primary sea

defence, and as early as the 14<sup>th</sup> Century legislation was in place for this purpose. By the time the urban population of Amsterdam began to swell in the 19<sup>th</sup> Century the extensive naturally functioning nearby dunes provided two of the most basic needs for its citizens, protection (from the sea) and drinking water.

The intertwining of human uses and demands on dunes has not always been as symbiotic as the example from Holland featuring water abstraction. Sand extraction has come to be a major destructive force in many dunes as sand winning for agricultural improvement and construction increased.

Rights granted by Royal Charter in England in the Medieval period gave farmers the opportunity to extract sand from within dunes and on beaches. In Ireland the continuous application of calcareous sea sand resulted in the formation of deep man-made plaggen soils around the coastal districts of the country. In the early part of the 20<sup>th</sup> Century the drawing of sea sand was practically the only occupation of people in coastal areas of Ireland during the winter months. One man drew *“four loads of sand six days a week, for 5 months of the year with a horse and cart”*<sup>[19]</sup>. This labour intensive approach, destructive enough in its own right to the functioning of the shoreline and protection of the dunes, was gradually replaced and upscaled as mechanisation crept in during the 20<sup>th</sup> Century.



Removal of sand from the foreshore for use as a building material — reproduced from ‘The manual of dune management’, Planning Division of the Republic of Ireland (1977).

The pursuit of ancient rights with modern techniques led to the depletion of the sand supply to feed dunes in many locations. In France laws now prevent the taking of sea sand from beaches and dunes at any scale, for private or commercial purposes. A prohibition that I was reminded of the on west

coast of France when I confessed to one site manager that I had taken a small quantity of sand from their dune to incorporate into clay for the making of pots as part of the communications around this study. The reprimand of a wagging finger was replaced by a smile as I was teased about being given special dispensation on research grounds.

There is evidence from around the UK and the island of Ireland that the practice of removing sand from beaches and dunes, with or without consent, continues. Paradoxically there is also a long tradition, stretching back over centuries, of efforts to stabilise rather than remove sand from dunes through a variety of interventions. I've mentioned in the section on agriculture the work of the Haws Watchers on the Sefton coast, whose role it was to safeguard dune stability by preventing the destruction of dune vegetation.

On the island of Terschelling in the Netherlands the 19<sup>th</sup> Century practice of creating 'stuifdijken' (blown dykes) enabled the natural dynamism of dunes to be tapped to consolidate new artificial dune ridges in the form of sand dykes. These sand dykes were created by using brush and vegetation to trap windblown sand at strategic locations and thus control the unfettered inundation of sand onto areas used for agriculture.



A Stuifdijk or blown dyke (the linear scrubbed-over feature in the centre of the photograph) Boschplaat, Terschelling.

Today the stuifdijks of Terschelling form a semi-natural cultural heritage layer in the landscape, representing literally a line in the sand where previous generations chose to try and halt the movement of sand.

More recent interventions to stabilise dunes sit less comfortably in the landscape. The 300 metre long run of sand filled geotubes at the Donegal Boardwalk Resort and Restaurant complex near Carrickart in Donegal illustrates an ongoing desire to 'stabilise' dunes. The geotubes in the photograph below were installed through a perceived need to protect the low dunes from coastal erosion, across which the newly created 'attraction' of the boardwalk meanders. Some years since construction this sea defence structure, using sand extracted from elsewhere with the dune system, is showing signs of failure. Outflanking at the northern end of the geotube, due to a concentration of wave energy at its terminus, is exacerbating erosion of the very dunes it was intended to protect. Whilst in the middle sections the geotube is failing and a sticking plaster of dumpy bags has been applied in a crude attempt to maintain the artificial barrier.



Sand-filled geotube, Donegal Boardwalk Resort, Carrickart, Donegal — Republic of Ireland

It is not only developers of dune resorts that have reached for solutions in recent times to stabilise dunes. From the 1960s onwards, and arguably up to the present-day, conservationists have been at the forefront of attempts to stabilise dunes. The British Trust for Conservation Volunteers (BTCV) guide to sand dune management first published in 1979 has stabilisation at its core. The guide announces its intention *“to be used by conservation volunteers and all others interested in maintaining or improving sand dunes [and contains] everything you need to know about sand dune*

*management — their formation, ecology, the law, health and safety, access, vegetation, stabilisation, and much more”.*

The handbook contains guidance, much of it still relevant, but on the topic of stabilisation new thinking associated with disrupting dune stability, or freeing up bare sand, has gained ground since the last revision in 2005. Fast forward 15 years and the emphasis of many dune managers, ecologists, and academics has shifted towards encouraging greater mobility in dune systems. The aim being to counter the loss of open dune habitats as a result of lack of management, disturbance, eutrophication, and a longer growing season. However, this is an approach that is not without its critics; a topic that I explore further in Part Three.

Humans have been abstracting, extracting, and stabilising dunes for centuries but human interactions with dunes and dune hinterlands, as places of habitation or hunting grounds, go back thousands of years, taking us into the realm of archaeology.

*"I had to make my way down to the sand to stand in the footprints of a Stone Age man."*

Stephen Gerrard.

The discovery of Neolithic footprints in the sun-baked clays that underlie the present beach at Formby, Lancashire offer an insight into the lives of our hunter-gatherer ancestors. These Holocene sediment beds are exposed periodically as the cover of beach sands shift in response to wind and tide, revealing the footprints of men, women, children, and animals laid down some 7,000 years BP. In his 21<sup>st</sup> Century song 'Stone Age Man', Formby born singer songwriter Stephen Gerrard (not the footballer) describes how he had to make his way *"down to the sands to stand in the footprints of Stone Age man"*<sup>[20]</sup>. A powerful connection between two individuals in the same landscape, standing on the exact same spot, separated by seven thousand years.



Formby Footprints — Gordon Roberts.

In many ways all eleven of the themes forming the categorisation part of this report can be regarded as being about archaeology. The OED defines archaeology as the study of human antiquities,

especially of the prehistoric period, and so the focus in this short section on archaeology will be on cultural heritage assets in sand dunes associated with a greater time-depth. But more than thinking just about the archaeological features of interest themselves, and as fascinating as this is, I want to focus on the opportunities and challenges that dunes pose for those with an interest in the historic environment.

Dune landscapes can be difficult for archaeologists to read as the normal layers of deposition, in which remains are found, can be jumbled by storms causing erosion and accretion, making interpretation difficult. Periods of historic dune activity and mobility disturb the stratification that help archaeologists understand previous human activities in a landscape. In some instances, such as Inch Spit, Co Kerry, Eire the period of intense storminess associated with the Little Ice Age 'top-sliced' the dune system, wiping clean both the archaeological and geomorphological record which had accumulated over preceding millennia. The clock marking the development of the historic record only began to tick again at Inch Spit in the 17<sup>th</sup> Century as the dunes once more began to build.

Because of this propensity for rapid change and 'churning' of stratigraphy in dunes some of the best evidence for human activity in dune landscapes can come not from within the dunes themselves, but from the dune margins or hinterlands. Dunes are often accompanied by mires that occur to landward as the sand mass impedes the flow of ground and surface water from land to sea. These wetlands provided ideal hunting grounds for our ancestors and it is from these areas, with a well preserved record of the palaeoenvironment, that techniques such as pollen analysis and radiocarbon dating can yield interesting evidence of earlier human activity<sup>[21]</sup>. Sometimes, as with the Formby Footprints, the macro evidence simply speaks for itself.

In dune landscapes recognising the crossover between the disciplines of archaeology and geomorphology is important. The 8<sup>th</sup> Century farmstead of Groot Olmen in the dunes at Zuid Kennermerland, Netherlands illustrates this point well.

The occupiers of the 8<sup>th</sup> Century Groot Olmen farmstead, perched on these raised sand grounds, were able to cultivate crops and raise livestock in a way that remained impossible on the undrained and unpolderised surrounding peatlands. The settled and affluent lives of the farming folk of Groot Olmen, witnessed by the remains of 6<sup>th</sup> and 7<sup>th</sup> Century Badorff Pottery imported from the east in present-day Germany, began to be disrupted by sand blow-in the 8<sup>th</sup> Century. As the sand began to move landwards the farmers tried to incorporate the accumulating sand, by ploughing, into the organic soils of the fields they had been nurturing for generations. Ultimately they were to be defeated and the Groot Olmen farmstead was abandoned to besanding. In a number of locations along the Dutch coastal dunes archaeological excavation has revealed profiles showing patterns of sand turned by the plough overlying and intermingled with rich humic soils. These plough-mixed profiles give way further up the strata to overlying deep layers of pure sand. Sand that marks the progressive development of new dunes and the besanding of former agricultural lands and settlements.





8<sup>th</sup> Century farmstead, reconstruction — Zuid Kennermerland Visitor Centre.

We know much about the 8<sup>th</sup> Century Groot Olmen farmstead at Zuid Kennermerland due to a 2005 project to recreate dune slacks for nature conservation. As the layers of blown sand were mechanically removed in pursuit of the underlying water table, required to create dune slack habitat, shards of Badorff Pottery were discovered. Ensuing reactive archaeological excavation revealed the site of a large rectangular building (reconstructed as a model in the photograph above), as well as; fire pits, cess pits, further pottery and bone shards, field boundaries, plough marks, and cart tracks.

During the years since 2005 the artificially restored dune slack habitat on the site of the Groot Olmen farmstead has been a success. As the dune slack vegetation flourished the finds of pottery shards gradually diminished, that is until the time of my visit in the early autumn of 2018. Following an extensive period of drought during the summer of 2018 the water table had lowered, leading to sand shrinkage, and as I walked across the site of the farmstead with my guides we stumbled across many fragments of Badorff Pottery. The Groot Olmen site tells the story of dunes and their mobility, and their ability to both besand and reveal cultural heritage interests.



5<sup>th</sup> to 8<sup>th</sup> Century Badorff Pottery shards — Groot Olmen farmstead, Zuid kennermerland, The Netherlands.

In other locations archaeological features have been overlain by changes in land use such as the densely forested dunes at Culbin on the Moray coast; Forest Commission Scotland's (FCS) vast 3,000 hectare forestry operation, which occupies the largest sand dune system in Britain.

The relict dunes within the Culbin complex are interspersed with shell middens and Bronze Age cremation burial sites, speaking of earlier habitation, yet these are features that are difficult to read under the canopy of plantation pines. As with all its land holdings, the Commission is under an obligation to maximise the timber yields from Culbin. Production forestry, as an intrinsic part of an initial dune stabilisation plan, has been the dominant land use here since acquisition in the 1920s.

Today, with the beginnings of a shift in emphasis towards providing greater public benefit, and recognition of the growing contribution tourism makes to the local economy, some areas of pine plantation have been felled and maintained as open land. Whilst the motivation for this is derived from maintaining nature conservation interest, it offers also opportunities to reveal the historic landform of parts of the dunes, and provide glimpses of the 92 non-scheduled monuments that are currently known to exist at Culbin.

Interestingly though in the 2017 FCS Land Management Plan for Culbin references to archaeology are thin and the historic environment fails to register as one of the seven key themes addressed by the plan. A reminder perhaps of how easy it is for the cultural heritage interests of dune landscape to be overlooked — a blind spot for recognition of the people who were in our dune landscapes before us.



Culbin — a typical scene of a coniferous mantle overlaying the dunes.

The burrowing and scraping of biodiversity-focused disruptor dune managers described elsewhere in this report also create opportunities for archaeologists. The notching of frontal dunes as a planned operation to stimulate migration of sand from beach to dune hinterland is, in The Netherlands at least, now being actively pursued as a way to enhance the integrity of dunes as coastal defences. Whether for habitat creation, or coastal defence purposes, excavation in dunes, as with the Groot Olmen project, presents archaeologists with a chance to better understand the layered history of human interaction with dunes. Unlike the Groot Olmen example, where archaeological investigation was retrofitted to the habitat creation project, it is more likely to be the case today that archaeologists will be involved with dune disrupting projects at inception. Although, as with Culbin and Formby, and indeed many of the dune sites I visited, it remains surprisingly common for the historic environment and considerations of cultural heritage to be overlooked.

This brief reference to how people have lived in and on the margins of dunes in the deep past also points to more recent human occupation of dune landscapes as places where people continue to live.

## Places where people live

*“About the lost village and Kirk at Forvie...this judgement came about because the folk of Forvie were papists and grossly ignorant.”*

Reverend Masson, Reformist preacher (1570).

Harsh words and conclusions drawn by the Reverend Masson regarding the loss through besanding of the village at Forvie on the coast of Aberdeenshire in the 15<sup>th</sup> Century.

What is clear however, and irrespective of religious persuasion, is that whenever we choose to live in or on the margins of dunes we cannot rely on these settlements and structures being there in the long-term.



Authors photograph of the interpretation panel at Forvie.

Places like the lost village and Kirk at Forvie and the Groot Olmen farmstead in the Dutch dunes described in the preceding section on archaeology serve to remind us that for centuries settlements have succumbed to inundation by sand.

What is possibly more alarming is that, even when armed with this knowledge, changes in settlement patterns in 20<sup>th</sup> Century have seen the development of many new houses at the coast. This has not occurred on the solid geology of the high ground away from the shoreline; instead we've chosen to settle down on the coastal plain as close to the shoreline as possible. This

development trend has occurred on many different types of coast, and dune coasts are no exception. Ideally dune systems would be left free from backshore development allowing coastal processes to function<sup>[22]</sup>, and dunes to maintain themselves, but this is rarely the case.

On the dune ridge at the Havre de Vanlée in Normandy stands a row of modest shacks constructed largely of concrete blocks with corrugated tin roofs. These summer houses were built to act as little more than beach huts, allowing the owners an escape from nearby towns and cities to take the sea air and share in the wonderful landscape; a tapestry of beaches, sand dunes, and saltings. No doubt dining on saltmarsh-fed lamb, washed down with Normandy cider from the rich agricultural interior.



Havre de la Sienne, Normandy.

Any dreams that the owners of these shacks at the Havre de la Sienne may have had of turning them into swanky marine residences have long since evaporated. These dunes were amongst the first to benefit from being designated for their landscape value under national landscape protection laws introduced in France in the 1930s, preventing any further development.

The shacks remain and some are clearly still in seasonal use but many appear to be abandoned, seemingly, almost patiently, waiting to being absorbed back into the dune landscape — perhaps not in this instance through besanding, but certainly as part of a process of aeolian weathering, as the shacks are shot blasted by winds charged with salt and sand.

In marked contrast, several hundred miles to the east, urban development on the on the sand dune dominated Belgium coast, appears to know no bounds. The coast of Belgium is just 65 km long and is caharacterised by the ribbon development of coastal resort towns such as Nieuwpoort and Koksijde



Koksijde, Belgium — coastal ribbon development with dunes in the background.

The Schipgat dunes to the east of Koksijde illustrate the interesting relationship Belgians have with their dunes. The Schipgat dunes, flanked by dense urban development are, by Belgian standards, a large area of dunes. The dunes extend some distance inland but, as with all dunes on this coast, the dune field is dissected by the coastal road; disrupting not only the continuity of habitats but also the opportunity for sand to migrate inland.

What is notable about the coastal section of the dunes at Schipgat is the large area of bare and clearly mobile sand that sits in startling juxtaposition with adjacent urban area, and both at the mercy of the adjacent energetic North Sea. The residents of Koksijde are fiercely proud and protective of this bare sand landscape, known locally as the Belgian Sahara, valuing it as a place where nature and natural coastal processes run their course in amongst the otherwise heavily modified and developed urban coast. The recipe perhaps for a perfect storm?

I took away no sense from Koksijde that the community has concerns that these dunes, through their mobility, pose a threat of besanding. Although on this coast, which in places benefits from a plentiful supply of sand coming ashore, accretion and the possibility of sand moving inland on a large scale is a very real possibility. This leaves me to wonder if the relationship between the people of Koksijde and their dunes might sour if greater mobility were to occur in the future.

The Dune du Pilat in Aquitaine, France is a dune system where besanding is a live issue and threat. This gargantuan dune system, actively fed by sediment emerging from the nearby Gironde river is

more than 100 m high, 15 km long, and 5 km wide. Pilat behaves more like a living, breathing organism than a geomorphological feature as it creeps landwards at a rate of one metre per year.



Dune du Pilat, Aquitaine.

Landward of the towering dune ridge sit a string of campsites, private residences, and a strategically important coastal road, all trapped, as if in a spiders web, waiting to be devoured by the dune.

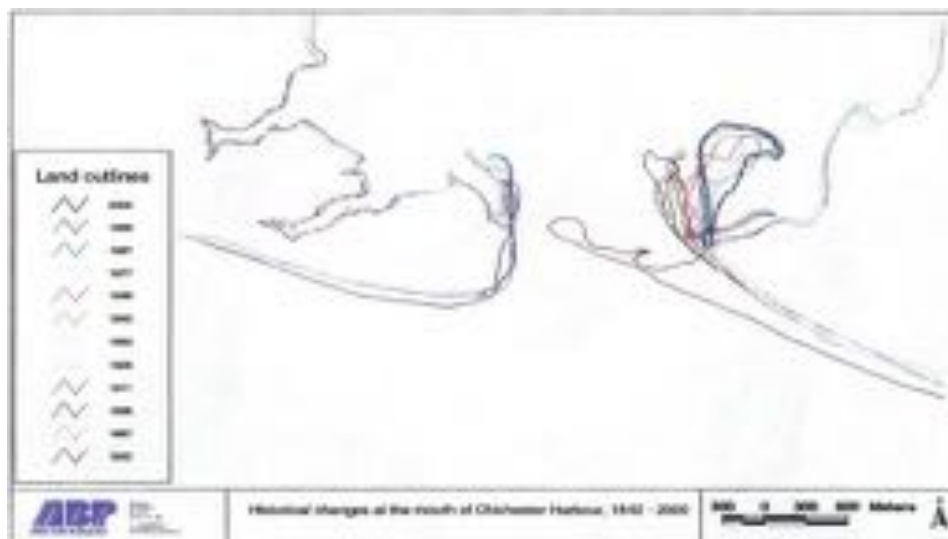
In conversation with colleagues at le Conservatoire du Littoral, France's coastal equivalent of the National Trust, I was curious to know if their policy on acquisition extended to buying the camping grounds, some of which are currently for sale (but seemingly with no takers), in order to create accommodation space for the dune to migrate in to. The answer was emphatically "*non*" — but qualified by the explanation that with such a vast mobile dune system the campsites, private residences, and in time the road itself, will all be swallowed by the dune, meaning that acquisition to secure the future of the dunes is unnecessary. The Dune du Pilat is actively securing a future of its own by exerting an overwhelming physical presence.

Wherever we live we also tend to create places of worship and, as the Reverend Masson cautioned, mobile sand pays no special regard to sacred land, be it a church site or burial ground. Whilst the village at Forvie remains buried in the dunes of this section of the Aberdeenshire coast, the church, after 500 years of submersion in sand, is once again at the surface and provides a fantastic opportunity to tell the story of dunes, their mobility, and their impacts on cultural heritage. This is illustrated by the photograph below of a school visit to the Kirk at Forvie.



Authors photograph of the interpretation panel at Forvie.

Mobile sand, and its ability to consume land and places where people live and worship was recorded by Carew in 1602 in his account of St Gothian's Chapel at Gwithian in Cornwall, buried by sand in the 13<sup>th</sup> Century (See Preface). Sand sheets on the move, as evidenced at the Dune du Pilat, show no respect for the boundaries that we humans impose on landscapes. The dune spit of East Head in Sussex, a National Trust site, stands at the East side of the entrance to Chichester Harbour. The figure below shows how dynamic this sand spit has been over recent centuries.



Historical changes at the mouth of Chichester Harbour – ABP Research

So how have issues associated with dynamic dunes impacted on human imposed boundaries, landownership and tenure at the coast?



## Boundaries — ownership, tenure, and designation

*“We may brave human laws, but we cannot resist natural ones.”*

Jules Verne.

At first glance the topics of ownership, tenure, and boundaries, indeed matters of law in general, may seem to have a tenuous link to a study of sand dunes, mobility, and cultural heritage. But given that so much of what we do is governed by spatial boundaries, which are in turn often bound by the Law, it is no surprise that these issues have and will continue to impact on the way we manage sand dunes. And as can be the case with things legal, matters are rarely straightforward, not helped in this instance by boundaries that are periodically on the move or overwhelmed.



The March Stone — now deep in the forest, stood in an open dune landscape and denoted 17<sup>th</sup> Century Salmon Fishing Rights on the Tay.

The dune system of Tentsmuir and Abertay Sands in the county of Fife, Scotland tells a number of stories of the significance of boundaries in dune landscapes and how they are continuously on the move. Tentsmuir Point lies at the southern mouth of the sediment-rich Tay Estuary. The river Tay discharges two million tons of new sediment from the hinterland each year to accumulate on the sand bars, spits, and beaches at the estuary entrance. Some 8,000 years ago the boundary between land and sea would have been found several kilometres inland of the current shoreline. By the 12<sup>th</sup> Century the shoreline had prograded (the coast building seawards) to a point that would today lie deep inside the forest, perhaps in the vicinity of the 17<sup>th</sup> Century March Stone pictured above.

The shoreline at Tentsmuir is said to advance seaward at a rate of a finger's width per day. In 1941, when the UK feared invasion by German forces across the North Sea, a line of anti-tank blocks (below) was installed along the then shoreline by the Polish Parachute Regiment, tasked with protecting nearby RAF Leuchars and Dundee harbour<sup>[23]</sup>. In the intervening decades coastal progradation has left these Second World War defences awkwardly out of context, remote from the current shoreline, which today lies some 200 metres to the east. This impressive row of concrete blocks, formed using local materials and shuttered with corrugated tin, demonstrate the value of cultural heritage features as markers of coastal change.



Anti-tank blocks installed in 1941 along the then shoreline — today some 200 metres from the sea.

Relative sea-level rise is a topic that we humans still have to come to terms with, not least because the rather brief period of recorded human history, say the last 5,000 years, has coincided with a period of relatively stable sea level, the rise associated with the tail end of the last glaciation having largely run its course. Recorded history, in the form of documents, music, and art, handed down over generations and millennia, informs the way we see the world, past, present, and future. So an absence of any mention of rising sea levels in historic documents, aside from those associated with ephemeral occurrences such as floods or tsunamis, arguably leaves us ill-prepared to deal with the changes to the shoreline, in response to a new period of marine transgression.

The concept of 'boundaries' is central to informing the way we currently think about land ownership, tenure, and conservation designation. Rising sea levels present a challenge to this thinking. The beach at Portstewart Strand, County Londonderry offers an interesting form of boundary by way of a line of posts that run perpendicular to the shoreline, from the foredune ridge down across the beach

and out into the intertidal zone. Their purpose is to keep a portion of the beach car-free, as in Northern Ireland beach users take their cars onto the beach as a proxy for beach huts.



Portstewart Strand, County Londonderry.

This line of posts at Portstewart Strand also serves to demonstrate that, as each year passes, relative sea-level rise is pushing the Mean High Water mark landward. This new period of marine transgression is marked on the posts by the presence of marine algae and barnacles.

With each successive year, and the addition of a few more millimetres of sea-level rise, these marine colonisers creep up the shoreline, attaching themselves to the next landward post and sustaining themselves there, as yesterday's terrestrial conditions yield to marine influence.



Beach Posts at Portstewart Strand, County Londonderry — ©National Trust Images/Laura Lavery.

The dynamic equilibrium at the shoreline described above in relation to marine transgression on the beach at Portstewart Strand, or in relation to the anti-tank defences at Tentsmuir is clear to see. The defence line at Tentsmuir, constructed on the 1941 foredune ridge, unequivocally marks the position of the shoreline at the time, it is a fixed point, in just the same way that the Atlantic Wall blockhouse at the Dune Dewulf, described in the section on The Military, marks a receding shoreline. Cultural heritage assets, whether a military feature or a set of posts to restrict cars, provide a tangible way for us to engage with and better understand shoreline change.

On dune coasts, where both erosion and accretion are possible, the consequences of a shifting shoreline and impacts on land ownership and boundaries comes into focus. In a UK legal context a dune front lost to the sea through erosion, leading to a landward migration of Mean High Water Mark results in the ownership of the 'new' beach or area of intertidal generally passing from the former sand dune owner into the ownership of The Crown Estate. Conversely, on an accreting dune coast the progradation of the sand dune shoreline into the sea, effectively pushing the Mean High Water Mark seaward, sees the former intertidal land ownership of The Crown Estate absorbed into the new ownership of the sand dune landowner.

A fine example of shifting shorelines, and a consequential shift in ownership, is currently playing out at Whiteford Burrows on Gower, Wales.



Whiteford Burrows, Gower — a prograding beach and foredune.

The sediment-rich entrance to the Burry Inlet, on which Whiteford Burrows stands, means that at present the shoreline, represented by the Mean High Water Mark, is advancing seaward as sand banks and embryonic dunes form. The National Trust and the adjacent private estate stand to be the beneficiaries of this 'new land', at the expense of The Crown Estate, but the benefit to landowners of choosing to register such new land is far from clear. On dune coasts what the sea and sand supply gives in one decade can just as easily be taken away in the next.

The dilemma associated with boundaries in sand dune landscapes also extends to the impacts of shifting boundaries on natural and historic environment designation. Our approach to conservation designations, be it a Site of Special Scientific Interest (SSSI) or Scheduled Ancient Monument (SAM) is based on lines on maps. In dynamic landscapes such as dunes, and foredunes in particular, physical change can be rapid — sometimes overnight in response to a storm. At Formby, on the Sefton coast,

the frontal dunes are currently receding at up to 4 metres per year. Whilst to the north and south of Formby the coast is prograding. And yet, whether receding or accreting, the boundary of the SSSI and the description of the features for which the site is designated, even where they no longer exist, remains the guiding legal instrument to inform conservation management.

Making sense of change is a significant challenge for conservation organisations and practitioners, and the National Trust is no exception. Within the Trust, our understanding of conservation is framed by the phrase ‘the careful management of change’. On this basis, change, such as loss through coastal erosion, should sit comfortably with our understanding of conservation. And yet, so often when we use the term ‘conservation’, we do not mean enabling the careful management of change, but are instead seeking to maintain the status quo, more akin to the thinking associated with the word ‘preservation’.

More widely, and looking beyond the Trust, it is important to recognise that our conservation designation frameworks in the UK arose in a period, predominantly in the mid- to late-20<sup>th</sup> Century, when conservation features ‘knew their place’. Once described by a line on a map, it was largely assumed that a SSSI or SAM, and their attendant features of interest, would remain there. Climate Change, and the impacts of climate change at the coast through increased erosion and flooding pose a serious challenge to this thinking, and the way we ‘do’ conservation in the 21<sup>st</sup> Century. This topic is big, and lies beyond the scope of this report, but it is a topic that dune managers, and the legislation, structures, and institutions that underpin protected area and historic environment management will need to attend to in the near future.

Whilst in Ireland in pursuit of my research I was fortunate to visit a number of machair dune sites which also tell interesting stories of how boundaries and tenure influence cultural heritage in sand dunes. Machair is a novel form of sand dune found in northwest Ireland and the west of Scotland. It is characterised by low-lying, flat grasslands that occur inland of the foredunes, and is a type of vegetated calcareous sand plain that can be highly-floristic, provided the grazing levels are maintained to halt ecological succession. I encountered machair in Donegal in the vicinity of Carrickart where the traditional practice of grazing the machair grassland persists under a land tenure system known as ‘commonage’.

Commonage is unique to Ireland but in many ways resembles a hybrid between the English medieval strip farming system and the grazing rights associated with English and Welsh Commons. Those with certain commonage rights are also able to break the grasslands and cultivate cereal crops using seaweed as a fertiliser. After cropping, the arable area, poor in nutrients, is allowed to revert to grassland and recover its fertility.

Commonage is not restricted to machair landscapes in Ireland, but persists as a significant form of land tenure in coastal dunes, either through shared ownership arrangements or the right to graze. In the case of ownership, ‘shareholders’ have, analogous with the English medieval system, formally divided their commonage into ‘stripes’ or blocks of land.

Commonage is key to maintaining these striking machair cultural landscapes as well as other landscapes in Ireland away from the coast. According to Your Commonage, one of Ireland’s leading commonage consultancies, more than 400,000 hectares of land remains in commonage, with 11,000 farms having a shareholding in 4,500 remaining commonages<sup>[24]</sup>.

What struck me about these machair dune landscapes, given their flat and low-lying characteristics, is their potential vulnerability to sea-level rise. One look at a map shows how, on the heavily indented coastline of Donegal, the machair often forms an isthmus between areas of high ground, defined by more solid geology, such as that found between Carrickart and the Rosguill peninsula (above). Commonage and the machair cultural landscapes may have survived the vagaries associated with the advance of modern agriculture but a question arises over the long-term survival of machair dunes in response to sea-level rise.



Machair dunes — forming an isthmus between Carrickart and the Rosguill peninsula.

During my travels my constant companions were the maps I carried with me, the starting point in many cases for my interaction with cultural heritage at a particular dune location. Understanding dunes from features such as boundaries and the other cartographic symbols described on these maps was a precursor to the conversations I went on to have with site managers. Along the way I learned that the maps themselves come in a variety of cartographic styles and vary by country. One only has to lay a 1:25,000 sheet from our own Ordnance Survey (OS) next to its French equivalent from the Institut National de L'Information Geographique et Forestière (ING) to appreciate these differences.

One significant difference that stood out was the way the OS and ING differ in the presence or absence of contour lines in dune systems. I've been staring at maps of UK dunes for decades but it was only when studying the ING maps that I noticed that contours are universally applied to the mapping of French dunes, whilst contour lines are, as often as not, absent from OS sheets. This made me curious.

Why, I wondered, do OS cartographers not systematically map contours on dune fields, particularly as dune systems have varied topography, and dune formations regularly reach a height of 20 metres. I was puzzled. Could the answer lie in this being a hangover from the military use of dunes, with contour details deliberately obscured to confuse a watchful enemy? Or is it simply that the OS considers dunes as impermanent geographical features, liable to change and therefore too unreliable to expend cartographic effort on in order to share their topographical secrets? My hunch was the latter.



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I telephoned the OS who confirmed that in general, and albeit with some exceptions (perhaps as a result of individual cartographers enthusiasm for dunes), the topography of dunes is often left to our imagination, as sand dunes can change form sufficiently frequently to make describing their topography with contour lines unreliable. This approach seems like an interesting legacy of both thought and practice stemming from a period when dunes were more dominated by bare sand and constant change, and contour data may well have proved only temporarily accurate, but that was half a century ago. For the past five decades, or longer, and as I have described elsewhere, the majority of sand dune systems have become increasingly stable, something perhaps that the OS has still to recognise.

Whilst the topography of sand dunes may still elude us on Explorer maps, it is clear that we like to interact with dunes, and sand dunes have become a significant place for many to indulge in a variety of recreational pursuits.

## Recreation, access and tourism

*“Golf is a game whose aim is to hit a very small ball into an even smaller hole, with weapons singularly ill-designed for the purpose.”*

Winston Churchill

I confess to having no interest in golf and tend to side with the view expressed by Winston Churchill, but I do acknowledge that golf, love it or loath it, remains a dominant cultural heritage feature of dune coasts in the UK and around the island of Ireland. My lack of enthusiasm for golf meant I have had to get used to the idea, rather grudgingly at first, that golf makes an important contribution to contemporary dune landscapes, and given the power of golf and the influence of golfers in civil society, is likely to continue to do so.



Newburgh on Ythan Golf Course — Aberdeenshire.

The Links courses found in coastal areas are highly-prized by golfers and some of the most prestigious courses, such as The Old Course at St Andrews in Scotland, Royal Portrush in Northern Ireland, and Royal Birkdale in Lancashire are regular hosts to the Open Championship, the oldest of Golf’s major championships.

Golf can seem an elitist pastime. The image below illustrates the lengths some clubs go to in order to prevent access to land in their ownership by the general public — in this instance deploying razor wire.





Boundary fence — The Royal County Down Golf Club.

In stark contrast, The Old Course at St Andrews, Fife is a public course over Common Land and the dunes lands, through which the course runs, are held in trust by The St Andrews Links Trust under an Act of Parliament. Whilst a number of St Andrews golf clubs have playing rights on the Old Course, so too do the general public.

I do not want to get further distracted by the moral or ethical aspects of golf, interesting as it is, but it is worth putting on record something about the contribution that golf, as a form of land use, has made to coastal landscape and nature conservation. Imagine a world without golf. What alternative land uses would have occurred in coastal dunes since the advent of golf? Ownership of coastal dunes, or links courses, by golf clubs predates any form of land use planning system or designation for protected areas. Whilst golf is not without its critics in terms of negative impacts for dune conservation, for example through the manicuring of fairways at the expense of dune flora and fauna, it can be argued that golf has played a significant part in preventing the urbanisation of vast tracts of coastal dunes.

Today, golf is a highly lucrative venture, not just for the clubs themselves but for the employment opportunities it presents to remote and often economically-restricted coastal communities. For the owners and managers of links courses the impact of storms attacking their protective foredunes is a real concern. A concern illustrated in the two images below of the Royal Portrush in Northern Ireland.



Royal Portrush Golf Club — looking from land to sea.



Royal Portrush Golf Club — looking from sea to land. Note the substantial dune front erosion in the centre of the picture.

The active erosion taking place along the dune frontage at Royal Portrush, host to the 148<sup>th</sup> Open Championship in 2019, provides an example of an emerging threat to golf. As sea levels rise, and the dune frontages become more dynamic in response to the onslaught of storms, the urge to make engineering interventions at the shoreline to ‘protect’ the links courses behind is certain to increase.

In early 2018 the Irish Times reported that Trump International Golf Links Limited, owners of the Doonbeg golf course in County Clare, planned to build a 38,000 tonne rock barrier to protect three holes at the course “*as a matter of urgency*”. The plan was supported by the local community in Doonbeg and proposals were approved by Clare County Council in 2018. This decision was appealed to An Bord Pleanála, the highest planning Board in the Republic, by several parties including An Taisce (NT equivalent in Eire), Friends of the Irish Environment (FIE), the West Coast Surf Club, and others.

In a decision published on March 2019, the Board refused permission saying it was not satisfied the proposed development would not result in adverse effects on the physical structure, functionality, and sediment supply of dune habitat within the Carrowmore Dunes Special Area of Conservation (SAC).

This high profile case serves as an example of a conflict involving golf that is likely to increase in dune landscapes in the future. A conflict that is in essence about making a choice between allowing dune systems, and their foredunes in particular, to evolve naturally, forming and reforming in response to a changing coastline, or choosing to make civil engineering interventions. The latter is no doubt attractive in the short-term, but highly likely to compound the problems that links golf courses will face as these engineering works, all with a time-limited design life, fail in the future.

There is a certain irony in the situation where golf, the unlikely initial saviour of many of our finest coastal dune systems, may turn out to be a threat to the long-term survival of naturally functioning dune coasts. Golf however is not the only recreational activity that has impacted on coastal dune systems.

The image below of the entrance to the National Trust's Murlough dunes in South Down, Northern Ireland serves to highlight the concerns amongst the nature conservation community in the 1960s and 1970s about the impact of human recreational pressure on our dunes. The image is reproduced from a 1977 manual of dune management commissioned by the Planning Division in the Republic of Ireland<sup>[25]</sup>. This study, and the resultant manual, was one of many such initiatives from this period that reflect a nervousness amongst conservationists about access and footfall-induced erosion of dunes, a nervousness that persisted through to the late-1990s and, in truth, still persists today.



Entrance to dunes at Murlough Co. Down — the authors caption reads *“this notice gives reasons why regulations are enforced and thus encourages public co-operation”*. Image reproduced from ‘The manual of dune management’, Planning Division of the Republic of Ireland (1977).

The advent of motorcar-based travel and tourism revolutionised our lives in the 1960s, putting at our disposal sand dune coasts that were previously out of reach for all but the most intrepid traveller. As illustrated in the photograph below *ad hoc* parking arrangements became commonplace, leading to desire line footpaths occurring through the dunes as visitors scrambled for the beach.



Image reproduced from 'The manual of dune management', Planning Division of the Republic of Ireland (1977).

I recalled in the Preface to this report my own actions as a dune manager in the 1980s on the Isle of Wight, tasked to go to great lengths to restrict access to the dunes; herding visitors onto designated access routes, and stopping the ingress of cars into the dunes. Today on sites where visitor numbers are high and access to the dunes restricted to just a small number of key access points there is much still to be said for continuing to carefully manage visitor footfall-induced trampling of fragile dunes, such as below at the Dune du Pilat, Aquitaine which sees two million visitors a year.



Dune du Pilat, Aquitaine.

In marked contrast, on areas of heavily-vegetated 'over-stabilised' dunes, some managers are beginning to experiment by harnessing the disturbance potential of some recreational activities to create areas of bare sand, leaving suitable openings in the vegetation for new plants to colonise.

Recreational activity in dunes, whether playing golf or simply getting on the sands to enjoy the experience, brings us into contact with nature, a contact that in most instances enhances our appreciation of and respect for sand dunes. A respect that, in the case of historic landfill at the coast, we have not always shown to our dunes.

## Landfill

*“Our evolutionary psychology preconditions us not to respond to threats which can be postponed until later.”*

Mark Lynas

Large-scale landfill at the coast could be regarded as simply a modern midden, and might easily fall victim to the human precondition that Mark Lynas refers to above. And why not, as there is something romantic about midden sites, well, ancient ones at least. They speak not of pollution and toxins, but of the past, providing a tangible insight into the archaeological record.

The shell midden in the dunes at Forvie, Aberdeenshire (below) dates from the Bronze Age and is made of mussel shells harvested from the adjacent Ythan Estuary. Recession of the dune front has occurred in recent times to partially reveal the dark, organic, shell-rich midden layer, sandwiched between a base of ancient dune and a more contemporary covering of windblown sand. Layers that mark the passage of time.



Bronze Age midden, Forvie.

Today the Forvie midden continues to make a fine vantage point and it is easy to imagine a Bronze Age family sitting on the mound, feasting on mussels, with a clear view of their surroundings and discarding the empty shells around them.

Contrast this scene of Bronze Age rural idyll with the situation at Le Havre de Vanlée, Normandy, where a modern municipal landfill site, established in a dune hollow just back from the coast in the

1960s, had, by 2015, fallen victim to a serious cutting back of the dune front caused by the scouring action of wind and waves in the estuary. The development of a landfill site at this location, in common with many in dune landscapes, had simply taken advantage of the natural topography of the dunes. Finding a convenient dune hollow, set back from the shoreline at the entrance to the estuary, the Municipality spent several decades piling in the detritus, blissfully unaware, or perhaps in denial, of the emerging threat. And emerge it did; by the 1990s the landfill's noxious content began spilling and leaching into the estuary.



Coastal landfill, Le Havre de Vanlée, Conservatoire du Littoral.

The content, unlike that of the Bronze Age midden at Forvie, included masses of plastic that rafted in and out of the estuary with the ebb and flood of the tide. Leachates, rich in 20<sup>th</sup> Century contaminants, permeated through the sands and into the adjacent marine environment.

The site is part-owned by Le Conservatoire du Littoral and managed in collaboration with the Municipality. By 2016, and as the pollution situation worsened, a temporary geotextile coffer dam was installed, whilst a more ambitious long-term solution was developed. In February 2018 the final scheme to remove all the waste from the location was put in place<sup>[26]</sup>.

The Havre de la Vanlée legacy landfill site was completely deconstructed. The materials were sorted, with the noxious elements being taken to a modern landfill site inland. The carefully sifted sand was used in the restoration of the dunes. Just a few weeks after the completion of the restoration I visited the site with Régis Leymarie, Deputy Regional Director for Conservatoire du Littoral in Normandy, who oversaw the project.



Le Havre de la Vanlée, Normandy, following removal of the landfill.

As we walked Régis confessed that at a cost in excess of 1.5 million Euro, and in spite of accessing grant aid, he had come in for some serious scrutiny from his bosses at the Conservatoire, but the result was just what he had been hoping for — a dramatic transformation from toxic tip to restored sand dune.

The National Trust have a number of high profile landfill sites in coastal dune systems. Two of which are on the same site, and within a few hundred metres of each other, at Formby on the Sefton coast. One landfill consists of 36,000 cubic metres of building rubble that spills on to the beach, creating a physical hazard. The other is comprised of dumped tobacco waste which is interrupting dune development.

Focusing on the latter, today's tobacco cliffs at Formby were formed when tobacco leaf waste was dumped on disused asparagus fields just back from the coast between the mid-1950s and early-1970s. The source of this waste was a local factory owned by the former British Nicotine Company which extracted nicotine from low-grade tobacco leaf. The factory produced large volumes, 22,000 tons per annum at its peak in the mid-1960s, of wet tobacco leaf waste. The tobacco waste is 3–4 metres in depth, and coastal erosion of the dunes has resulted in steep 'tobacco cliffs' that act as a barrier to the wind-blown movement of sand from the beach, interrupting dune forming processes<sup>[27]</sup>.

The DuneLIFE Project (part of Dynamic Dunescapes) includes actions to create notches in the tobacco cliff to help promote dune-building over the tobacco waste area and to help the reconnection of the mobile dune belt along this coast.



Formby — tobacco cliff, the large blocks on the beach are compressed tobacco waste.

The restoration at Le Havre de la Vanlée and the work planned for Formby is inspirational and gives hope that we are starting to attend to “*Our evolutionary psychology preconditions...*” that I quoted from Mark Lynas at the head of this short section on Landfill. And whilst we are not always responding to threats in a timely fashion, we are starting to make progress in retrofitting solutions to coastal landfill issues that we have inherited from earlier generations. However, the size of the challenges associated with legacy landfill sites at the coast should not be underestimated. The Environment Agency database on coastal landfill sites includes over 1200 locations, with a significant number on sand dune dominated coasts.

In the past we’ve not solely been guilty of desecrating dune coasts through negative human interventions such as landfill. Sand dunes have also been locations that have acted as a positive source of inspiration for the arts.



*“If you're fond of sand dunes and salty air, quaint little villages here and there...”*

Groove Armada

I'm not a huge fan of Electronica, although I did once own a glow in the dark version of the Kraftwerk EP containing the track Trans-Europe Express — but that is another story.

I do though have a CD in my collection by Groove Armada, another band that perform in this genre. The album is called 'Vertigo' and contains the track 'At the River'. The track could seem dull as it repeats the lyric *“If you're fond of sand dunes and salty air, quaint little villages here and there...” ad infinitum*. Unexpectedly, and for me at least, there is something captivating about the instrumental accompaniment that speaks of sand dunes, a sort of slow grinding, washboard effect, interspersed with elaborate bursts of trumpet solo that puts me by the sea and in the dunes. I can smell the marram and feel the sand between my toes. Take a listen and see what you think — here is the link

<https://www.youtube.com/watch?v=Kg3wrLWAIU0>



Groove Armada — Vertigo.

At the other end of the musical spectrum Formby-born teacher and folk singer songwriter Stephen Gerrard celebrates the 'sandgrounders' of the Sefton coast with a song of the same name in his album 'Broken Shells'. To be a sandgrunder you should be born between the Alt and Nelson Rivers on this section of the Lancashire coast and, ideally, have several generations of ancestors hefted to this location. The song describes the joy and inspiration derived from visiting the dunes and beach at Formby<sup>[20]</sup>.

A Google search of 'sand dune music', reveals there is not a whole lot more out there beyond Groove Armada and Stephen Gerrard by way of dune specific music, apart that is, from some interesting videos around why sand squeaks when you walk on it.

In marked contrast, a visit to the website [artuk.org](http://artuk.org), entering 'sand dune' into the search engine, reveals that dunes have attracted the attention of painters over the centuries, and continue to do so. I'm not very sure of my 'isms' when it comes to art categories but 44 entries appear, dating back as far as the 17<sup>th</sup> Century, and reaching through to the present-day. They include French and Dutch landscape painters, as well as more modern paintings, covering I'm sure a number of isms, and a good deal in between. Some of the illustrations I have used in this report were derived from this source, and these serve to highlight the diverse cultural heritage interests associated with sand dune landscapes. Bare sand features often in dune paintings, as in the 19<sup>th</sup> Century painting below titled 'Sand Dunes near Boulogne-sur-Mer', a record in art of a time when vegetation in dunes was scarcer than today.



Sand Dunes near Boulogne-sur-Mer — Joséphine Bowes.\*

Dunes have also been a source of inspiration for writers, and I've referred to 'The Riddle of the Sands' by Erskine Childers elsewhere in this report. I suppose what surprised me a little on my journey was that I did not come across other blockbuster literary titles that took dunes as a specific setting for a novel. Perhaps there is scope to pursue such a project?

However, what I did come across on my travels was a plethora of non-fiction writing about individual dune sites by local historians, nature writers, and photographers. Kate Martin at Formby sent me a sample of titles depicting various aspects of the Sefton coast: 'The Sands of Time' by Dr. Phil Smith, 'The Sands of Time Revisited' by the same author, 'Sandscape' by The Sefton Coast Landscape Partnership, 'Sands' by Jean Sprackland, and a local author, Joan A. Rimmer, who has written numerous books and poems about Formby including 'Formby Remembered: A Century of Change', 'My Formby: Recollections of Village Life', and 'The Village That Was Formby'<sup>[28]</sup>.

Formby is not unusual in this regard and almost all the sites I visited had a plethora of locally-generated books, photography, paintings, or ceramics inspired by their dune location.

The arts are alive and kicking in the dunes, and I leave them now to travel to my final category of cultural heritage associations with sand dunes and mobility — navigation.

## Navigation, ports, and harbours

*"I may not have gone where I intended to go, but I think I have ended up where I needed to be."*

Douglas Adams

The medieval port of Regnéville-sur-Mer in Normandy, stands today rather self-consciously detached from the sea and prospect of trade, increasingly cut-off by the shifting dunes and infilling sand flats of Le Havre de la Sienne estuary. Over the centuries sand has choked this ancient haven, a maritime version of besanding, and a process that continues bringing into question how long Regnéville qualifies as 'sur-Mer'.

A coastal survey of 1694 reported that this once major port (a staging post for the Crusades) could no longer receive any ship with a draught greater than 12 feet. Sand continues to infill the haven, impeding navigation, and its function as a harbour is steadily being lost. A variety of interventions have been made to try and outwit the shifting sands: a training wall to flush the sand on the ebb tide, a jetty extension to reach over the sandflats to the deep water channel — but all probably in vain. There is even a grandiose scheme proposed to dredge the entire estuary clear of sand and reuse the spoil as beach recharge just up the coast at Agon-Coutainville where the shoreline is subject to erosion. More realistically perhaps, the 'Exemplary Yachting Port' project promoted by Communauté de communes de Saint-Malo de la Lande in 2009 sought to find solutions to compensate for the decrease in the number of days when boating activities are possible in harbour towns such as Regnéville due to accretion of sand. This is essentially about helping communities impacted by sedimentation to wean themselves off the idea of being ports and switch to alternative, often tourism-based commerce. Yet civic pride in Regnéville still spills over into talk of the town rediscovering itself as a major port, something not seen since the Middle Ages.



Regnéville, Normandy — with ruined 14<sup>th</sup> Century castle.

In the summer of 2018 I was fortunate, via a friend who was cruising his yacht in the area, to visit the Ile de Glénan ten miles off the coast of Finisterre, Brittany. This archipelago is a striking place, like a miniature version of the Isles of Scilly, with a series of granite atolls, many connected by tombolo dune ridges that have formed between the granite islands. Ile de Glénan provides an interesting example of how future dune mobility might impact on cultural heritage, in this instance navigation and recreational sailing.



Ile de Glénan — tombolo dune ridge in middle distance connecting two granite islets.

Ile de Glénan is the spiritual home of sailing in France, and hosts a number of sailing schools but it is a harsh environment, surrounded by the wild Atlantic. Safe anchorage is only possible due to the shelter afforded by the islands, reefs, and tombolo dunes.

As sea levels rise and the intensity of storms increases the Ile de Glénan face a precarious future, with the tombolo dunes potentially vulnerable to the energy of Atlantic waves. Who knows, perhaps these islands are destined to become less an archipelago and more a scattering of semi-submerged reefs, and a hazard to navigation.

On setting out on my journey to explore sand dunes, mobility, and cultural heritage I had not thought that sand-choked havens on accreting coasts or increasingly precarious anchorages in exposed locations would feature in the way they have. Similarly, most of the 11 broad categories of cultural heritage interests I have explored in this section of the report only became clear as I talked with the people I met along the way; site managers, academics, and interested individuals. Through the sharing of their knowledge I have been better able to understand societal attitudes towards sand dunes, cultural heritage, and mobility.

### Part Three: Attitudes towards dunes and their mobility

Patrick Geddes, the father of UK town planning, observed on one of his frequent visits to Tentsmuir dunes in the county of Fife, Scotland “...one comes forth on Tents Moor, a waste and empty territory, a land of lost footsteps... no one can enter it without feeling he has penetrated a region apart...”. Geddes’ reaction to being in the dunes, sensing a landscape that evokes responses different from other landscapes, is a feeling I too have shared. For me, it is linked to the latent or indeed active dynamism that one encounters in the dunes; the sound of marram ruffled by the wind, the roar of distant surf, or grains of sand racing across the dune surface. As I touched on earlier in this report the trend in dunes over the past couple of generations has been towards ever greater stability and this shapes both our individual and societal response to them.

Dunes have of course been more mobile in the past, as Carew observed in his 1602 survey of Cornwall, “*Gwithian, a parish standing near St Ives Baye, muche annoyed with sea sande, which flyeth at lowe water with the winde out the choked haven into the Lande, swallowing up muche of the lande of the inhabitants, to their great impoverishment*”<sup>[1]</sup>. Such periods of mobility had serious consequences for coastal communities, the small village just inland from the coast at the Forvie in Aberdeenshire was besanded in the 15<sup>th</sup> Century, and the dwellings remain buried to this day.

In subsequent centuries much effort in and on the margins of sand dune landscapes has been directed at stabilising dunes, and with considerable success. A sense of mankind being in control of dune behaviour has emerged through a range of interventions; marram grass or tree planting, beach nourishment, and groyne construction. From the industrial revolution onwards dune stabilisation has been further aided by an abundance of atmospheric nitrogen which feeds dune vegetation, resulting in the fixing of the majority of European dunes.



Image reproduced from ‘The manual of dune management’, Planning Division of the Republic of Ireland (1977).

Since the middle of the 20<sup>th</sup> Century, and with just a handful of exceptions, sand dunes have become increasingly stable. In summarising this in relation to the extensive Sandscale Haws dune system in Cumbria, Pye *et al.* note that consideration of the evidence suggests that a trend towards a warmer,

slightly wetter, and less windy climate has been the main driver of stabilization, although atmospheric nitrogen deposition, increasing atmospheric CO<sub>2</sub> concentrations, reduced grazing intensity, reduced human disturbance from the mid-1980s onwards, and a tendency for shoreline progradation on the west-facing coast have also played contributing roles<sup>[29]</sup>. It's worth underlining that the drivers of stabilisation vary according to the circumstances specific to individual dune systems.

In spite of this overriding trend towards stabilisation, and whilst we may not see day-to-day evidence of the impacts of mobile dunes, my sense is that a societal nervousness persists around the uncertainties associated with sand on the move, akin perhaps to the way we fear flooding. This trepidation towards mobile sand seems, as I heard on the Dutch island of Terschelling, to be deeply rooted in the psyche of some, in spite of the fact that few have direct experience of besanding. This apprehension may seem illogical, because unlike river or coastal flooding we do not face personal injury through drowning in a sea of sand, but perhaps sand on the move makes us uneasy because it has the ability to consume our assets, an ability to swallow agricultural lands, camping grounds, and roads alike.

In the Netherlands, where dune stabilisation for the purpose of coastal protection has been a primary goal for centuries, dune managers are increasingly embracing the management practice of encouraging both small-scale and large-scale wind dynamics to increase mobility. In a 2020 report by the Dutch Knowledge Network for Nature Restoration and Management (OBN) the authors assert that the restoration of wind dynamics in the frontal dunes is now considered indispensable to improve the resilience of coastal sand dunes to future sea-level rise<sup>[30]</sup>. This re-awakening of dunes can be to the consternation of local communities. On Terschelling, Statsbosbeheer, the dune manager, has been involved in a 25 year-long conversation with islanders about the long-term benefits of remobilising dunes in some locations to enhance coastal protection and also improve biodiversity.

On Terschelling the tide seems to be turning in favour of an acceptance of increased mobility, but elsewhere a counter-view emerged from some I interviewed; a view that we toy with destabilising dunes at our peril. They argue that sand dunes continue to have a primary sea defence function, and in the face of rising sea levels and increased storminess, our dunes have the capacity to deliver important ecosystem services in the form of coastal protection. In a 2019 paper Delgado-Fernandez *et al.*<sup>[31]</sup> caution against the practice of freeing-up areas of bare sand and review the limitations and dangers of this approach [arguing] that it is not sustainable given the current climatic and environmental conditions, and that it can increase the risk of coastal erosion.

There now appear to be two diametrically opposed schools of thought amongst conservation dune managers and academics, the stabilisers and the disruptors. The disruptors are clearly in the ascendancy from the conversations I had during my research, but I am increasingly of the view that the truth probably lies somewhere in between the two extremes, a truth that must be informed by locally specific factors affecting each individual dune system. Factors such as aspect, visitor pressure, coastal processes, sediment availability, nature conservation, and cultural heritage interests. My sense is that decisions to stabilise or disrupt are nuanced. It may be that at a single dune site local stabilisation at a key access point to counter erosion induced by visitor pressure might sit perfectly logically alongside attempts to induce bare sand through disruption elsewhere in the same dunes.

## Part Four: Discussion and recommendations

The cultural heritage interests associated with sand dunes are varied, as I have outlined in the categorisation in Part Two of this report. Not only are the cultural heritage interests of dunes and dune landscapes broad, but if one delves into any of the individual categories it becomes clear that the cultural heritage interests also have a depth to them. Sometimes deep in their complexity, or deep on occasion in time, and deep also in the significance of what they can tell us about past, present, and future dune behaviour. Take for example the military use of dunes. The massive construction of a pillbox or blockhouse conceals a fragility when confronted with the forces of nature on a changing coast as I saw at Dune DeWolf, which, following its undermining and subsidence, provides a graphic marker of coastal change. Similarly, the blockhouses at The Dune du Pilat illustrate how the significance of a place or artefact may change over time, in this instance a shift in significance from war to peace, and currently from terrestrial to marine as the shoreline retreats and the sea gradually swallows them up. Military structures act as a reference point to measure and understand the dynamic nature of dune coasts over time, and vividly illustrate the role that cultural heritage artefacts can play in telling this story. For me this serves to underline the importance of preservation by record as being key to enabling us to understand coastal change in dynamic and perhaps increasingly ephemeral frontal dune landscapes.

The idea that we have developed control over dunes and are able to contain their inclination to wander has become deeply engrained in our psyche, driven in turn perhaps by the fear, or at least the ‘annoyance’ caused by sand on the move. Yet, in spite of the state of peak stability that most dunes are currently in, we should remember that this sense of control emerged during a period when the impacts of sea-level rise and the prospect of increased storminess were not a consideration. Increased instability in the foredune areas of our dune systems may, in a limited number of cases, lead to the progress of sand inland, presenting challenges for cultural heritage conservation in dune hinterlands. However, what is becoming clear to me is that our priority should be to work to understand the impacts of coastal change on cultural heritage in the foredune areas, as this is where the biggest and earliest signs of change will occur.

In Scotland the work of the SCAPE organisation (Scottish Archaeology and the Problem of Erosion), hosted at the University of St Andrews, provides a model approach to research, conservation, and promotion of archaeology at sites at risk of coastal erosion; a model and methodology that could beneficially be applied elsewhere. SCAPE, whilst not specifically focused on change along dune frontages, is interested in all archaeological sites and historic landscapes that have either a proximity to, or relationship with, the coast. The aim is to understand and record what is happening to archaeological sites that face the most immediate impacts of coastal change through erosion. SCAPE’s robust sound science and risk assessment-based approach to delivering on the aspiration of ‘preservation by record’ has much to commend it.

The National Trust’s preferred approach to the conservation of the historic environment on a changing coast is also predicated on preservation by record, but across England, Wales, and Northern Ireland there are no permanent units modelled on the SCAPE formula. There are a number of project-based initiatives such as Citizan in England, and the CHERISH project in Wales, but by their very nature, these project-based initiatives cannot provide a regular and ongoing approach to monitoring change in the coastal historic environment. In England and Wales the network of

excellent regional coastal monitoring observatories provides an authoritative evidence base for shoreline change but the focus is on informing flood and coastal erosion risk management in relation to impacts on communities, infrastructure, amenities (such as beaches), and on the natural environment. Reference to the historic environment and cultural heritage is largely absent from the work programmes or considerations by the Observatories. In England and Wales, Historic England and CADW respectively have created excellent gazetteers of coastal historic environment assets, above, on, and below the shoreline. These gazetteers, by their very nature, provide only a snapshot at a moment in time, and, like the coastal observatories, largely overlook how shoreline change is impacting on cultural heritage interests.

The importance of putting preservation by record on a sound footing came to the fore at National Trust locations during the winter of storms in 2013/14, which impacted upon dune sites. In spite of a commitment to this approach, the Trust has struggled to put in place measures to undertake responsive, event-driven preservation by record work. This seems to be partly due to resource issues linked to competing priorities — for example, should we fix a flight of steps, restoring access to a beach, or spend the same funds on understanding newly-exposed archaeology? Additionally, Trust business systems, quite rightly, follow a formal project management framework-based approach with project bids and approvals being made within a set timeframe. Yet, at dune change, and the revealing of features of archaeological interest, can be rapid; exposures can appear and be either totally lost to erosion or besanded again in just a few tides.

For dune coasts in the Trust's care it would be advantageous, in pursuit of effective conservation management of cultural heritage interests, and specifically archaeological features, to have in place a more fleet-of-foot approach to preservation by record that can be rapidly mobilised in response to storm events. This might be about having call-out contracts in place to enable additional external expert help to be brought in in response to a storm event. It might also be helpful to have a 'first response' fund readily available to streamline the release of project funding to cover costs.

In addition to event driven responsive preservation by record, there would be significant advantage for cultural heritage conservation in sand dune landscapes in the Trust pursuing, in partnership with relevant agencies and research establishments across the three countries, a planned proactive programme of monitoring coastal change with a specific emphasis on historic environment interests along the lines of the SCAPE model. Recognition of this shortcoming is surfacing across England and Wales. The Welsh Government undertook a consultation in 2018 on how to manage some of Wales' most iconic historic sites in the light of climate change and is proposing a fresh approach, based on the need to adapt to the new reality<sup>[32]</sup>. Minister for Culture, Tourism, and Sport, Lord Elis-Thomas flagged the need to re-think the way we manage the historic environment in Wales to respond to the threats of climate change. While we are taking steps to limit climate change, we must also adapt to the changes which are already happening.

Where practicable it would be good to link monitoring of the coastal historic environment to the region and country coastal monitoring observatories, bringing consideration of the impacts of coastal change on cultural heritage and the historic environment into the frame alongside environmental, social, and economic issues. If this could be achieved it would create a 'one-stop shop' for coastal change monitoring relevant to the Trust's interests in England and Wales, and would give a model to continue to pursue in Northern Ireland.



The impact of climate change on sand dune landscapes will be mixed. On the one hand dune fronts and beaches are likely to become increasingly mobilised in response to storm events, and correspondingly the cultural heritage features within this zone will be impacted first and worst. In marked contrast the dune hinterlands are likely to maintain their stability, due to the protective mantle of sand-binding vegetation, meaning that any onset of greater mobility here could be delayed for decades. There will be exceptions to more stable dune hinterlands where, for example, mobility already exists, such as at Formby on the Sefton coast.

Whilst the impacts of climate change at the coast may vary, what is certain is that at a site-based scale the likely impacts will need to be taken into account by those managing sand dunes, for nature, for cultural heritage, for recreation, or as sea defence structures. For the Trust this will mean committing resources to understand and record change on beaches and in foredunes, not just in reaction to individual storm events but as part of a regular regime of monitoring that provides an evidence base to show how sand dunes, and their mobility, are impacting on cultural heritage over time. To this end I offer the following recommendations:

1. Recognise that cultural heritage features associated with sand dunes are of significant value in providing a tangible way to better understand shoreline change and engage with stakeholders
2. Pursue a proactive programme of monitoring coastal change on sand dune sites in partnership with relevant agencies and research establishments with a specific emphasis on historic environment interests, adopting the SCAPE model from Scotland, and as appropriate linking to region and country Coastal Monitoring Observatories.
3. Put in place a more fleet-of-foot approach to achieving preservation by record that can be rapidly mobilised by having in place 'call-out contracts' to enable additional external expert help to be deployed in response to a storm event.
4. Review Trust sand dune locations to determine where, through acquisition or partnership working, it is possible to provide accommodation space for dune evolution inland or along the shoreline.
5. Contribute to the Dynamic Dunescapes project workstream 'Sand dune management handbook' to develop contemporary guidance for site managers that includes geomorphological, historic and natural environment interests, climate change impacts and access issues.
6. Maintain and/or establish broad ranging sand dune management research partnerships with Universities and other research bodies for key Trust sand dune locations.

## Epilogue

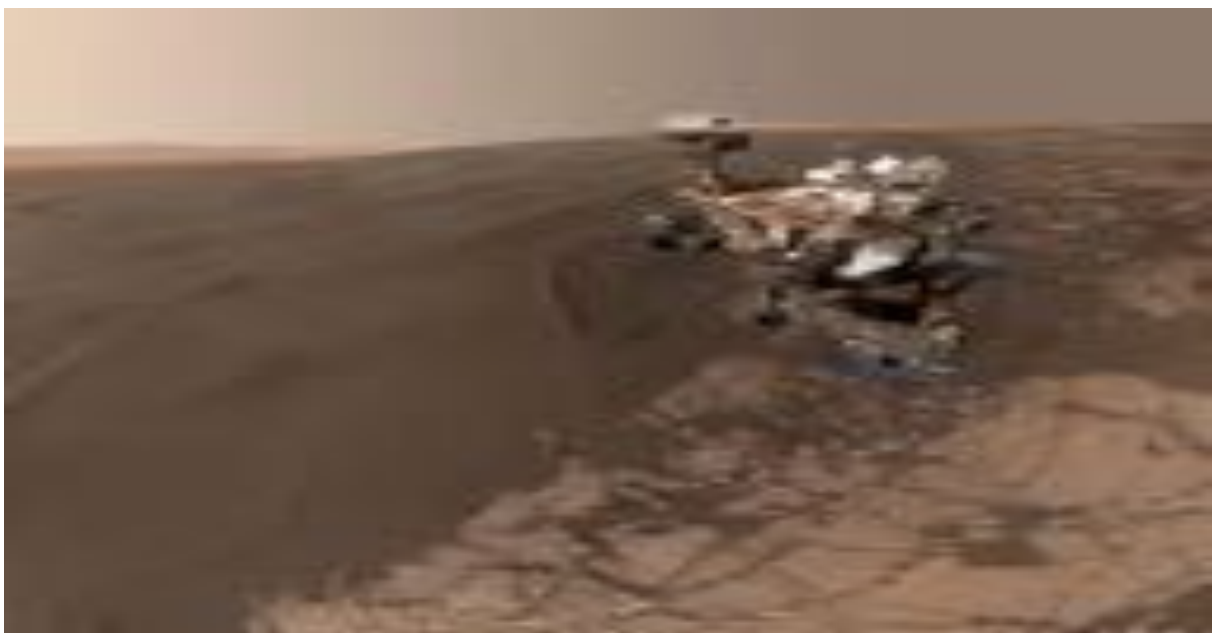
I finished my sabbatical in October 2018 with every intention of finalising this report during 2019. Life, as it tends to, got in the way and 2019 slipped into 2020. In my defence I did publish an article on my research into sand dunes, mobility, and cultural heritage in the 2019 edition of the Trust's internal technical magazine Views.

The delay in finalising this report has had the advantage that I have been able to assimilate more up-to-date information, particularly in relation to the tension amongst dunes managers and academics on the pros and cons of stabilisation and disruption.

These delays, and of course the arrival of COVID-19, has also influenced what I'd hope to do by way of communicating the outputs of my research. In addition to this written report, I'd hoped originally to give a lunchtime talk at our central office, Heelis, and combine this with a modest exhibition of the ceramic pieces that I made in response to the range of dune sites I visited. Clearly talks and exhibitions are not currently possible, and it looks unlikely that I will be able to fulfil this aspect of my ambition for some considerable time.

These self-inflicted delays and enforced changes of plan did enable me to think further about the creative ceramics spin-off element of my sabbatical research and I've now added at Annex 3 a catalogue of the pieces I have created called 'Sand and Clay'. I hope that, in the absence of being able to touch and handle the pots I made, the reader will still be able to explore, through images of these pieces and the locations that inspired them, some of the thinking recorded in the formal setting of my report in relation to sand dunes, mobility, and cultural heritage.

[Ends]



Sand dunes on Mars — NASA 2018.

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- 70. Coastal landfill, Le havre de Vanlée Conservatoire du Littoral.
- 73. Groove Armada — Vertigo.
- 74. Sand Dunes near Boulogne-sur-Mer, France Joséphine Bowes (1825–1874) The Bowes Museum\*.
- 77. Please keep off; Sand dunes formation erosion and management, Anne Quinn, Planning Division Eire, 1977.
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**Annex 1 — Research questionnaire**

**Sand dunes, mobility and impacts on cultural heritage\* — questionnaire**

1. Interviewee Details

1. Name	
2. Date	
3. Contact Details	
4. Interview Location/Site location	
5. Role	
6. Job Title	
7. Dune Location(s)	

\* Cultural heritage is referred to in its broadest definition — so whatever you feel is in scope

2. What is/was your main area of responsibility/interest with regard to coastal management

2a. What specific interests/responsibilities do you have for sand dune sites

3. Over what geographical area do you work?

3a. In relation to a specific case study site, what is:

- the name of the site;
- the scale of the site ( e.g. metres of frontage/ area in hectares)
- How do you currently manage dunes at this location
- What monitoring do you undertake

Historic Environment	Geomorphology	Ecology	Visitors
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4. Does dune mobility feature in your work? Yes/no

If yes how often

Almost never	Rarely (every 5 yrs)	Occasionally (annual)	Frequently (monthly)
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4a. How would you describe current dune behaviour at this location

Stable	Active becoming stable	Stable becoming active	active
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4b. What is the general trend in shoreline/dune front behaviour

receding	accreting	static
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5. What are your specific interests with respect to sand dune management and in particular working with dune mobility. (tick more than one if appropriate)

Cultural heritage	Natural environment	Community	Economy
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Additional Category:

6. From your perspective which of the following do you consider best describes the current approach to dune management in mobile dune systems, say within the last 5 years:

Stabilise	Contain/Constrain	Tolerate dynamism	Encourage Dynamismhange
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6a. Has this approach changed from historic practice, say over the past 20–30yrs

6b. Do you anticipate this approach will change again in the future

## 7. Policy and Strategy

7a. Do the policies and mechanisms within your organisation, enable you to respond to the impacts of mobile dunes on communities, natural environment or cultural heritage. (can you illustrate with an example from your location)

7b. Similarly do the policies and mechanisms from government and its agencies enable you to respond to the impacts of mobile dunes on communities, natural environment or cultural heritage. (can you illustrate with an example from your location.

8. Impacts on cultural heritage

What are the main impacts of mobile dunes on cultural heritage from your experience/on this site, based on the following categories and moments in time

Topic	Past (decades–centuries)	Present	Future (0–20, 20–50, 50–100 yrs)
Agriculture, Warrening, fisheries and saltworks			
Forestry and Woodlands			
Infrastructure and industry			
Drainage and Boundary features			

Archaeological Features			
People's homes/ Chalets, Caravans and camping			
Religious Sites			
Military Use — historic and current			

Ownership and tenure			
Designation			
Recreation and tourism activities			
Arts and literature			

Aggregate Extraction			
Landfill			
Navigation			
Scientific and Social Science Monitoring  History  (Conservation History)			

9. Key Issues in mobile dune management

How do you think the dunes at this case study location will change in the future?

**9a.** What do you think are the strategic or locally significant issues in managing mobile dune sites in the past, now or for the future in relation to cultural heritage interests.

	Past	Now	Future
Strategic			
Local			

10. The Future

10a Do you think you will need new policies and strategies for the future management of mobile dunes (Yes/No)

10b. If yes — what might these be and why might new policies and approaches be necessary

10c. Do you consider that you can influence the development of these new approaches and if so how and who?

11.Data Requirements and research

11a. Are resources available to monitor and record cultural heritage assets in dynamic dune sites.

11b. Do you have any specific data requirements to inform management activity in relation to dune mobility (please list)

11c. Do you have a sense of the priority dune locations, at your site/region or country scale, where cultural heritage research and monitoring is or will be required in the future.

## 12 Public perceptions

12a. How do you think local communities view mobile dune systems — is there a concern about mobility?

Unaware	Concerned	Impacted significantly	Do not know
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12b. Stakeholder impacts

Are there stakeholders who will be particularly impacted by future dune mobility. (refer back to categories in Q8)

12c. Information

Do you think stakeholders should receive more information to help them understand current and future change in mobile dune systems. Yes/No

If yes what information is required and why

How should this information best be delivered

12d. Compensation

Are or should people be financially compensated for losses or costs incurred through sand movement. (yes/no)

If yes by whom and in what form

State	Local government	Insurers	Private landowners

13. Are there any key lessons you have learnt that others could benefit from in working in mobile dune landscapes.

14. Other observations and comments



## **Annex 2 — List of organisations involved in dune management that formed part of this research**

Agency for Nature and Forests, Vlaanderen (Belgium).

Le Conservatoire du Littoral (France).

Defence Infrastructure Organisation (United Kingdom).

Departement du Nord (France).

Flemish Coastal Agency (Belgium).

Forestry Commission Scotland (Scotland).

Historic Environment Scotland (Scotland).

Historic England (England).

Liverpool Hope University (England)

National Park Zuid Kennermerland (The Netherlands).

National Trust (England, Wales, and Northern Ireland).

Natural England (England).

Natural Resources Wales (Wales).

Office National du Foret (France).

PWN (The Netherlands).

Royal Commission on the Ancient and Historical Monuments of Wales (Wales).

SCAPE, St Andrews University (Scotland).

Scottish Natural Heritage (Scotland).

Staatsbosbeheer (The Netherlands).

Simon Stevin Stichting, NGO fortress study group (Belgium).

Syndicat Mixte de la Grand Dune du Pilat (France).

University of Aberystwyth (Wales).

University of York (England).

University College Cork (Republic of Ireland).

University of Ulster, Coleraine (Northern Ireland).

Wildlife and National Parks Service (Republic of Ireland).

# Sand and Clay



Phil Dyke

# Sand and Clay

I've been learning pottery for the past 3 years, initially as a student of Abigail North, and subsequently, having set up my own small studio, by simply getting out there as often as I am able and throwing pots. My work as coastal adviser for the National Trust provides a source of inspiration for many of my pots — coasts, like clay, offer a chance to get close to raw nature.

My pottery passion lies in throwing pots on a wheel, although I have dabbled with slab work and slip casting. The intense concentration when throwing becomes a meditation and I find relaxation through pot-making — the inevitable disasters simply adding to my experience and learning.

In 2018 I made a study of sand dunes, their mobility, and impacts on cultural heritage along the Atlantic coast of Europe with specific reference to the impacts of climate change on sand dune landscapes. The pieces contained in this catalogue were inspired by this study, either as a result of the sand dunes I visited, the cultural heritage associations I explored, by the sand itself, or the many people I met along the way.

At most places I visited I was able to collect a small quantity of sand, and in some of the pieces I've mixed this material with stoneware clay to create some interesting textures. Other pieces in the collection rely on their form or the glazes I've used to maintain the connection with sand dunes, the adjacent sea, and, on occasion, the dune hinterlands.

The pieces, for the most part, are functional as I like to make pots that can be picked up and used, although one or two of the pieces do stray into the territory of being installations.

My hope is that as you look through this catalogue you might be reminded of the raw feel of the coast, sand dune landscapes in particular, and may even be tempted to read the report of my study into sand dunes, mobility, and cultural heritage.

I'd like to thank Abigail North, ceramicist and teacher, and Minnie Ingram, artist and photographer, both of who helped make this catalogue of my sand dune-inspired pottery possible.

Phil Dyke, December 2020.



# Teaching Phil

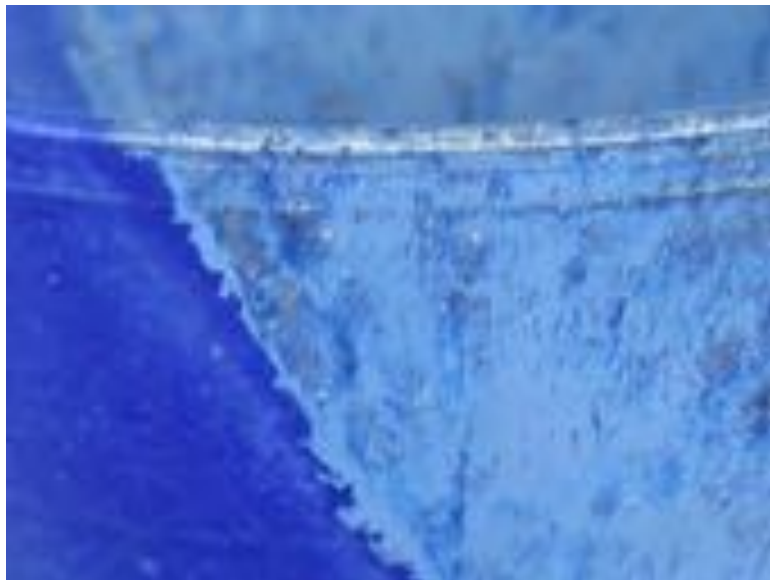
Have you ever heard a teacher say that they have learned much from their student? Phil was a complete pleasure to teach, and so full of exciting and original ideas, particularly in terms of his treatment of form and surface. He became an excellent thrower in a very short time, working with ease on larger pieces, and I watched him incorporate different natural materials into his thrown vessels, methodically experimenting with the effects on the clay body and surface. I admired the fact that this linked a particular vessel to a particular place/location, resulting in a truly unique body of work.

I am thrilled that he has achieved, through this catalogue a very well-deserved exhibition of his ceramics, and thrilled too that he continues to develop his work with clay in his own studio. It is lovely to have another potter just around the corner. And yes, I did learn much from Phil — I am now not afraid to be experimental in my own work and am increasingly fascinated by geology and history as they pertain to my ceramics. I can say with certainty that the seeds of these new curiosities and adventures would not have happened without inspiration from my very talented student. Thank you Phil.

Abigail North, 2020.



# Perfect Storm



Perfect Storm

11 x 21 cm

Stoneware with 10% sand from Schipgaatduin, Koksijde.

# Perfect Storm

This piece stems from the relationship between dense urban development and sand dunes along 65 km coast of Belgium. The dark blue glaze representing the deep waters of the North Sea offshore, and the light blue glaze the frenzied waters of the surf zone as waves attack the shoreline. The Schipgaat dunes to the east of the town of Koksijde illustrate the interesting relationship Belgians have with their dunes and the sea.

What is notable about the dunes at Schipgaat is the large area of bare and clearly mobile sand that sits in startling juxtaposition with adjacent urban area, both at the mercy of the sometimes highly-energetic North Sea. The residents of Koksijde are fiercely proud and protective of this bare sand landscape, known locally as the 'Belgian Sahara', valuing it as a place where nature and natural coastal processes run their course in amongst the otherwise heavily modified and developed urban coast. Sea, sand, and places where people live — the recipe perhaps for a perfect storm?



Koksijde, Belgium — coastal ribbon development with dunes in the background.

# Sandnotching



Sandnotching

7.5 x 26 cm

Stoneware.

# Sandnotching

Sand notching is a technique increasingly being used by dune managers to punch a hole in frontal dunes. This enables sand from the beach and marine sources to blow inland, with the intent of strengthening the dune hinterland and creating new bare sand habitat. The notches are made by heavy earth moving machines and the fresh sand slopes created at either side of the notch often reveal bands of subtly different coloured and textured sands. This bowl uses a striking glaze called Glut Orange and reproduces the striation seen in freshly-cut dune notches.



Newborough Warren, Anglesey — striations on the side slopes of artificially created dune notch.



# Capillary



Capillary

12 x 26.5 cm

Stoneware with 10% sand from Zuid Kennermerland.

# Capillary

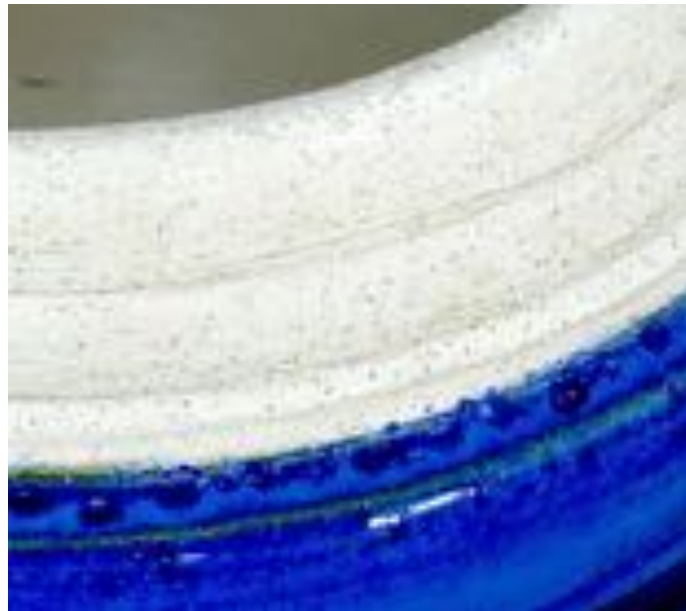
This chunky bowl illustrates how the water table in dunes can be many meters higher than that in adjacent land. As a consequence of capillary action water trapped in sand 'climbs' to form a lens, producing a water table higher than the level of groundwater in the surrounding land.

One key reason for the presence of largely undeveloped swathes of coastal dune in The Netherlands, which predates any notion of conservation designation, is directly attributable to the dune's function as a water supply for the nearby urban population.



Zuid Kennemerland National Park — formerly the drinking water dunes for Amsterdam.

# Drowning Archipelago



Drowning Archipelago

10 x 24 cm

Stoneware with 10% sand from Ile de Glénan in upper wall of the bowl.

# Drowning Archipelago

I was fortunate to visit the Ile de Glénan ten miles off the coast of Finisterre, Brittany, which provided the inspiration for this piece. Through a mixture of the use of glaze and coarse sand gathered on the islands incorporated into the clay, I've tried to create a sense of the ephemeral nature of this archipelago. Ile de Glénan is a very striking place, like a miniature version of the Isles of Scilly, with a series of granite atolls, many connected by tombolo dune ridges that have formed between the granite islands.

Ile de Glénan is the spiritual home of sailing in France, and hosts a number of sailing schools but it is a harsh environment, surrounded by the wild Atlantic. Safe anchorage is only possible due to the shelter afforded by the islands, reefs, and tombolo dunes. As sea levels rise and the intensity of storms increases the Ile de Glénan face a precarious future, with the tombolo dunes potentially vulnerable to the energy of Atlantic waves. Perhaps these islands are destined to become less an archipelago and more a scattering of semi-submerged reefs, and a hazard to navigation.



Isle de Glénan — a drowning archipelago with tombolo dunes in the middle distance spanning the two granite islands.



Leaving Glenan.

# Footprints



Footprints

2 x 30 cm

Stoneware (cranked) with 5% sand from Formby.

# Footprints

I threw this plate and, whilst still soft, I got my youngest grandson to stand on it and leave his footprint impression in the clay. The clay is a quite heavily cranked stoneware to which I added a further 5% of sand from Formby.

The discovery of Neolithic footprints in the sun-baked clays that underlie the present beach at Formby, Lancashire, offer an insight into the lives of our hunter-gatherer ancestors. Formby-born singer songwriter Stephen Gerrard (not the footballer) describes how he had to make his way “*down to the sands to stand in the footprints of Stone Age man*”. A powerful connection between two individuals in the same landscape, standing on the exact same spot, separated by seven thousand years.



Formby Footprints — Phil Dyke.



Formby Footprints — Gordon Roberts.

# Machair



Machair

7 x 20 cm

Stoneware (white porcelain).

# Machair

This functional bowl is made of a stoneware clay called White Porcelain, given to me by my teacher Abigail North to experiment with.

Machair is a novel form of sand dune found in north-west Ireland and the west of Scotland and is characterised by low lying, flat grasslands that occur inland of the foredunes; a sort of vegetated sand plain. I encountered machair in Donegal in the vicinity of Carrickart where the traditional practice of grazing the machair grassland persists.

I used a Spectrum glaze call 'textured dark cloud', which pretty much summed up the weather on the day of my visit. The glaze has reacted beautifully on the surface of the pot, and looking at it side-on I can see the green of the machair dune field stretching across the landscape under the hanging dark clouds of Donegal. Aren't glazes wonderful in the surprises they yield.



Carrickart, Donegal — machair.



# Atlantic Wall



Atlantic Wall

15 x 21 cm

Stoneware.

# Atlantic Wall

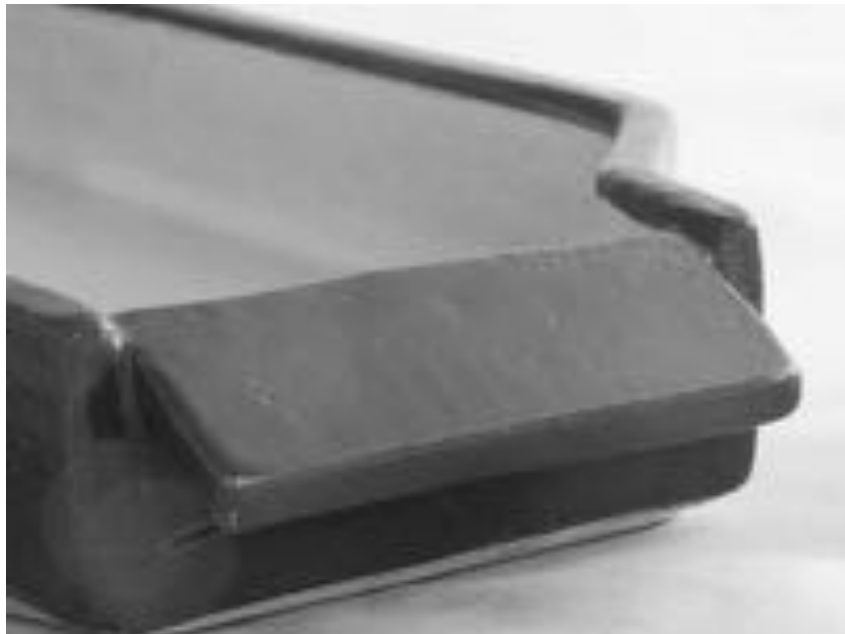
Atlantic Wall is a chunky functional casserole dish inspired by the massive Blockhouse at the Dune Dewulf, near Dunkirk. A chain of these defences, known as the Atlantic Wall, were built from Denmark to Spain by Field Marshall Erwin Rommel to deter Allied landings.

This blockhouse stood for more than seventy years on the dune crest commanding, as intended, a view across the Channel. In 2015 a rapid recession of the dune front occurred, undermining the several thousand ton block house structure and allowing it to rest now on the beach at a rather jaunty angle.



Dune Dewulf, Dunkirk — Atlantic Wall.

# Landing Craft



Landing Craft

5 x 18.5 x 45 cm

Stoneware (cranked).

# Landing Craft

This substantial functional stoneware serving or oven dish is slab-built and glazed for use at the table.

Hidden in the dunes at Braunton Burrows, three of these very solid concrete landing-craft survive. They were constructed to prepare American GIs for making amphibious landings in France. Time and again tanks, trucks, and artillery were loaded and secured in these concrete hulks. As each simulated landing progressed, and often under live fire from their colleagues, the troops freed the chains securing their vehicles and disembarked.

Lieutenant Colonel Paul W. Thompson was tasked with training the Americans at Braunton and said of the place *“If Waterloo was won on the playing fields of Eton surely the sands of North Devon beaches contributed importantly to the success of the assault over the Normandy beaches”*.



Photographic reproduction by the author of the historic photograph used for the onsite interpretation panel at Braunton Burrows.

# On the Sands



On the Sands

13 x 26.5 cm

Stoneware with 10% sand from Dune du Pilat.

# On the Sands

On the Sands is a large bowl in stoneware. I incorporated 10% by volume of sand from the Dune du Pilat into the clay before throwing.

Pilat is the tallest sand dune in Europe and attracts over 2 million visitors every year, so echoes of the Lowry line drawing 'On the sands'. Pilat is also highly mobile, moving landward at 1 metre a year and devouring forest and buildings that stand in its way. The coarse texture of the unglazed outer-surface of this piece reminds me of being there, and the feel of sand between my toes.



Dune de Pilat, Aquitaine — On the sands.



On the Sands — Laurence Stephen Lowry (1887–1976) The Lowry.\*

# Four Dunes



Four Dunes

10 x 4, 12 x 18.5, 14 x 22, and 18 x 25 cm

Stoneware.

# Four Dunes

These four functional bowls show something of the variety of scale of sand dunes I encountered on my travels. The smallest bowl represents the embryonic dunes at Whiteford Burrows on Gower. The next in size the dunes at Formby on the Sefton coast. This is followed by the dunes at Murlough in County Down. The fourth, and largest, bowl speaks of the gargantuan Dune du Pilat, Aquitaine; Europe's tallest sand dune at 110 metres.



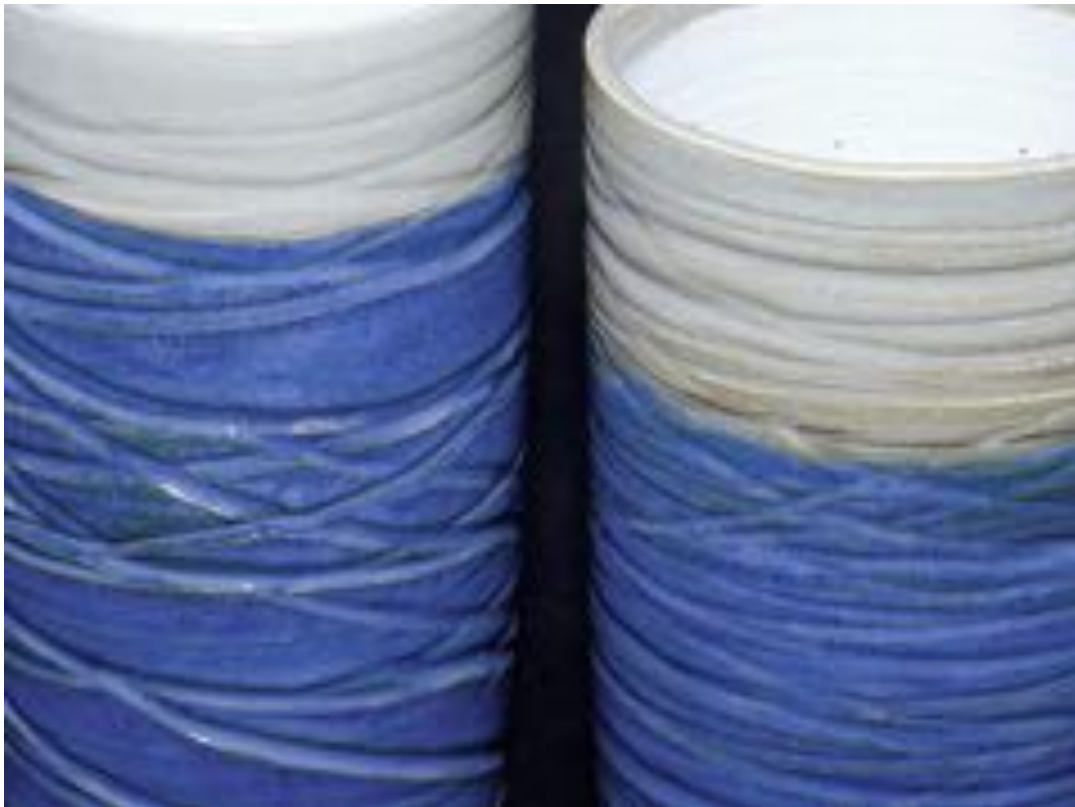
Whiteford Burrows, Gower.



Dune du Pilat, Aquitaine.



# Posts with Rising Seas



Posts with Rising Seas

10.5 x 18, 11.5 x 17, 9 x 13.5, 7 x 12, and 7 x 10.5

Stoneware.

# Posts with Rising Seas

This series of vases seeks to emulate the posts at Portstewart Strand, Northern Ireland. The posts run from the foredunes down into the sea to restrict vehicle access to this part of the beach. They also serve to demonstrate that, as each year passes, relative sea-level rise is pushing the Mean High Water mark landward. Marine colonisers such as barnacles and seaweed creep gradually up the shoreline, attaching themselves to the next landward post and sustaining themselves there as yesterday's terrestrial conditions yield to the new marine influence.



Beach Posts at Portstewart Strand, County Londonderry — ©National Trust Images/Laura Laverty.



Portstewart Strand — Posts with Rising Seas. ©National Trust Images/Laura Laverty.

# Shoreline



Shoreline

7 x 6 x 6

Stoneware, 21 slip cast pieces.

# Shoreline

This installation was informed by the tank traps at Tentsmuir, Fife built in 1941 on the dunes at the then shoreline to thwart any attempt at invasion. The 21 pieces were made by slip casting, having taken a mould from my original slab-built pot. Slip casting is technique that mirrors how the original structures were made in the dunes, using sheets of corrugated iron to form a mould, before pouring in the concrete.



The mould taken from the original slab pot.

Tentsmuir is a dune system that is actively growing seaward, fed by the millions of tons of sands and gravel transported annually from the hinterland by the river Tay to be deposited on the shoreline. The tank traps serve to remind us of the significance of sand dunes in times of war, as well as acting as a reference point for the previous position of the shoreline; a shoreline that is today some 200 metres to the east. It is said that the shoreline at Tentsmuir grows seaward at a fingers-width daily.



Tentsmuir, Fife — Shoreline.



### **Phil Dyke**

Coast and Marine Adviser, National Trust.

I have worked for the National Trust for more than 30 years on coastal and marine issues. In 2007 I was appointed as National Trust Coast and Marine Adviser working across England, Wales, and Northern Ireland, supporting colleagues dealing with coastal change issues and working with external partners and government to promote sustainable approaches to coastal and marine management.

I maintain my academic interests through teaching aspects of coastal and marine management at a number of universities, sitting periodically as an external evaluating new Masters programmes and collaborating on research projects to further our understanding of climate change-driven coastal change, and impacts upon the natural environment and culture heritage. I am a Research Associate at the University of York.

I live on Dartmoor, where in my spare time I enjoy walking, as well as pursuing my interests as an amateur potter.