Breeding Tern Recovery Project: Strangford Lough

Feasibility Study and plan

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1. Introduction

1.1 Overview

1.1.1 The project will look at the viability of enhancing Strangford Lough for breeding terns, which are facing an uncertain future due to a range of threats, most notably coastal change. Coastal erosion, storms and rising sea levels will potentially lead to the loss of many low-lying on islands on the Lough currently used by nesting terns. That process is already happening. The project will assess what islands are resilient to coastal change and what islands maybe used in the future by nesting terns.

1.1.2 The project will benefit breeding Sandwich *Thalasseus sandvicensis* and Common Terns *Sterna hirundo* which are internationally important and Arctic Tern *Sterna paradisaea* which are nationally important designation feature of the Strangford Lough SPA.

1.1.3 Many of the breeding sites, and potential breeding sites, are currently under threat from rising sea levels due to climate change. These threats are relevant in the short term (loss of nesting substrate, loss of nesting area, loss of nests) and the long-term (complete loss of breeding islands). An island will become unsuitable for breeding birds before it is completely lost, and that is indeed becoming the case. More recently, Avian influenza has been an issue.

1.1.4 The author was commissioned by the National Trust to carry out a feasibility study and development a plan to support the breeding population.

1.1.5 The author has simultaneously carried out a study of breeding terns and potential recovery projects, covering the north Co. Down coast, that being defined as an area running from Bangor in the north to Ardglass in the south. Both documents should be read together.

1.2 Strangford Lough

1.2.1 Situated on the east coast of Northern Ireland, Strangford Lough is a large shallow sea lough with an indented shoreline and a wide variety of marine and intertidal habitats. The west shore has numerous islands typical of flooded drumlin topography.

1.2.2 The lough contains extensive areas of mudflat and also sandflats, saltmarsh and rocky coastline. It supports an impressive range of marine habitats and communities with over 2,000 recorded species. It is important for marine invertebrates, algae and saltmarsh plants, for wintering and breeding wetland birds, and for marine mammals.

1.2.3 The lough is designated as an Area of Special Scientific Interest (ASSI), Special Protection Area (SPA), Special Area of Conservation (SAC) and RAMSAR site.

1.3 Scope of study

1.3.1 The author was commissioned by the National Trust to carry out a feasibility study for a breeding tern recovery project, and potential actions to meet the aims of such a project.

1.3.2 The overall scope of the study was defined by the National Trust. That has been refined into the following steps:

1. Review monitoring data and any other information on tern populations.
2. Review current threats to nesting terns on Strangford.
3. Assessment of existing breeding sites and potential sites within the lough.
4. Identify sites for the breeding tern recovery project, whether those be existing natural tern nesting sites, new natural sites (i.e. other islands) or new artificial sites (i.e. rafts, barges etc). Overarching plan for metapopulation colonies.
5. Review habitat management and creation options for nesting sites at natural sites (worth maintaining on a short- or long-term basis), existing and new.
6. Review habitat management and other practical requirements for the creation of new artificial nesting sites.
7. Review and summary of practical options, outside habitat management, for the attraction of terns and maintenance of populations e.g. sound lures, decoys, nest boxes, chick shelters. This should also cover mitigation against threats e.g. gull predation, mammalian predators, where practical.
8. Recommendations for future exploration and work to implement the project, on a site-by-site basis, to maintain or create tern colonies.
9. Consents/licences required to undertake such a project.
10. Identify any further project stakeholders.
11. Potential funding options.

1.3.3 In agreement with NT this document will not cover possible project costs. The outcomes of this study will be suggestions and recommendations, but any, all or none of those may be followed, and there will remain many steps to implementation. The author is a seabird expert, not a planning expert or economist, and to price such projects needs specialist knowledge and a firm specification. Therefore, this document will be used as the basis for determining the best way forward, and thus pricing and funding the final agreed plan.

1.3.4 The report focuses on breeding Sandwich, Common Terns and Arctic Tern but all action are also valid for Roseate Tern

1.3.5 To meet these requirements the document is presented as below, divided into three broad sections within the report.

Overview and issues

1.3.6 An overview of the main threats and other issues facing the breeding tern population on the lough, and potential challenges.

- Chapter 2 Tern populations
- Chapter 3Tern foraging ranges and ecology
- Chapter 4 Challenges, threats, restrictions

Management and solutions – habitat, predation, other measures

1.3.7 A broad overview of habitat management, site attraction, predator and other site management issues.

- Chapter 5 Habitat management and creation – man-made and natural sites
- Chapter 6 Habitat management and creation – artificial breeding sites
- Chapter 7 Site attraction
- Chapter 8 Operational management - prevention of predation
- Chapter 9 Site management and enhancement
- Chapter 10 Licences and consents

Assessment, solutions and recommendations

1.3.8 Aims and objectives, recommendations going forward.

- Chapter 11 Assessment of breeding sites (current and potential)
- Chapter 12 Recommendations – the plan
- Chapter 13 Objectives
- Chapter 14 Funding

1.4 National Trust policy

1.4.1 The National Trust policy is that sea level rises will be allowed to naturally reclaim islands, managed retreat. There will be no rebuilding or 'recharging' of existing islands.

1.5 Photograph usage

1.5.1 This document is intended to be private to National Trust and not to be published publicly. The document contains many photographs of sites and potential solutions, which have been taken from other sites and examples. No direct permission has been sought or given and full attribution is given. The provision of these photographs within the report vastly increase the usefulness of this report.

1.6 Statement of Authority

1.6.1 This document was prepared by Kerry Leonard BSc (Hons), MSc, MCIEEM. Kerry is the principal of Sterna Environmental Ltd, an ecological consultancy in Bangor, Co. Down. Kerry has 40 years of experience identifying and monitoring Northern Irish wildlife, with a principal interest in birds, mammals and Lepidoptera. He is knowledgeable in the identification, tracks and signs of these and other relevant species groups in Northern Ireland. Kerry has experience on a wide variety of projects including wind farms, single wind turbines and for large and small commercial development works of many types including bat roost assessments, bat surveys, mammal surveys, bird surveys, marine mammals, Biodiversity Checklists and Preliminary Ecological Assessments. He has been operating as a professional consultant ecologist for sixteen years.

1.6.2 He has carried out breeding seabird surveys for many species including all tern species on the Copeland Islands, Carlingford Lough and Strangford Lough, Manx Shearwater *Puffinus puffinus* surveys, cliff nesting species at The Gobbins, Muck Island and Rathlin, gull surveys, and Black Guillemot *Cepphus grylle* surveys at many sites across Northern Ireland. He first visited and helped survey tern colony in 1989.

1.6.3 Kerry has a first-class honours degree in Environmental Biology from QUB, a Masters degree from UU and is a full Member of CIEEM, the Chartered Institute of Ecology and Environmental Management.

1.6.4 The author spent over twenty years growing up Groomsport, in a house overlooking the harbour and Cockle Island. He is therefore intimately familiar with the site and the species involved.

1.7 Aims

1.7.1 The aims of the project are:

1. Maintain Strangford Lough as a breeding site for Sandwich, Common and Arctic Terns.
2. Establish new tern breeding sites, natural and non-natural, within Strangford Lough.
3. Develop a network of natural and non-natural breeding sites within Strangford Lough.
4. Take management actions to maintain as high a breeding success as possible.
5. Maintain breeding sites to be suitable for potential use by Roseate Terns.
6. Further develop a long-term monitoring and population maintenance capability within the National Trust.

1.8 Consultees

1.8.1 The individuals and organisations listed below were consulted as part of this feasibility study.

1.8.2 It is important to note that the information provided to consultees was the best available at the time, but that responses and advice should be considered preliminary and subject to change if further information is provided.

1.8.3 Some requirements are ultimately driven by external consultees to the application process, planning is a complex area of legislation.

Table 1 Consultees contacted

Consultee	Organisation	Expertise
Andrew Upton	British Trust for Ornithology	Former National Trust manager responsible for Strangford
Dave Allen	Allen & Mellon Ltd	Prepared Strangford management plan
David Barr	Northern Ireland Environment Agency, Quoile	Northern Ireland Environment Agency, Quoile
Donnell Black Monika Wojcieszek	RSPB	Term conservation and site management
Hugh Thurgate	National Trust	Strangford Lough site warden
Judith Hassard	Strangford Lough and Lecale Partnership Newry Mourne and Down District Council	AONB and Geo Park Officer Strangford and Lecale AONB
Liz Pothanikat	Northern Ireland Environment Agency	NI Seabird Seabird Strategy
Mariclare Gallagher	National Trust	Funding
Maurice Turley	Wildfowl & Wetlands Trust	Site management at Castle Espie
NIEA Marine	Northern Ireland Environment Agency Marine Division	Marine Division requirements, marine licences.
Richard Weyl	Northern Ireland Environment Agency Natural Heritage	Bird, ASSI designations and consents.
Steven Fyffe	Northern Ireland Environment Agency, ornithology	NIEA ornithologist

1.9 Strangford Lough management plan

1.9.1 A management plan has been developed and is currently active for the site (Allen & Mellon 2020).

1.9.2 In relation to the Special Protection Area the stated aims of the SPA designation are:

To maintain or enhance the population of the qualifying species:

1. Fledging success sufficient to maintain or enhance population (breeding species only).
2. To maintain or enhance the range of habitats utilised by the qualifying species.
3. To ensure that the integrity of the site is maintained.
4. To ensure there is no significant disturbance of the species.

To ensure that the following are maintained in the long term:

5. Population of the species as a viable component of the site.
6. Distribution of the species within site.
7. Distribution and extent of habitats supporting the species.
8. Structure, function and supporting processes of habitats supporting the species.

1.9.3 The following text has been taken, almost verbatim, from the outline management plan provide to the author but is repeated here as the context is important.

1.9.4 Actions will include:

- Vegetation control: Concentrate on gravelly substrate: remove stands of thatched and dense vegetation in areas above MHWM using cut and remove or with consent, glyphosate spray. Alternatively use plastic sheeting to smother vegetation (winter) or deploy grazing animals (outside breeding season). Work with graziers to ensure grazing is geared to provide an appropriate sward structure on agreed islands. Avoid areas considered to be 1210 Annual vegetation of drift lines/Coastal vegetated shingle or seek consent.
- Habitat preparation: Prepare suitable gravel/broken shell patches on islands to encourage nesting through provision of preferred habitat.
- Predator control: identify and trap predators on nesting islands such as mink and rats. Remove "crow perches". If other species are identified as predators (e.g. otter) then seek advice from DAERA. Wolsey (2019) reported otter as a major predator of tern nests. Any action on this species would require licensing.
- Nest boxes: consider nest box provision on sites where aerial predators are known to be an issue.
- Disturbance: all unauthorised landings during the breeding season must be prevented. This will involve liaison with user groups, including boat and sailboard users, canoeists (see link for current advice[1] which is not totally comprehensive and includes at least one "safe to land" site which supports terns – Green Is Quoile), Councils, etc. No-go areas should be clearly marked on all material such as tourist and user group maps.

- Long-term nesting islands: Research the islands which previously supported breeding terns and identify the reasons why they are now abandoned. From this develop a programme of island rehabilitation with the aim of making the chosen islands favourable for terns. This will involve techniques listed above and rely heavily on ongoing studies as undertaken in 2018.
- Explore connectivity with other "Irish Sea Colonies".

1.9.5 All colonies must be counted annually. Because of their mobility ALL suitable nesting islands must also be visited annually otherwise a colony could be over-looked. Wherever possible monitoring should involve a carefully timed count designed to capture a peak nest count. If a nest count is not feasible then a "flush count" of adult birds can be used but this method is far less accurate. It is very difficult to calculate fledging success but efforts should be made to assess productivity using counts of newly fledged birds. Fledging can of course be staggered over a number of weeks because of differing egg laying times.

- Breeding Tern Counts: Annual tern nest counts are of key importance and must be continued annually. Counts of other nesting species (primarily gulls, wildfowl and waders) should also be continued but not if this impacts on tern counts.

1.10 Seabird Conservation Strategy and Action Plan for Northern Ireland

1.10.1 A Seabird Conservation Strategy and Action Plan for Northern Ireland is currently in development (NIEA 2024).

1.10.2 The plan aims to aid in the protection and recovery of seabird populations through targeted management actions. The plan recognises that conservation, restoration and creation of seabird breeding habitats is required. The plan also recognises that colony loss, flooding and sea-level rises are a particular issue for breeding terns. Management to mitigate predation events and disturbance is required.

1.10.3 The ideas and plan presented in this report are directly aimed at meeting the objectives of the Seabird Conservation Strategy and Action Plan for Northern Ireland.

1.11 Terms

1.11.1 The following terms are used in the report and are defined here.

1.11.2 Inundate – inundate is defined as the ingress of tidal water across an island, covering parts of the island, or infiltrating to a degree which renders the land unsuitable for nesting. Inundation is both short-term, and often associated with over-washing in poor weather conditions, and long-term when parts of the island are permanently lost.

1.11.3 Over-washed – an island is over-washed by wave action, associated with wind action in a temporary fashion. Over-washing typically is associated with tidal inundation during spring tides, which combined with higher winds and rough seas results in waves over-washing areas

which would have been safe from normal tidal waters. Thus, the impact of higher tides is felt beyond the actual level which the water reaches.

1.11.4 Ecological trap – ecological traps occur when animals mistakenly prefer habitats where their fitness is lower than in other available habitats following rapid environmental change and have important conservation and management implications. Traps can be defined in terms of their population-level effects (i.e. as preferred habitats of sufficiently low quality to cause population declines), and this is the scale most relevant for management. At Strangford Lough there is an existing trap, where birds continue to nest at existing sites despite their unsuitability. Islands seem to be good nesting sites, and in some senses are, but regular summer flooding and over-washing results in egg and chick losses, lowers breeding success and lowers population fitness. The birds will however return to the traditional nesting islands year after year, with low productivity eventually resulting in population declines and population loss from the site.

1.11.5 Lost – an island being lost means it is no longer now, or shortly in the future, will not be an acceptable breeding site. Birds may still be using the site but it is considered that, long-term, the island will become unsuitable.

1.11.6 AON – Apparently Occupied Nest. The unit used to define tern populations, an apparently occupied nest. In the opinion of the author this likely underestimates populations somewhat, as there are always birds in pre-breeding and failure states throughout the summer, but peak nest counts provide a constant measurable for comparison.

2. Tern populations

2.1 UK and Ireland populations

2.1.1 The populations of the relevant tern species are shown below. Other than the overall UK and Ireland counts, these populations are calculated from the raw data provided by JNCC for the Seabirds Count results (JNCC 2024). https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fjncc.gov.uk%2Fmedia%2F8535%2Fcomparative-seabirds-count-dataset-revised-20231213.xlsx&wdOrigin=BROWSELINK.

2.1.2 In the south the 'Irish Sea' includes the populations in Wexford which are just outside the region.

2.1.3 In the north many Northern Irish colonies are not, technically, within the Irish Sea proper, as the Irish Sea ends at the tip of the Ards peninsula. The extent of consideration covers what most people would consider the Irish Sea, at a line within the North Channel from Larne in the Northern Ireland to Cairnryan in Scotland.

Table 2 Recent population counts and SPA status (Seabirds Count data)

Site	UK and Ireland	All Ireland (Island) only	Northern Ireland only	Irish Sea only
Arctic Tern	33215	3508	800	5900
Common Tern	17089	6548	1820	5971
Sandwich Tern	15484	4408	1944	5986
Roseate Tern	1989	1869	1	1871

2.2 Northern Irish populations

2.2.1 Population counts for sites within Northern Ireland are shown below, to allow the relevant importance of tern colonies within Northern Ireland to be assessed.

2.2.2 It should be remembered these are comparative data drawn from the values submitted for Seabirds Count and sites/counts are not up-to-date for 2023, but are used for across the board comparisons from a national survey (JNCC 2024).

2.2.3 Known historical breeding sites which had a zero count for Seabirds Count are not listed.

Table 3 Arctic Tern site populations (AON) in Northern Ireland (Seabirds Count data)

Site	Population (AON
Belfast Lough RSPB	4
Bird Island, Portavogie	140
Carlingford Lough	41
Cockle Island, Outer Ards SPA	43
Copeland Islands	150
Green Island, Portavogie	248
Sheep Island	1
Strangford Lough	173

Table 4 Common Tern site populations (AON) in Northern Ireland (Seabirds Count data)

Site	Population (AON)
Ballyronan, Lough Neagh and Lough Beg SPA	1
Belfast Channels	12
Belfast Lough RSPB	418
Carlingford Lough	123
Cockle Island, Outer Ards SPA	18
Croaghan Island, Lough Neagh and Lough Beg SPA	2
Green Island, Portavogie	180
Larne Lough RSPB	333
Lower Lough Erne RSPB	41
Padian, Lough Neagh and Lough Beg SPA	33
Portmore Lough RSPB	75
Strangford Lough	457
Torpedo Platform, Lough Neagh and Lough Beg SPA	127

Table 5 Sandwich Tern site populations (AON) in Northern Ireland (Seabirds Count data)

Site	Population (AON)
Carlingford Lough	7
Green Island, Portavogie, Outer Ards SPA	145
Larne Lough RSPB	1229
Lower Lough Erne RSPB	226
Strangford Lough	337

2.3 Irish Sea populations

2.3.1 Population counts for each constituent country with the UK, the Isle of Man and Ireland, are shown below, to allow the relevant importance of tern colonies on the Northern Irish east coast to be assessed, are given below.

Table 6 Irish Sea tern populations only (Seabirds Count data)

Site	Irish Sea total	Northern Ireland	Ireland	Wales	Scotland	England	Isle of Man
Arctic Tern	5900	800	1010	3978	0	56	56
Common Tern	5971	1727	3558	497	11	178	0
Sandwich Tern	5986	1718	1799	519	0	1950	0
Roseate Tern	1869	1	0	1	0	0	0

2.3.2 The most important colonies for Arctic Tern are those in north Wales, on Anglesey, at Cemlyn Lagoon, The Skerries RSPB and Ynys Feurig.

2.3.3 For Common Tern south-east Ireland is the most important area with very large colonies at Rockabill and Lady's Island.

2.3.4 Sandwich Terns nest in a few large colonies, and are known to move between sites across years. There were only seven active colonies recorded in the Irish Sea for Seabirds Count. There were big increases at Morecambe Bay and Lady's Island since Seabird 2000. Larne Lough is the most important Irish Sea colony.

2.4 Strangford Lough populations and SPA condition

2.4.1 The landward boundary of the Special Protection Area (SPA) is entirely coincident with the landward boundary of the ASSI Strangford Lough.

2.4.2 Marine areas below mean low water are also included. The Quoile Pondage Nature Reserve is also included in the SPA.

2.4.3 The site qualifies under Article 4.1 of EC Directive 79/409 on the Conservation of Wild Birds by supporting internationally important breeding populations of both Sandwich Tern *Sterna sandvicensis* and Common Tern *Sterna hirundo* and nationally important breeding populations of Arctic Tern *Sterna paradisaea*.

2.4.4 The five year means for the period prior to designation, 1993 to 1997, were: Sandwich Tern - 593 pairs which was 1.2% of international population (13.5% of the all-Ireland population) and Common Tern 603 pairs which was 1.2% of the international population (22.3% of the all-Ireland population).

2.4.5 The site also supported nationally important numbers of Arctic Tern *Sterna paradisaea*. The five-year mean for the period 1993 to 1997 was 210 pairs (8% of the all-Ireland population).

2.4.6 The populations of all species are currently below that at designation.

Table 7 Recent population counts at Strangford Lough

Site	Population at designation (AON)	Seabirds Count population (AON)	2023 population (AON)
Arctic Tern	210	173	154
Common Tern	603	457	273
Sandwich Tern	593	337	251

2.4.7 The tern populations on Strangford Lough are shown in the figures below.

Figure 1 Arctic Tern populations at Strangford 1980-2023

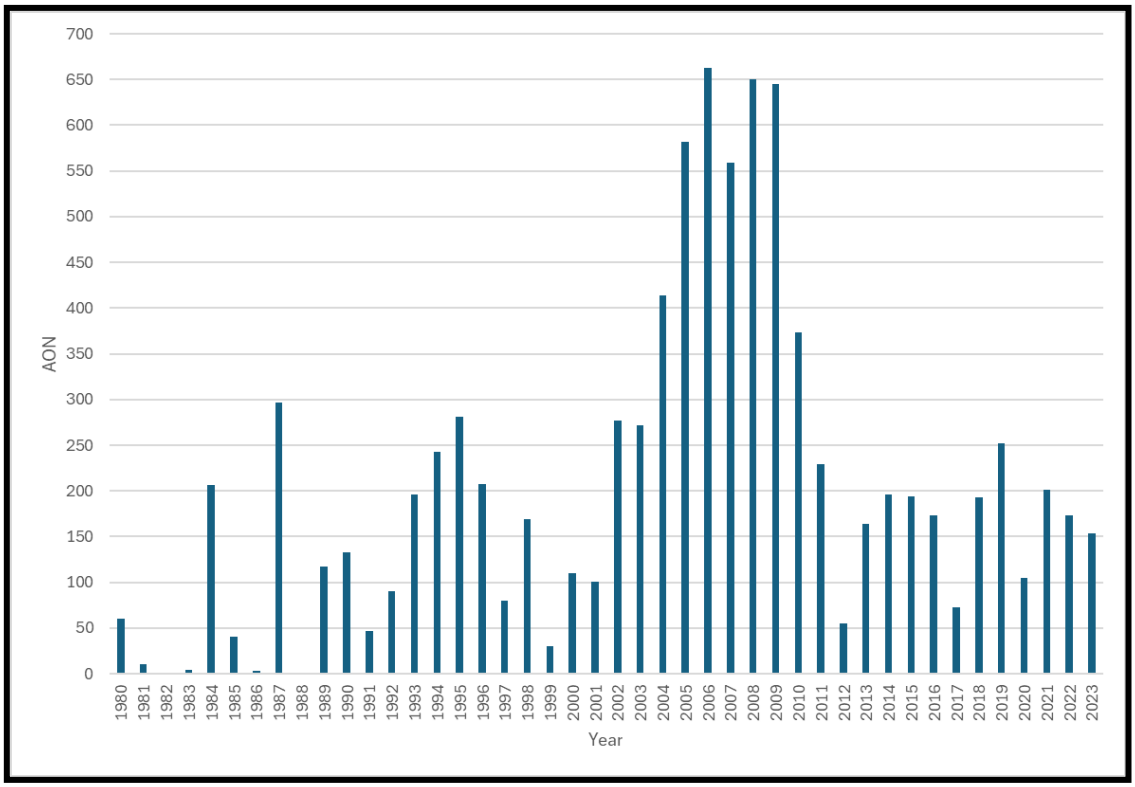


Figure 2 Common Tern populations at Strangford 1969-2023

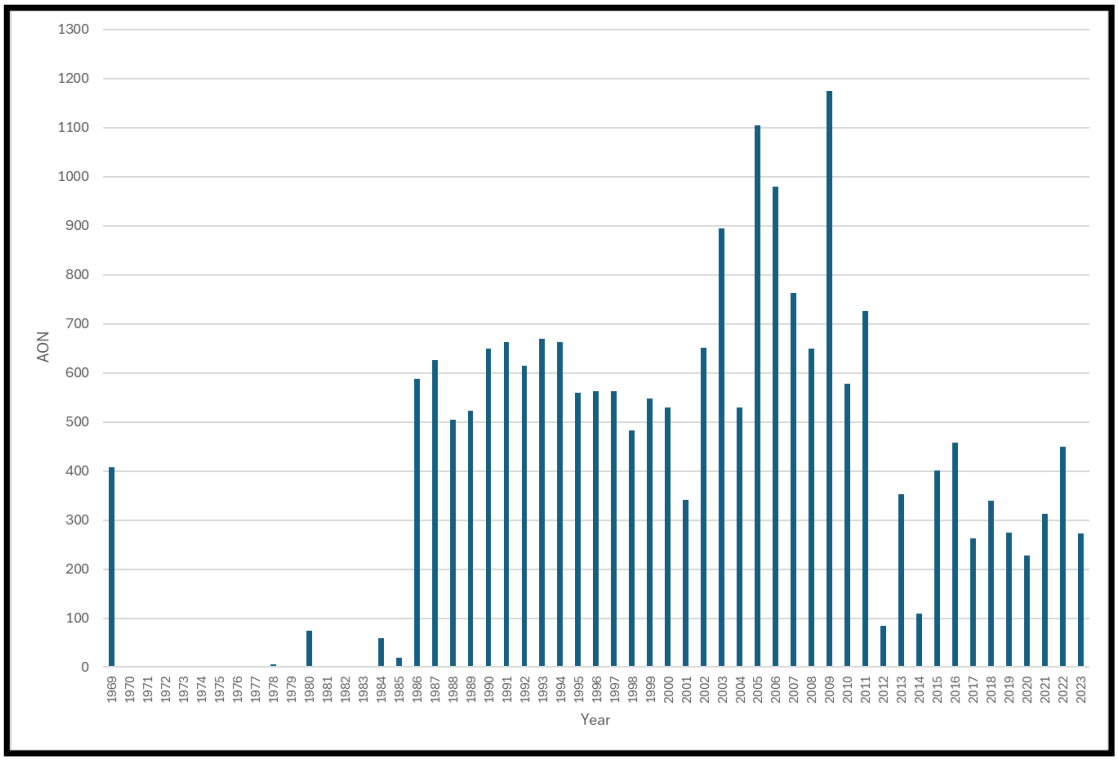
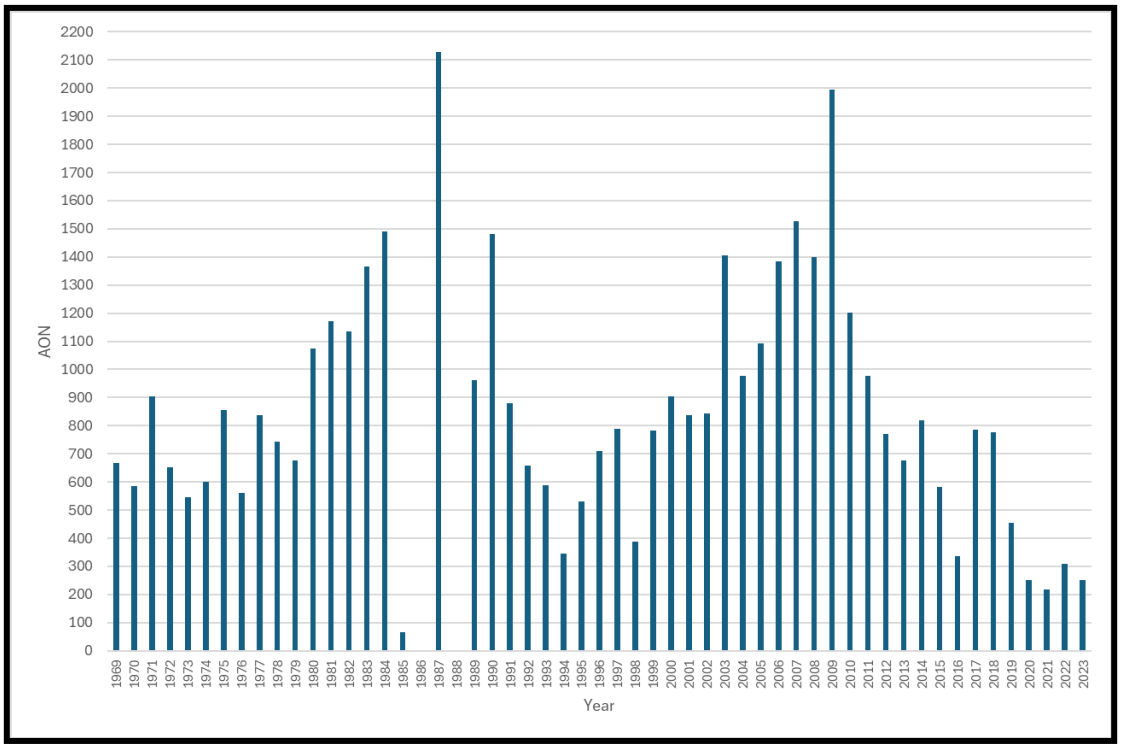


Figure 3 Sandwich Tern populations at Strangford 1969-2023



2.5 Relevant importance

2.5.1 For Arctic Tern, Strangford Lough represents 22% of the Northern Irish population. It represents 2.9% of the Irish Sea population. It represents 4.9% of the all-Ireland population and 0.5% of the overall UK and Ireland population.

2.5.2 For Common Tern, Strangford Lough represents 25 of the Northern Irish population. It represents 7.6% of the Irish Sea population. It represents 13% of the all-Ireland population and 2.7% of the overall UK and Ireland population.

2.5.3 For Sandwich Tern, Strangford Lough represents 17.3 of the Northern Irish population. It represents 5.6% of the Irish Sea population. It represents 7.6% of the all-Ireland population and 2.2% of the overall UK and Ireland population.

3. Tern foraging ranges and ecology

3.1 Overview

3.1.1 This section provides a broad review of foraging ranges and ecology for Common, Arctic and Sandwich Terns, and how those pertain to colonies in Northern Ireland.

3.2 Tern foraging research – JNCC study

3.2.1 There is a solid dataset available for foraging behaviour in Northern Ireland, though none of it is directly from Strangford. JNCC (Wilson *et al.* 2014) carried out surveys at tern colonies, from 2009 to 2013, by observing and 'chasing' terns in high-speed boats, in order to identify marine extensions to SPAs. The author assisted with the work in Northern Ireland. Although it could only be carried out on very calm days, the work produced impressive results which provide the core of the review here.

3.2.2 The project relied primarily on data collected using visual tracking, a technique specifically developed by Perrow *et al.* (2011) for quantifying the use of the marine environment by terns of known provenance. The alternatives of bird-borne radio-tags and GPS tracking devices were not feasible at the time: the larger tern foraging ranges exceed the detectable range (from land) of the radio signal, and at the time the project started, GPS devices were unsuitable for terns (they are now available due to advances in the technology making the devices smaller). Existing aerial and boat transect data were collated.

3.2.3 Data collection to assess the foraging distribution of the tern species was carried out over three years from 2009 to 2011 using visual tracking. The visual tracking method involved using an easily manoeuvrable boat capable of speeds up to 40 knots (such as a rigid-hulled inflatable boat (RIB)) to follow individual terns from their breeding colony out to sea and back.

3.2.4 An on-board GPS recorded the boat's track, which was used to represent the track of the bird. The RIB was kept c.50-200m from the bird so that one observer could maintain constant visual contact with the bird and another observer could record behaviours, along with their associated timings.

3.2.5 Behaviours were assigned to locations based on the common time field between observations and the GPS track log. Observers were given operational definitions of the different behaviours, which were categorised as continuous behaviours (different types of flight) and instantaneous behaviours (different types of foraging events).

3.2.6 In addition, any foraging associations with other individuals of the same or other species were recorded, as were any fish or crustaceans captured.

3.2.7 The total number of tracks obtained was 1005 including 55 (6%) for Roseate Tern (2 SPAs), 184 (18%) for Arctic Tern (6 SPAs, 1 non-SPA), 381 (38%) for Common Tern (7 SPAs, 1 non SPA)

and 385 (38%) for Sandwich Tern (5 SPAs, 1 non-SPA), with multiple years of data collected at five of the ten JNCC study colony SPAs.

3.2.8 Northern Ireland was an important component of the study with tracking taking place at Larne Lough, Outer Ards (Cockle Island) and the Copeland Islands. The resulting model was used to estimate foraging areas at Strangford Lough and Carlingford Lough. No tracking was carried out at those two sites because of the dangers of fast-moving boats in a relatively shallow environment, with many shallow rocks.

3.2.9 Mean maximum foraging distances are used as a strong illustration to show how far birds may forage from the colony, though most foraging will occur closer to the colony.

3.2.10 Although there have been some more recent studies using GPS tracking, which is now small enough to attach to Common and Arctic Terns (e.g. Seward *et al.* 2020), the JNCC study remains the widest ranging and comprehensive study. Other studies (using GPS or other methods) are referenced where relevant.

3.3 Arctic Tern

3.3.1 The JNCC study (Wilson *et al.* 2014) tracked Arctic Terns at Cockle Island, Outer Ards (n=11) and the Copeland Islands (n=13).

3.3.2 The mean maximum foraging range recorded at Cockle Island was 46.01km, at the Copeland Islands it was 39.56km.

3.3.3 The mean maximum foraging ranges were approximately twice that of the other two main sites where Arctic Terns were tracked. At Coquet Island it was 22.8km (n=104), at the Farne Islands 20.66km (n=42).

3.3.4 Thaxter *et al.* (2012) reports a mean maximum foraging range of 24.2km from 14 studies including three using direct tracking of one form or another. A moderate level of confidence is given to this assessment. In contrast, Langston (2010) reports somewhat different figures with 20.6 km maximum range, 12.24 km mean maximum range.

3.3.5 Perrow *et al.* (2011b) visually tracked seven birds in Anglesey, North Wales following one bird for 57 km until it was last recorded at a maximum distance of 29 km from the colony.

3.3.6 In the same study, considerable individual variation in the areas selected was noted by Black & Diamond (2005) who recorded Arctic Terns 30 km from the nest site.

3.3.7 Morton *et al.* (2022) recorded mean foraging distances form the colony of 37-40km, with 19 terns travelling more than 40km. Although reported as foraging at a further distance from the breeding colony than has been seen before, this study actually shows similar results to Cockle Island and the Copelands.

3.3.8 The JNCC model maps for Strangford are repeated below, from Wilson *et al.* 2014. For Strangford the core foraging area (using Dunsy Rock as a central point) was within the lough. This is a relatively restricted range and it is likely birds forage outside the lough to the south. The data for Cockle Island was combined with the Copeland Islands, the predicted foraging range was much

wider, influenced by the fact that Arctic Terns were observed foraging far out into the North Channel and at times closer to Scotland than Northern Ireland (*pers. obs.*)

3.3.9 In the UK Arctic Tern feeds exclusively over marine habitats, often over the open sea but sometimes along edges of sandy or rocky shores, tidal flats or shoals, tending to concentrate over tide rips or along drift lines (Lascelles *et al.* 2013, Uttley *et al.* 1989, Hall *et al.* 2000, Cabot & Nibset 2013).

3.3.10 Areas with strong water currents are thought to be important as they bring small prey to the surface (Schwemmer *et al.* 2009). Foraging areas are usually 10-20 m deep (Schwemmer *et al.* 2009, Perrow *et al.* 2011b), although foraging mainly takes place where prey is within 20 cm of the surface. Arctic Terns often feed above predatory fish and seabirds such as auks that drive prey to the surface (Pierotti 1988, Perrow *et al.* 2010).

3.3.11 In the UK, sandeels *Ammodytes* sp. are the most important prey species for chicks, with clupeids (especially herring and sprat) making up most of remainder of the diet (Monaghan *et al.* 1989, 1992, Uttley *et al.* 1989, Horn 1995, Schreiber & Kissling 2005).

3.3.12 Specific diet composition varies according to reproductive state and location (BWPi 2006). For example, during courtship, adult Arctic Terns in Shetland appear to be specialist feeders on sandeels whilst sprat made up the bulk of prey on Coquet (Monaghan *et al.* 1989, Uttley 1989). Chick diet was however consistently focussed on sandeel at these two colonies, although larger sandeels were also caught on Shetland as compared to Coquet. Adults will catch small crustaceans but these are eaten at sea (Granadeiro *et al.* 2002, Danhardt *et al.* 2010, Perrow *et al.* 2010, *pers. obs.*).

3.3.13 Diet appears to be relatively consistent between colonies, with sandeel being especially important to both chicks and adults, although the latter may exploit small prey even including insects. Exact composition varies in different locations with certain species being more dominant at certain locations.

3.3.14 In summary Arctic Terns at Strangford are likely exclusively marine feeders, feeding on sandeels and other clupeids. Range form the colony is dependent on food sources and surrounding land.

3.4 Common Tern

3.4.1 The JNCC study (Wilson *et al.* 2014) recorded the mean maximum foraging range recorded at Cockle Island was 19.88km, at Larne Lough it was 30.38km.

3.4.2 The mean maximum at Larne Lough was the highest across the UK, Cockle Island was the third highest. Thaxter *et al.* (2012) reports a mean maximum foraging range of 15.2km. This was based on 22 studies and they assign moderate confidence in this assessment. Most other sites studied by Wilson *et al.* (2014) were similar to the values reported by Thaxter.

3.4.3 Langston (2010) gives a similar maximum figure of 37 km, but with greater mean maximum (33.7 km). Perrow *et al.* (2010, 2011b) tracked Common Terns in Norfolk and found that some birds ranged to ~9 km but never more than 2 km offshore. At another site in Teeside, birds

travelled over 6 km from their inland colony to reach the estuary and from there ranged nearly 10 km out into the open sea and 14 km along the coast.

3.4.4 As with Arctic Terns, foraging range is likely to be site-specific, but the recorded mean maximum foraging range at Larne Lough is at the upper end of recorded distances. It is worth noting that Common Terns must fly 4km just to get to the open sea and the start of the preferred foraging grounds.

3.4.5 The JNCC model maps for Strangford are repeated below, from Wilson *et al.* 2014. For Strangford the core foraging area (using Dunsy Rock as a central point) was within the lough. This is a relatively restricted range and it is likely birds forage outside the lough to the south and the model showed that. However, given that two of the three sites with the highest mean maximum foraging range were in Northern Ireland it would have been interesting to track birds from Strangford Lough. Birds at Swan Island likely range further outside the lough, being several km further south.

3.4.6 Foraging habitats include the open sea, brackish waters, lagoons, estuaries, rivers, lakes, reservoirs, ponds and marshes. Common Tern adults take a wide range of prey including fish, crustaceans, squid and marine worms,

3.4.7 In some colonies terns switch between marine and freshwater habitats depending on different conditions such as weather or state of the tide. This seems to be the case at Strangford. The author has found dead fish at the Strangford colonies in 2022 and 2023. Clupeids are common, but Roach *Rutilus rutilus* and Three-spined Stickleback *Gasterosteus aculeatus* were also found. This indicates that Common Terns are fishing in freshwater, nearly certainly the Quoile River where the species can be frequently observed (*pers. obs*.).

3.4.8 Differences between Common Tern diet in different colonies are notable. For example, in Norfolk, small clupeids were the dominant item presented to chicks. Larger clupeids were the most important item at a colony in Teeside, but with a greater prevalence of larger items of a range of species such as (Perrow *et al.* 2010). At other locations in the UK, clupeids and sandeels have also been found to be the mainstay of chick diet (Newton & Crowe 2000, Lascelles *et al.* 2013), although Saithe *Pollachius virens* was particularly important at some colonies in Scotland. Herring and sprat tend to become more important in chick diet than sandeels as the season progresses, which may influence or reflect choice of foraging habitat and therefore range (Pearson 1968, Lang, BWP 2006). There is also a tidal influence upon availability and capture of different species.

Figure 4 Roach at Black rock in 2023

3.5 Sandwich Tern

3.5.1 The JNCC study (Wilson *et al.* 2014) recorded the mean maximum foraging range at Cockle Island was 36.89km, at Larne Lough it was 17.25km.

3.5.2 The mean maximum foraging range at Cockle Island was the third highest recorded, only sites in Norfolk had a higher value. Birds from Cockle Island were observed travelling to Scotland, foraging and landing on the beach.

3.5.3 In contrast, and in contrast to the findings for Common Tern, the mean maximum foraging distance at Larne Lough was the lowest in the UK.

3.5.4 Thaxter *et al.* (2012) reports a mean maximum foraging range of 49km. Langston (2010) reported a 42.3 km mean maximum based on a sample of 17 studies.

3.5.5 There is wide variation between colonies as shown by Wilson *et al.* (2014).

3.5.6 There is also wide variation between individuals within colonies, with 61% of birds observed foraging less than 2km from the Cemlyn Bay colony, even though the maximum distance was 27km. This was observed at Cockle Island by the author, where one bird would fly 600m to catch a fish while the next bird followed would fly to Scotland.

3.5.7 The author has regularly observed Sandwich Terns, over many years, flying across the Ards peninsula from Strangford Lough in the direction of Donaghadee or Groomsport. Such overland flights are not unusual, an overland journey of approximately 12km. At Larne Lough returning Sandwich Terns and Common Terns will fly the 3.5km directly over the land from Portmuck.

3.5.8 Sandwich Terns appear to prefer waters with sandy bottoms, and so usually feed at sea, sometimes following the tide into sandy parts of estuaries and lagoons (Cabot & Nisbet 2013).

3.5.9 The birds tracked by Perrow *et al.* (2010) tended to forage alone and aggressively interact with each. Tracks from the colony often showed little deviation as the birds commute to a pre-determined foraging location (Centrica Energy 2009, Perrow *et al.* 2010).

3.5.10 Adult diet is not well studied, but it is clear that it may be rather different from that of chicks. For example, Perrow *et al.* (2010, 2011b) found that a relatively high proportion of invertebrates (24–26%) were captured by self-feeding adults but constituted less than 1% of that delivered to chicks.

3.5.11 Sandwich Tern chick diet is dominated by a few fish species of high nutritive value; namely clupeids and sandeels. A wide variety of other fish and crustaceans have been reported but are less frequent (Götmark 2000, Stienen *et al.* 2000, Vanaverbeke *et al.* 2007, Fuchs 2008, Perrow *et al.* 2010, 2011b, Cabot & Nisbet 2013)

3.5.12 At Lady's Island Lake, Newton & Crowe (2000) demonstrated inter-annual variation in diet, clupeids were the most abundant prey type presented during the incubation period in 1997, but sandeels dominated provisions in 1998. Overall, sandeels were the most frequent prey item in chick diet in both years and it is suggested that this reflects prey availability. Brenninkmeijer & Stienen (1994), in contrast, found that chick diet in 1992-1993 was virtually identical to that in 1969-1974.

3.6 Summary

3.6.1 Broad conclusions can be drawn from the data presented:

- The three species under consideration may have significant foraging ranges in the breeding season. Individuals at a single colony have been shown to employ wildly different foraging strategies.

- Current research presented here, combined with local observations, indicate that it would incorrect to think that the lough itself is the only foraging area of importance to foraging terns, but modelling suggests that it is of significant importance.

- Colonies further south, like Swan Island likely have a core foraging area which ranges further outside the lough.

- It is very likely that Belfast Lough, the Ards peninsula, the Lecale coastline and Quoile area are of importance to Strangford terns during the overall nesting period.

- It is has been shown that foraging range of terns varies by colony and country, and is site dependent. What long range foraging data shows is that near distance to foraging grounds is not a limiting factor for breeding terns and *suggest* that suitable nesting sites are at least an equal limiting factor.

Figure 5 Predicted relative usage of the waters around Copeland SPA for Arctic Terns (from Wilson *et al.* 2014)

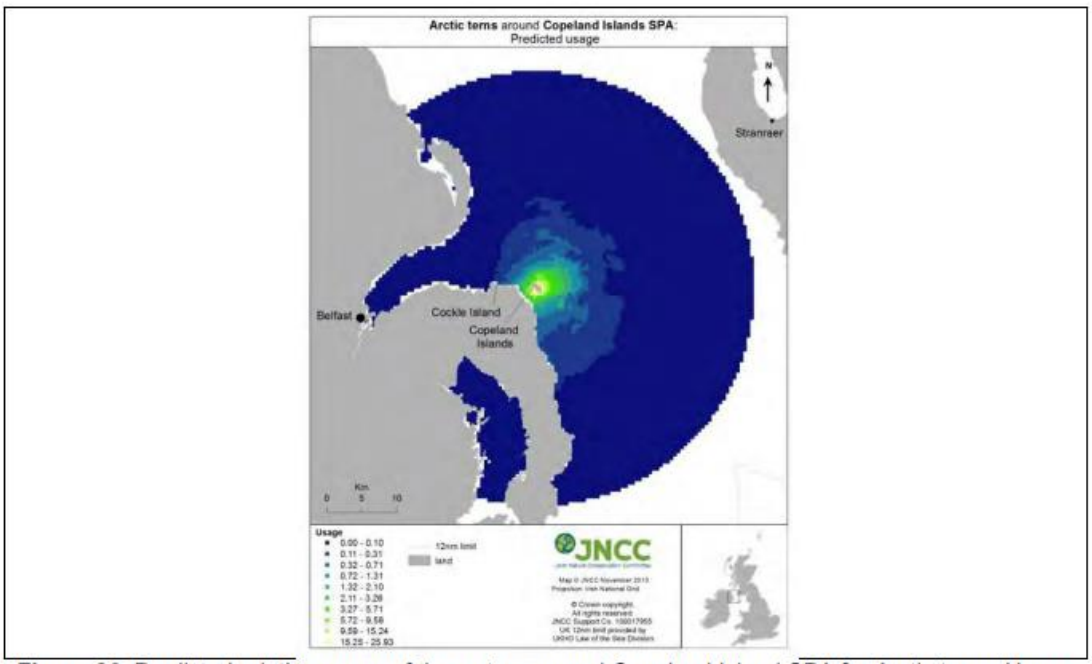


Figure 26. Predicted relative usage of the waters around Copeland Island SPA for Arctic terns. Usage values are relative and binned using natural groupings inherent in the data (natural jenks, which reduce the variance within classes and maximize the variance between classes, determined within ArcMap v10.1).

Figure 6 Predicted relative usage of the waters around Dunsy Rock in Strangford for Arctic, Common and Sandwich Terns (from Wilson *et al.* 2014)

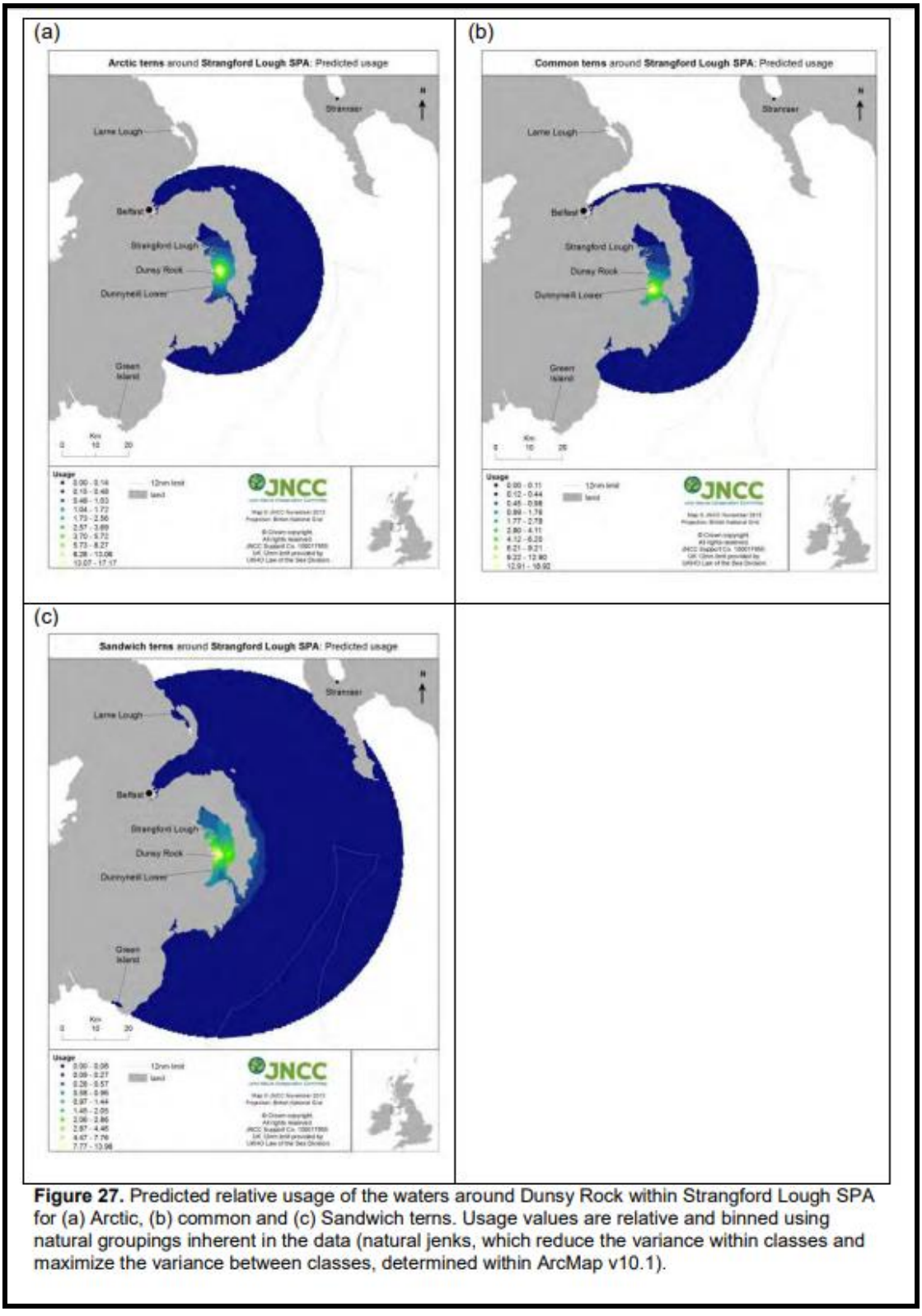


Figure 27. Predicted relative usage of the waters around Dunsy Rock within Strangford Lough SPA for (a) Arctic, (b) common and (c) Sandwich terns. Usage values are relative and binned using natural groupings inherent in the data (natural jenks, which reduce the variance within classes and maximize the variance between classes, determined within ArcMap v10.1).

4. Challenges, threats, restrictions

4.1 Overview

4.1.1 Tern populations on Strangford, like many low-lying island tern colonies, are facing a number of issues. Some of these are long-term threats to the viability of the colony, others short-term issues which may compound those longer-term issues.

4.1.2 These threats are impacting current colonies, but also must be taken into account when siting and constructing new colonies.

4.1.3 Other restrictions are not threats but may restrict works aimed at assisting nesting terns. For example, site designations present constraints which must be worked within, while human actions may cause disturbance.

4.2 Island/nesting site loss (climate change and sea level rises)

4.2.1 The greatest long-term threat to nesting sites is sea-level rise. The majority of current and potential low-lying nesting sites on Strangford will be completely lost in the next 50 years. It is important to understand that some of these sites are at times nearly underwater NOW at spring high tides.

4.2.2 This document cannot go into a detailed examination of climate change and sea level rises, but a broad consideration of the topic is needed, and some assumptions are required for the rest of this document. However, *overall*, it is only necessary to understand that many of the current breeding sites are not going to be viable in the near-term, and that action is needed.

4.2.3 There has been an increase in global mean sea level rise of about 20 cm between 1901 and 2018. Such a sea level rise is unprecedented in the last 3000 years, i.e. no century has seen as much sea level rise in the last 3000 years. It is also clear that sea level rise is accelerating: the rate of sea level rise was ~1.3 mm/year over the period 1901-1971, this increased to ~1.9 mm/year over the period 1971-2006 and to ~3.7 mm/year over the period 2006-2018. The contribution to sea level rise from ice sheets has increased by almost a factor of four from the 1990s to 2010s (Met Office 2024).

4.2.4 There are five sea level scenarios, defined by central target values of Global Mean Sea Level Rise in 2100. These are defined as follows: Low (0.3 m), Intermediate Low (0.5 m), Intermediate (1 m), Intermediate High (1.5 m) and High (2 m) (Met Office 2024).

4.2.5 Should sea levels continue to rise at current rates of ~3.7 mm/year then by 2050 a rise of nearly 0.1m is predicted. This is the very lowest observable levels. Given that the rate of change has been increasing, drastically, in the last 50 years, and the rate of ice sheet loss is increasing, it is not unreasonable to expect that the rate of sea level change will continue to increase.

4.2.6 For the purposes of carrying out works to protect terns, those works, and the money spent, should be worthwhile and valid for the lifetime career of a National Trust warden, which is taken

as 45 years, or to 2070 i.e. if these measures were implemented by a new warden in 2025 they would last their career lifetime. This does not preclude fixes (e.g. a new raft is needed). Within that context there should be no major permanent works on new islands which may be lost to sea-level rise, or associated near-inundation, before 2070. This seems a reasonable approach to planning.

4.2.7 At the Low scenario, by 2070 sea levels will have risen by 0.181m, rounded to 0.2m. At the Intermediate Low scenario sea levels ill have risen to 0.3m by 2070. At the Intermediate scenario sea levels will have risen by 0.6m by 2070. Given the increase in the rate of rise, a 0.2-0.3m increase is very likely in the next 45 years.

4.2.8 The Climate Central coastal risk screening tool has been used to examine Strangford Lough under these scenarios. Some caution is needed as the mapping uses a grid-based system, although at a high resolution, and will not correspond *exactly* to the future coastline, but it gives a very good indication of where inundation will occur. Note also that some of the islands in Strangford are so small, and are probably not recognised as land, so are not highlighted on the maps. They are undoubtedly underwater in all scenarios.

4.2.9 Example maps are shown below. What is important is that under even the lowest sea level increase scenario of 0.2m all nest sites used in 2023 are either lost or severely compromised. Indeed, a 0.1m increment in the tool results in most sites being lost. This is unsurprising as any of the nesting islands are barely viable at times, in 2024.

Figure 7 Northern section of the lough. 0.2m Low scenario by 2070. The Boretree Islands and Gabbock are lost. The Chandries, North Boretree, Salt Rock and Gull Rock are not highlighted but are lost in this lowest sea rise scenario. Note that just a 0.1m level rise results in a similar outcome. As sea levels rise storm events and erosion will quicken the reduction. Also note that Chapel Island (the long island in the centre), which has the potential to be a new site, has lost much of its low-lying areas. This will influecne future planning for new sites. Chapel Island is connected to the mainland at low tide aross, the mudflats, but in the future may fully become an island with no low tide access.

Figure 8 Central section of the lough. 0.2m Low scenario by 2070. Dunsy Rock (bottom right corner) is lost. Much of this island is low and almost completely inundated already at the highest tides now, which is exacerbated by weather events. Many of the larger island have shallow sloping edges with higher domed centres. The edges will be lost, which has importance when identifying sites for new colonies.

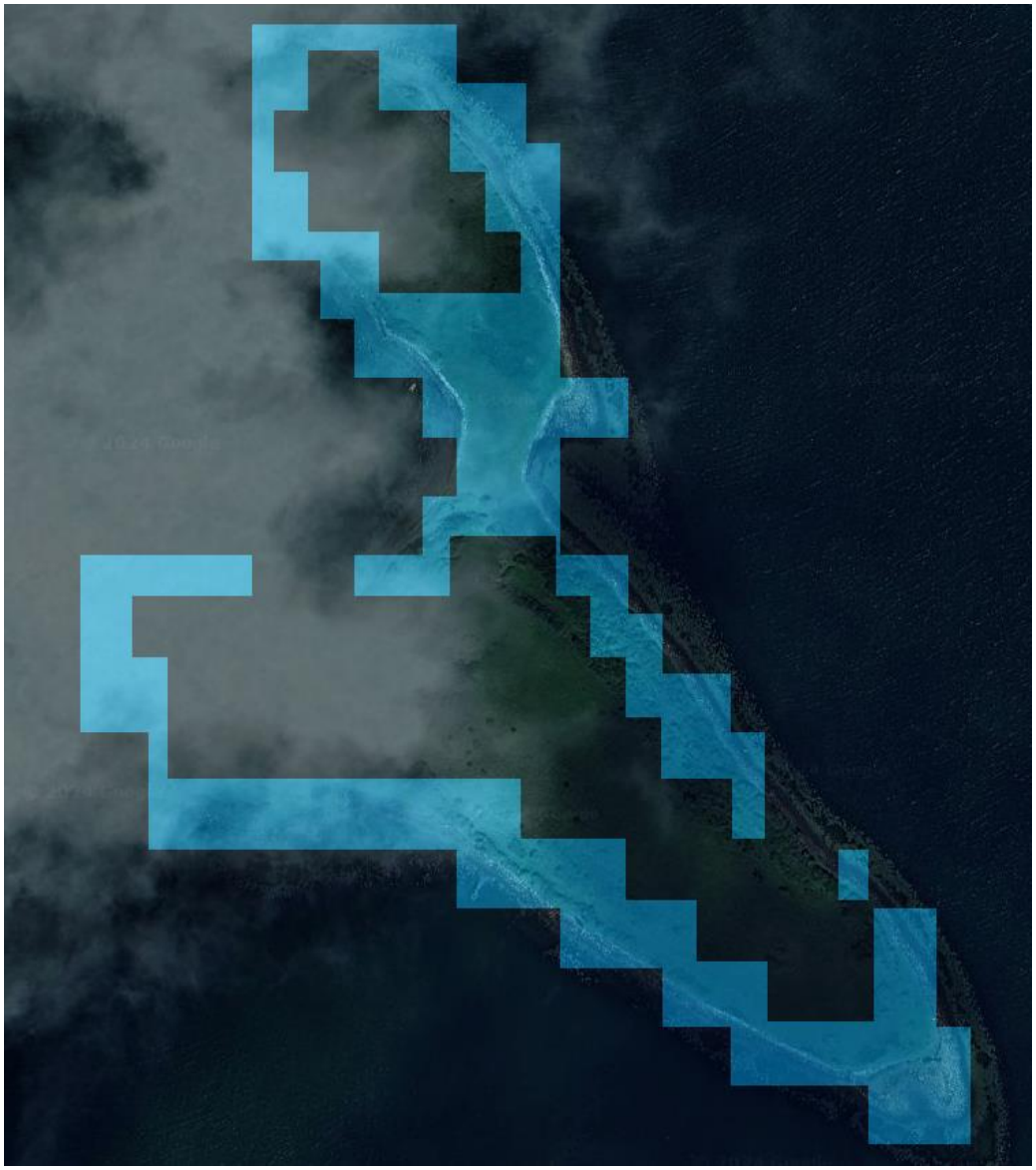


Figure 9 Darragh Island. 0.6m Intermediate scenario by 2070. Darragh is owned by the National Trust and a *potential* site for establishing a new tern colony or raft. Under this intermediate scenario significant areas of the island are lost, though under the 0.2m sea level increas scenario the loss is similar. Surrounding islands which could potentially be used are similar.

4.3 Nest loss – inundation/weather/substrate (pre site loss)

4.3.1 Sea level rise is a long-term threat, but nesting sites will become unusable long before an island is completely lost. Many of the extant islands in Strangford are in the position where they can be completely inundated by the sea and are bordering on being unusable. The current nesting islands are at risk of: loss of nests due to inundation by the sea during the breeding season.; the influence of weather in breeding failure, in combination with inundation; he loss of substrate caused by inundation and weather events.

4.3.2 It is incorrect to think of inundation as a dramatic covering of the island. When examining islands it is human nature to look at the top of rocks and boulders, or at any vegetation present, and the

human mind interprets land to be higher than it actually is. In fact, water needs to reach the *bottom* of those rocks/boulders/vegetation and inundation will be complete. These islands are much lower than they seem.

4.3.3 Where there is a high tide combined with strong winds, the results can be catastrophic. In 2023 there were two south-easterly gales during June. Combined with high tides, waves and wavelets washed over the islands. It needs only a relatively small wave to dislodge or break eggs and many nests were lost.

4.3.4 Gull Rock (Boretrees) was almost completely inundated in summer 2023, as was Salt Rock, The Chandries and South Sheelaghs. There was evidence that North Sheelaghs was completely covered. Black Rock, a major colony, was nearly completely covered late in the breeding season, and may have been completely under water. Dunsy Rock was reduced to two very small islets, with the majority of the tern nesting area completely covered. Thes sites are in immediate danger of being rendered unsuitable for terns. Chicks fledged from Black rock and Salt Rock only because at the time of flooding they were large and could swim. Many other nests and young chicks on Black rock were lost.

4.3.5 Only Swan Island, North Boretree, Jackdaw and the Dunnyneils are not in immediate danger, though North Boretree is a borderline case.

4.3.6 Inundations and weather events are rendering these islands of dubious quality for nesting terns, possibly decades before the actual covering by sea level rises, and creating the aforementioned ecological trap. This is also an important consideration for establishing a new colony, which must be placed at a height where weather related inundation and wave events cannot impact it.

Plate 10 Greenislandrock at high tide, June 2023. This is a calm day, a moderate wind would cause over-washing of the island. Nests on the island were lost on this occasion. There was evidence that the island was completely over-washed in 2024.

Plate 11 Greenislandrock at high tide, June 2023. This is a calm day, a moderate wind would cause over-washing of the island. Note how the water infiltrates into the stones on the very low island.

Plate 12 Greenislandrock at high tide, June 2023. This is a calm day, a moderate wind would cause over-washing of the island. Most nests on the island were lost due to inundation.

Plate 13 Dunsy Island, June 2023, showing tidal seaweed has reached close to the highest part of the island. There is a narrow ithmus which joins two islands, terns often nest on the ithmus but the nests are lost in such tides.

Plate 14 Black rock on a rising tide. In 2022 and 2023 the shingle bank often nearly disappeared.

Plate 15 Black rock in June 2023. High tides combined with a gale inundated much of the island, on the second occasion new seaweed was deposited in the centre and the island was seemingly over-washed completely. Some terns still fledged as they were large enough to swim. All other nests with eggs and small chicks (many of which had just hatched) were lost.

Plate 16 Black rock in June 2023. A high tide combined with a gale inundated the island, on the second occasion new seaweed was deposited in the centre. Some terns still fledged as they were large enough to swim. All other nests with eggs and small chicks (many of which had just hatched) were lost.

4.4 Predation (gulls)

4.4.1 Large gull species (in the UK and Ireland these are herring gull *Larus argentatus*, lesser black-backed gull *Larus fuscus* and great black-backed gull *Larus marinus*) can have an adverse effect on tern breeding colonies, either by predating or displacing terns, and other seabird species. (e.g. Guillemette & Brousseau 2003, Lopez *et al.* 2023, Morrison and Allcorn 2006). Often the issue is very localised, with one island predated but a nearby island not being targeted.

4.4.2 The latest population survey results for Strangford Lough (2023) can be summarised:

Lesser black-backed Gull

4.4.3 A count of 293 AON on 18 islands in 2023, a slight decrease from 2022. Green Island off Killyleagh hosts the largest Lesser Black-backed Gull colony at 156 AON, the next largest being East Boretree Island off Mount Stewart at 51 AON. The species is scattered across other islands.

Herring Gull

4.4.4 In 2023 there was the third largest count on record for Strangford Lough, representing an eight-fold increase on the nest count in 2001, and was 65% above the 10-year rolling mean (data start from 2013 as no gull data were collected in 2020 due to COVID-19), a total of : 1,920 AON on 27 islands (Thurgate 2023). This species is the most widespread of all the seabirds on the lough,

occupying more islands than any other species. Seven of the colonies exceed 100 pairs (Inishanier – 117 AON, East Boretree – 137, Bird Island, Kircubbin – 145, Jackdaw Is. – 172, Round Is. – 247, Drummond Is. – 264 and Green Is., Killyleagh – 510.

Great black-backed Gull

4.4.5 The 2023 count was the second highest on record (since 1969), surpassing the recent count of 143 pairs in 2021 and approaching the record count of 176 pairs, recorded in 1972. The breeding population is concentrated in one large colony on Great Minnis's Island (122 AON in 2023) with a growing colony on West Boretreee Island (20 AON in 2023).

4.4.6 While many islands have relatively small numbers of gulls nesting, many of the islands are relatively small, although most of the larger colonies are on grassy islands. For example, South Sheelaghs has been noted has having relatively low numbers of Herring Gull AONS, but in 2023 attracted up to 60 adult gulls in late June, on an island which at very high tides is well under 100m^2.

4.4.7 Monitoring on Strangford since 2018 has shown that gull predation can have a major impact on breeding success. Great black-backed Gulls have been recorded as predating tern colonies at Strangford in 2018, 2019, 2022 and 2023 Wolsey 2019, Leonard 2022, 2023).

Gull predation on Strangford in 2022

4.4.8 Great black-backed gulls were observed within the colonies, searching for eggs and chicks, on Dunsy Rock (camera) and North Boretree Rock (camera). Predation of a chick (likely a Black-headed Gull) was observed on camera at North Boretree Rock. Lesser black-backed Gull predation was highly likely at Gull Rock (Boretrees). Pressure from gull predation was also considered likely to be a contributing factor at Salt Rock and South Sheelahs.

Gull predation on Strangford in 2023

4.4.9 Gull predation was again a cause of loss. Great black-backed Gulls were observed on North Boretree Rock (camera), searching for eggs and chicks. This caused the abandonment of the colony. On both South Sheelahs and The Chandries, vibrant colonies with mid-sized chicks vanished in the space of a few days. Herring Gulls are suspected at South Sheelahs, Great black-backed Gulls at The Chandries. A Great black-backed Gull with a full crop was observed flying away from The Chandries in late June. A Great black-backed Gull was observed on 5th July attacking and attempting to predate a flying Common Gull *Larus canus* chick on the water near The Chandries (it escaped). Great black-backed Gulls also moved on to Green Island Rock, Black rock and Gull Rock (Boretrees) in early July, when they had previously been absent.

4.4.10 The Copeland Islands large gulls of all species were major predators of terns. The author has observed a single pair of Herring Gulls which predated at least 55 eggs, and Lesser black-backed

Gulls snatching flying Arctic Tern chicks from the air. During previous attempts to establish terns on Mew Island 2009-14 Lesser black-backed Gulls were observed to predate chicks.

4.4.11 Sudden complete disappearances of chicks, with no other obvious cause or carcasses found are nearly always thought to be due to large gulls.

4.4.12 The presence of gulls is also important when considering sites for new colonies, new colonies cannot be established in locations of high gull density. Small number of gulls may need to be relocated/discouraged.

4.4.13 Methods for deterring avian predators are considered later in the document.

Plate 17 Predated egg

4.5 Predation (raptors)

4.5.1 Predation by other bird species at seabird colonies, particularly raptors, is widespread. It is however often site and year specific. Peregrines have been recorded predating adult terns on Strangford (Wolsey 2019). The author has observed Peregrines killing adult terns on Big Copeland and at Blue Circle Island, Larne Lough. A surprising predator observed at Copeland Bird Observatory was Short-eared Owl (twice) (*pers obs*).

4.5.2 Elsewhere raptors can be occasionally devastating predators of breeding terns. This is particularly the case for Little Tern which can suffer chick predation form Kestrels (Birdwatch Ireland 2024, Buckley 2020, Smart & Amar 2018). Peregrine has also been recorded as a predator of *Sterna* terns in Canada (Nisbet 1992) and of the Inca tern (Velando & Marquez 2002).

Short-eared Owl predation of Common Terns was recorded in Massachusetts (Holt 1994) and Great Horned Owl was shown to be a significant egg predator of Black tern in Canade (Von Zuba & Nocera 2015).

4.5.3 Despite some raptor predation at Strangford and the Copelands over the years, it is likely this will remain a site and year specific issue from individual predators, though where it occurs raptor predation can have a high impact on adults and chicks.

4.6 Predation (corvids)

4.6.1 Corvids, in particular Hooded Crows *Corvus cornix*, are well known egg thieves (e.g. Lemmetyinen 1971, Stien *et al.* 2010).

4.6.2 Often birds are specialist egg finders. At Copeland Bird Observatory, the author observed a pair of Hooded Crows which became specialist nest finders of many ground nesting species, in one year the pair ended up predating more than ten Black Guillemot nests, many Mallard, Oystercatcher *Haematopus ostralegus*, Eider *Somateria mollisima* and Pheasant *Phasianus colchicus*. The species has also been observed over many years predating eggs at Cockle Island, Groomsport (Anthony McGeehan *pers comms*).

4.6.3 At the Gobbins cliffs the author observed another specialist crow pair (one a Carrion Crow *Corvus corone*), which specialised in predating Kittiwake *Rissa tridactyla*, Razorbill *Alca torda* and Common Guillemot *Uria aalge* eggs, predating dozens each year 2013-2015.

4.6.4 Jackdaw is another efficient nest predator of ground nesting species, though perhaps often overlooked. The author has observed Jackdaws stealing Black-headed Gull eggs at Cockle Island and Arctic Tern eggs on Big Copeland.

4.6.5 Jackdaws are common in Groomsport, nesting in chimney pots and have been observed by the author launching raids to steal tern and gull eggs.

4.7 Predation (Otters)

4.7.1 Otter species are known to predate birds but usually this represents a relatively low proportion of the overall diet, although they are capable of taking large birds such as herons and gulls (Ruiz-Olmo & Marsol 2002). Ewins (1989) reported the European Otter (Otter) as a predator of Black Guillemots in Shetland and Craik and Campbell (2000) noted the characteristics of seabird chicks killed by Otters in western Scotland. Harris (1984) also noted that Puffins *Fratercula arctica* may be predated by Otters.

4.7.2 Speich and Pitman (1984) recorded the remains of 93 Fork-tailed Storm Petrels *Oceanodroma furcata* on a single visit to the den of a North American River Otter *Lontra canadensis*. Quinlan (1983) also reported North American River Otter predation on Fork-tailed Storm Petrel and Leach's Storm Petrel *Oceanodroma leucorhoa* in Alaska. The North American River Otter has also been recorded as a predator of adult and young Glaucous-winged Gulls *Larus glaucescens* in North America (Hayward *et al.* 1975, Verbeek & Morgan 1978). Mattern *et al.* (2002) detail a

South American Marine Otter *Lontra felina* preying upon chicks of the Peruvian Diving Petrel *Pelecanoides garnotii*.

4.7.3 Research in southern England (de la Hey 2008) showed that Otter diet there could include up to 61% birds, including Mallard *Anas platyrhynchos*, Great Cormorant *Phalacrocorax carbo* and Common Coot *Fulica atra.* The Otter has been reported as the probable predator of Little Tern *Sternula albifrons* nests in County Louth (Martin 2011). The Otter has previously been reported as a predator of the Manx Shearwater and at Rum (Scotland) birds were reported to be predated by otters (Strachan 2007).

4.7.4 Otter has been implicated in the predation in several years on Cockle Island, including 2023 (A. McGeehan *pers. comms.*). The species has been strongly suspected or proven as a predator on Strangford several times since 2018, including at Swan Island in 2023. Impacts can be very local. For example, in 2023 The Shones tern colony was wiped out by a possible Otter attack (Mink *Neogale vison* and Fox not discounted), but a few miles away, Jackdaw Island, which is easily accessible and held numbers of terns, gulls and geese, suffered no predation.

4.7.5 Leonard & Preston (2008) showed that Otters were responsible for the predation of Manx Shearwaters *Puffinus puffinus* on the Copeland Islands, something which has been noted since at least the 1990s. Shag *Phalacrocorax aristotelis*, Eider *Somateria mollissima* and gulls were also predated.

4.7.6 Conversely, at Castle Espie WWT, Maurice Turley reports that the small number of Common Terns nesting do not seem to have suffered any Otter predation, despite a natal holt being present on one of the lakes.

4.7.7 Otters are a European protected species and any measures taken will need to be preventative.

Plate 18 Predated Black-headed Gull chick (probable otter kill)

Plate 19 Predated Black-headed Gull chick (probable otter kill)

4.8 Predation (Brown Rats)

4.8.1 Invasive rodents have been implicated in declines and extinctions of seabird populations worldwide, and the impact of rat species is regarded as one of the most significant global threats to seabirds (Jones *et al.*, 2008). Rats have been implicated in numerous seabird extirpations and population declines worldwide (Jones *et al.*, 2008) and it has been reported that the presence or absence of brown rats is the single most important influence on Storm-petrel (*Hydrobates pelagicus*) distribution in Orkney and Shetland (de León *et al.*, 2006).

4.8.2 It has also been suggested that the severity of impacts of introduced rats on native island fauna may have been exaggerated, and that direct evidence for negative impacts is patchy (Towns *et al.*, 2006). Indeed, some seabird colonies may be less vulnerable to rat predation because of biogeographical factors that limit rodent-seabird interactions, which could explain the long-standing co-existence of rats and seabirds on many Mediterranean islands (Ruffino *et al.*, 2009). Lambert *et al.* (2015) showed that on Rum, Scotland, that Brown Rats had an overall minimal impact on the internationally important Manx Shearwater colony. O'Hanlon & Lambert (2016) suggested that Brown rats in low densities were not an issue for ground nesting seabirds.

4.8.3 Amaral *et al.* (2010) showed that the removal of Black Rats benefitted a recovery of breeding Roseate Terns in the Azores. At higher densities rats may causes relatively high levels of predation in tern colonies (Hughes *et al.* 2019).

4.8.4 Spectacular seabird recoveries on Ramsey Island (Bell *et al.* 2019) and Lundy Island (Lundy Bird Observatory 2023) have been entirely attributed to the removal of Brown Rats.

4.8.5 There is relatively little evidence of Brown Rats in the UK being a predator of nesting terns. Rats would need to be present in a high density to find what is an ephemeral food source. Rat predation on eggs is hard to confirm, and without other camera or chewstick evidence it is hard to be certain of presence in marine environments.

4.8.6 Rats are widespread on some of the islands on the western side of Strangford Lough (Hugh Thurgate *pers comms*.) It is likely that they swam to some islands, though there is regular livestock related boat traffic around some of the islands and those could potentially introduce rats. Once one island was reached, many others are in swimming range.

4.8.7 Some of the islands with nesting terns are very close to land or can be accessed at low tide. For example, Swan Island is mere metres from Strangford village and in early 2024 evidence has been found of rat activity (Hugh Thurgate *pers. comms*), where they have not historically been present. Jackdaw Island, The Shones, Dunsy Rock, North Sheelah, North Boretree, Salt Rock, Gull Rock and The Chandries can all be accessed either directly at low tide or through very shallow waters. Dunsy Rock is known to have rats, which reach the island via Dunsy Island.

4.8.8 Wolsey (2019) reported evidence of Brown Rats predating eggs on Strangford Lough. The author has not found any firm evidence of rat predation. Some eggs on Black Island in 2023 *could* have been rat predation (though were not reported as such), but it is very difficult to differentiate a rat-predated egg from one predated by Black-headed Gulls or even Herring and Great black-

backed Gulls. Gulls can be surprisingly delicate, making a small break and then tipping the egg to drink the contents.

4.9 Predation (Red Foxes)

4.9.1 Red Foxes *Vulpes vulpes* (Fox) are well know predators of a wide range of species. Predation on Sandwich Tern eggs and chicks by Foxes is an important factor determining productivity at some sites in the UK, and cause abandonment of a colony on some occasions (Ratcliffe *et al.* 2000). They have been reported as predators on gulls, terns and other ground nesting bird species (Birdwatch Ireland 2024, Gunnar Thor Hallgrimsson & Hersteinsson 2011, Minksy 1980, Porteus *et al.* 2024, Southern *et al.* 1985).

4.9.2 Their impact on seabirds can be limited by those species usage of offshore islands, but the use of inshore islets and sandbars, sites in lakes and inlets, or along the shoreline, are vulnerable to Fox predation.

4.9.3 Some islands are very close to the mainland, connected to the mainland, or may rarely be connected to the mainland at very low tides. Some islands would, at first glance, appear to be too far out into the lough for Foxes to reach. However, if a Fox can reach an inner island, then it is fairly straightforward to access the outer islands. This is particularly the case with the islands south of Whiterock, in the Ringhaddy area. 'Leapfrogging' is relatively easy in that area. Pawle, Island Taggart and Dunsy all have Foxes (Hugh Thurgate *pers. comms.*) and it is likely all nearby islands can be reached.

4.9.4 The larger islands to the east of Whiterock may be less vulnerable due to distance and tides, but it cannot be ruled out.

4.9.5 The southern islands at Castle Ward and the Quoile are all easily accessible. In 2022 The Shones were predated by what was probably an otter or Fox, the island can be walked to at the lowest tide. The predation event resulted in the killing of all chicks, although most were left uneaten, a habit more likely to be Fox or mink, rather than rat. In contrast. Jackdaw Island, a major gull, goose and sometimes tern colony, suffered no predation in 2023, despite easy access.

4.9.6 Many islands on the eastern side of the lough are connected to the land at low tide, making them vulnerable to Foxes.

4.9.7 At Castle Espie there are two main potential areas for nesting terns, including locations for rafts, but only part of the site is behind a predator proof fence.

4.9.8 Islands which may be suggested for new colonies, large enough to cope with se-level rises, are vulnerable to Fox (and otter) access. Permanent protection of such sites from land predators is a fundamental requirement for new colony creation.

4.10 Predation (American Mink)

4.10.1 American Mink are a voracious introduced predator of seabirds and other ground-nesting species. They have found to be a problem in the Western Isles of Scotland (Clode & MacDonald

2010, Craic 1995, 1997, Moore *et al.* 2003). Predation on nesting terns has also been reported from France (Cadou 1998).

4.10.2 There have been no confirmed predation events by American Mink on Strangford or the Outer Ards coastline.

4.11 Predation (Pine Marten)

4.11.1 The Pine Marten *Martes martes* population in Ireland has increased greatly in the last 20 years. No reference to Pine Martens predating breeding terns could be found, but the species is opportunistic and could certainly potentially visit islands on the southern edge of Strangford Lough. Pine Martens are good swimmers.

4.12 Predation (Sheep)

4.12.1 Peterson *et al.* reported that sheep predating Arctic Tern eggs and chicks. Furness (2009) observed sheep eating 680 terns over seven years on Foula. The author often suspected that sheep on Big Copeland were responsible for egg losses, although no firm evidence was available.

4.12.2 Any new colonies must be fenced from sheep.

4.13 Avian influenza

4.13.1 Avian Influenza has been present in wild bird populations for some time, particularly in waterfowl species. The strain H5N1 of Highly Pathogenic Avian Influenza (HPAI) has had particularly serious consequences, spreading across a range of bird species. In Northern Ireland, it was confirmed in a limited number of species in autumn 2021.

4.13.2 In 2022, the UK situation deteriorated rapidly with HPAI jumping across to populations of colonial-nesting seabird. The author recorded no birds with HPAI in 2022, though on reflection a single adult Black-headed gull found in early July was likely a victim.

4.13.3 In 2023, however, the disease was blamed for 24 adult tern deaths and at least 41 chicks. These figures are likely underestimates. Many other adult and chick gulls were also lost to presumed Avian Flu.

Plate 20 Dead Sandwich Tern on Black rock in 2023, presumed Avian Flu

Plate 21 Dead Common Chick on Gull Rock, Avian Flu

Plate 22 Dead Common Chick on Gull Rock, Avian Flu

Plate 23 Dying Common Chick on Gull Rock, Avian Flu

4.14 Site designations and protections

4.14.1 Strangford Lough is one of the UK's most important wildlife sites, recognised by a series of European and National designations including Special Protection Area (SPA) under the EU Birds Directive, Special Area of Conservation (SAC) under the EU Habitats Directive, Area of Special Scientific Interest (ASSI), Ramsar Site, and Marine Conservation Zone (MCZ). The Lough supports major concentrations of wintering waterfowl with the most recent peak counts exceeding 70,000 birds including approximately 90% of the world population of light-bellied brent goose.

4.14.2 Some parts of these designations may be very specific for example the location of a rare plant on a small part of a single island. Any selected site for a new tern colony will need to have detailed assessment.

4.14.3 Prospective licence requirements are dealt with further below.

4.15 Site ownership

4.15.1 The majority of the islands in the lough are owned privately. Any creation of new colonies will have to be with the agreement and permission of the land owner.

4.15.2 Any new rafts will need the permission of the Crown Estate.

4.16 Archaeology and historical importance

4.16.1 Islands within the lough may have sites of archaeological or historical importance, which must be considered in the micro-placement of new colonies.

4.17 Human site utilisation

4.17.1 The utilisation of the site by people has the potential to cause problems for nesting seabirds. One of the key management issues relating to bird populations at Strangford Lough is disturbance, which has been defined as "any phenomenon that causes a significant change in the dynamics or ecological characteristics of populations of birds" (EU Commission 1992).

4.17.2 Thankfully all of the breeding islands are relatively difficult to reach, and only those in kayaks or small boats can safely approach.

4.17.3 Possible causes of disturbance identified by Allen & Mellon (2015):

- Kayakers.
- Landings by small boats.
- Kite-surfing.
- Shellfish collection.
- Coasteering.

- Walkers and dogs.
- Aircraft.
- Wind-surfing.
- Shooting.

4.17.4 Of these, kayakers, small boats, shellfish collection and coasteering are likely to be the main cause of human disturbance.

4.17.5 The disturbance observed by the author in 2022/23 has been minimal, though there is a notable upsurge of boat activity in the lough from the end of June.

4.17.6 People were observed by trail camera on North Boretree in 2022 (the colony having deserted the previous day) (Leonard 2022). Wolsey (2019) also recorded the activity of people on the islands using trail cameras.

4.17.7 The potential for human disturbance needs to be considered for any new breeding sites.

5. Habitat management and creation – natural sites

5.1 Overview

5.1.1 National Trust have indicated that any solution should be **short-term** and **'naturally engineered'**. It is National Trust policy to allow a managed retreat in the face of sea-levels, and not have large scale interventions. This rules out large-scale remedial options, primarily the use of rock armouring of any type or 'recharging' by the large-scale permanent addition of new substrate, to create a permanent and highly modified island. Any such engineered solution would need to permanently re-model the island.

5.1.2 Therefore, all such heavily engineered solutions have been excluded from consideration for existing islands, any interventions on those islands must be reversable.

5.1.3 However, for new colonies the solutions *will* be to create new breeding sites on existing larger islands, on a permanent basis, but beyond areas impacted by mid-term sea-level rise.

5.2 Addition of loose substrate to an island

5.2.1 This is the most basic option, placing shingle or shells on to the island, to raise the level of the island and provide a suitable nesting substrate. No other protections are provided, or measures taken, stones are simply added to the island.

5.2.2 There are a number of issues with this approach but the main one is that most of the substrate will eventually be lost.

5.3 Terracing - large-scale

5.3.1 'Terracing' of an island or area is, in principal, an easy way to introduce levels to an island and preserve nesting areas. The name 'terracing' encompasses many kinds of altering of the viable habitat to improve and protect the nesting areas. The examples are large scale but can be implemented at any scale.

5.3.2 The three main examples of terraces are at Rockabill, Coquet Island and the Farne Islands (both in north-east England) (Babcock & Booth 2020a).

5.3.3 At Rockabill the island has been terraced to provide more flat areas to support breeding Roseate Terns. Rockabill is however a properly formed rocky island, and the terraces are well above sea level, taking advantage of natural features. The site is not at risk from inundation.

5.3.4 The Farne Islands and Coquet are a similar situation, the terraces are areas of ground on a major island which have been cleared, terraced using paving stones, low walls and nesting substrate to benefit terns.

Figure 24 Tern terraces at Rockabill (source: RSPB https://roseatetern.org/terraces-and-nest-boxes.html)

Photo 25 Tern terraces on Coquet Island (source: Chronicle Live https://www.chroniclelive.co.uk/news/north-east-news/watch-northumberland-kittiwakes-enjoying-five-11224591)

Photo 26 The Isle of May tern terraces at the Beacon in April 2016 (SNH). In subsequent years Coquet Island style sloping roof rectangular boxes were also used. After the 2019 breeding season the boxes were moved closer to the cliff edge which may be preferred by Roseate Terns, with more open Common Tern nesting areas behind.

5.3.5 There are options for the creation of terrace-like structures which are potentially very suitable for Strangford Lough. At Lymington Breakwater in England (Babcock & Booth 2020b) were created on top of existing breakwaters in an effort to attract terns to an area without breeding birds. While no terns were attracted to the area, Oystercatchers and gulls used the bunds, and they provided a perfect raised 'bed' of nesting material for the birds. The ingenious construction of these bunds was carried out by filling hessian sacks with quick drying postcrete, on site, and positioning the bunds. Stainless steel pins provide additional support, and the hessian sacks disappear over time.

5.4 Small-scale terracing - temporary

5.4.1 Rather than using bagged concrete, which is undesirable, it would be possible to use small rock filled metal gabion baskets filled with natural stone. These have the advantage they are natural looking and do not involve the introduction of concrete or other such materials.

5.4.2 Rock gabions are large rock filled baskets which are set on top of each other to form a protective wall through which water cannot penetrate. Infill is then used behind the gabions.

5.4.3 Rock baskets (usually used in gardens) are a small-scale version of rock gabions and can be installed temporarily.

5.4.4 Rock Baskets are used to build the bund (effectively a raised flowerbed). Within the interior are placed more gabions or containers. If the baskets are shallow then no interior building is required.

5.4.5 Across the top is placed a layer of woven geotextile, and on top of that a layer of aggregate and natural shingle 1ocm deep. The exact method and materials are not important at this stage, and could be finessed, the important takeaway is that it would provide a terrace, at a greater height above sea-level.

5.4.6 Importantly it would be a **temporary structure**, as natural as possible, and would be relatively straightforward to remove. It may require considerable *effort* to remove from a site, but it could be removed.

5.4.7 An even simpler method would be to lay out geotextile and edge it with concrete blocks (or similar) to keep in the substrate, pavers could also be used. The geotextile also suppresses vegetation. Such a design is more useful for flattish grassy sites.

5.4.8 These structures have a number of advantages.

- They are temporary and the construction process will allow removal, but they are heavy duty with regards to the weather.
- They are of natural appearance and will blend in with the island.
- They could increase the area of nesting substrate.
- They will raise the substrate above high tides.
- They in effect provide nesting terraces like other islands.
- Relatively straightforward to transport and install, no heavy equipment needed.
- Ill require ‘elbow-grease’ to remove, but can be deconstructed and removed.

Photo 27 Bund at Lymington (source: Matthew Brown https://roseatetern.org/uploads/3/5/8/0/35804201/babcock_and_booth_2020_habitat._rafts_and_structures._tern_conservation_best_practice..pdf)

Figure 28 Large-scale Rock gabions for coastal defence (source: https://commons.wikimedia.org/wiki/File:Gabion-hengistbury-head.JPG)

Figure 29 Small wire gabion for garden use (source: https://www.wirefence.co.uk/)

Figure 30 Small wire gabion for garden use (source: Customgabion.com)

Figure 31 Small wire gabion for garden use (source: ebay.com)

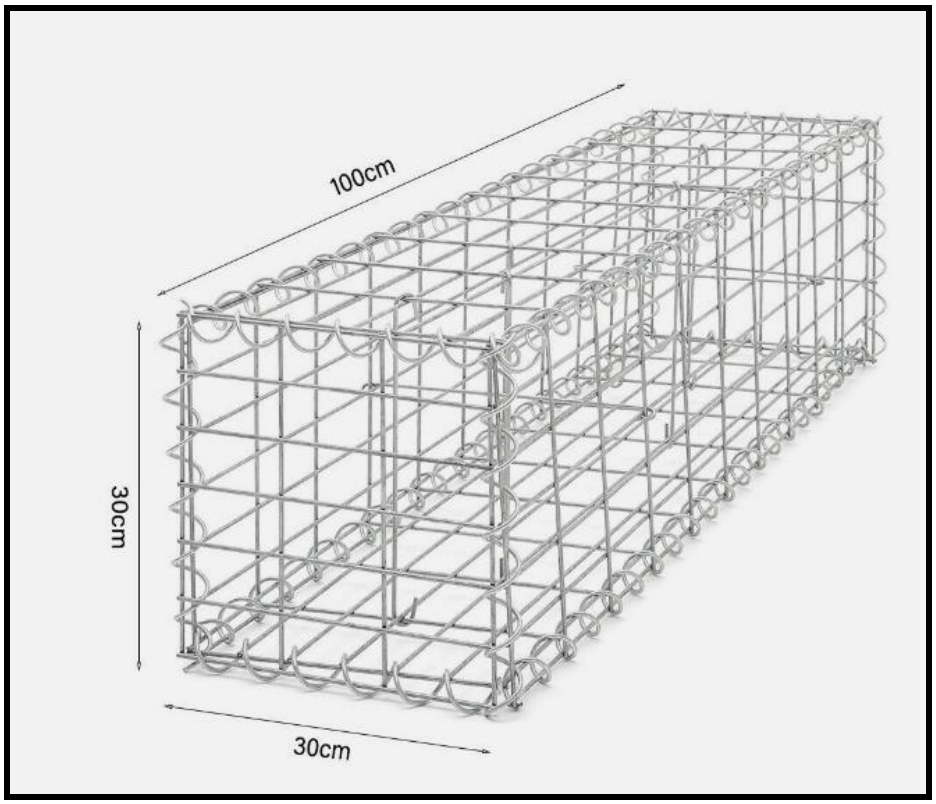


Figure 32 Example tern terrace structure with rock gabions and geotextile

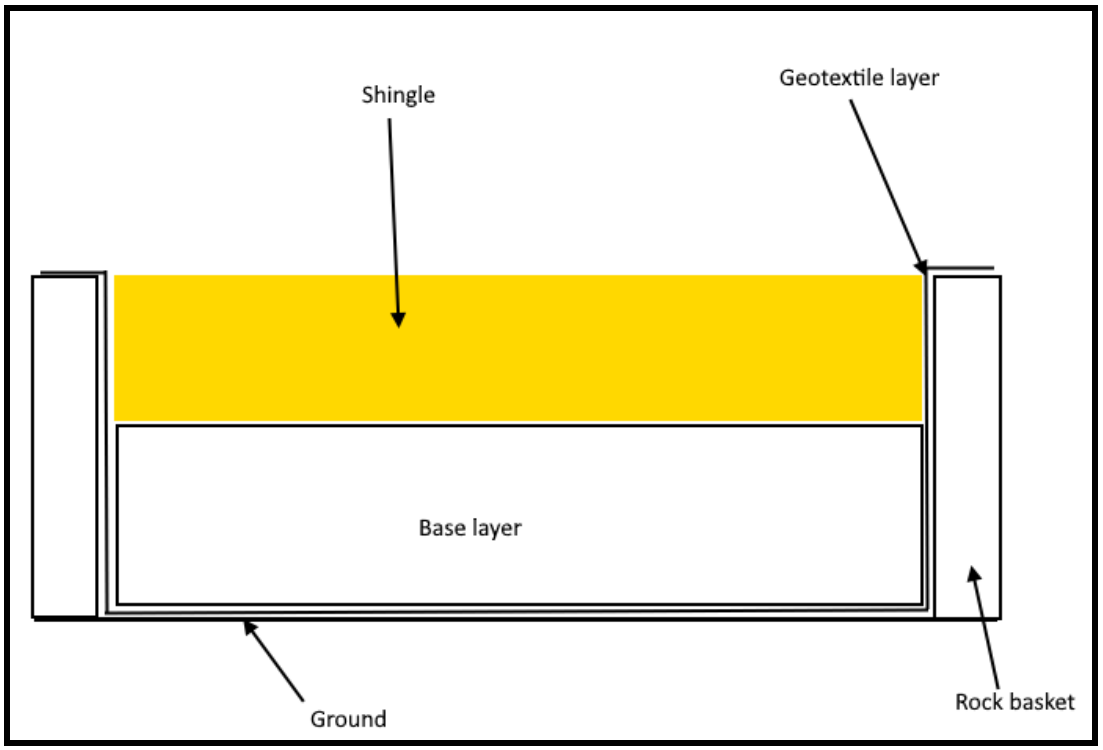
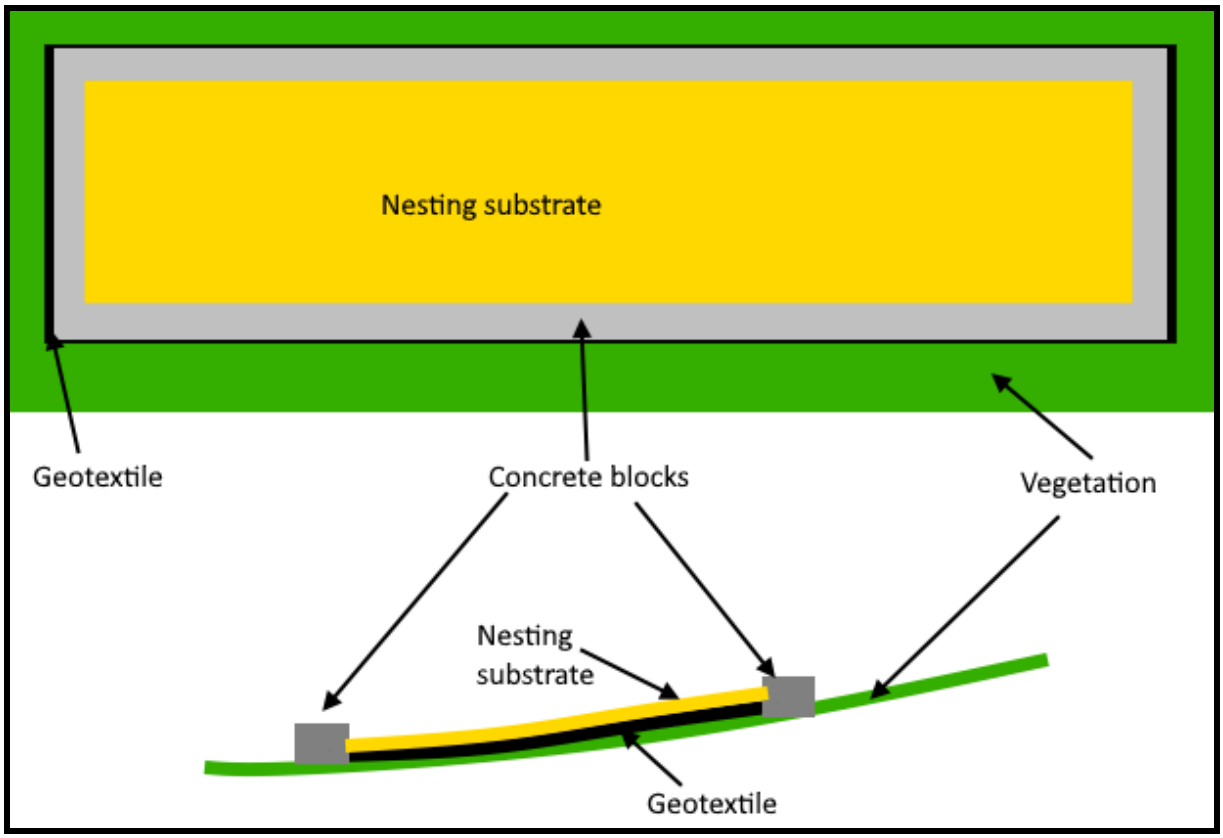


Figure 33 Example simple tern terrace layout using geotextile and blocks



5.5 Tern Tables

5.5.1 Similar to a standard tern raft, but placed over land, this solution was used at Langstone Harbour (RSPB 2018) to provide extra potential breeding sites for terns and other species away from the main breeding islands, which are being dominated by Mediterranean Gulls.

5.5.2 The table is effectively a small raft on stilts. Such tables could potentially be installed in many locations on Strangford Lough. They have the potential to open up areas of habitat which would not otherwise be suitable. A number of larger tables of this type could be used to create a new colony within protective fencing, rather than terracing. The platforms do not need to be very tall if protected by fencing.

5.5.3 There are a wide variety of commercially available structures which could potentially be used in a similar fashion, for example large garden planters or industrial wooden crates.

5.5.4 The drawback of tern tables is that they will only have a small number of birds on each table, and that risks fragmenting the population, whereas at Strangford the aim is to focus the population on large, defensible locations.

Figure 34 Tern 'table', Langstone Harbour (Source: RSPB https://community.rspb.org.uk/placestovisit/langstoneharbour/b/weblog/posts/trialing-a-tern-table-attempt-one)

5.6 Retention of nesting substrate (new sites)

5.6.1 It is important that for new areas of substrate (on permanent colonies or for temporary terracing) that terracing is in place to maintain new substrate in place, and that geotextile is placed below that substrate. Substrate must also be added in sufficient quantity. Without these measures new substrate will quickly be lost.

5.7 Vegetation management

5.7.1 Some sites may require vegetation management. This is currently an issue at Swan Island and at the Dunnyneills. While terns *will* nest in taller vegetation it is less preferred. A mosaic of open habitat and low vegetation is preferred.

5.7.2 Annual cutting management may be required.

6. Habitat management and creation – artificial breeding sites

6.1 Tern rafts

6.1.1 Tern rafts have been commonly used around the word to provide nesting opportunities for various tern species. In the UK these are largely used by Common Terns and sometimes Arctic Terns.

6.1.2 The best-known local examples are the rafts at Belfast RSPB WOW reserve and Portmore Lough, but there are many other examples (Ely Wildspace 2023, Hampshire & Isle of Wight Wildlife Trust 2023, Landscapes for Life 2023, Leicester Rutland Wildlife Trust 2023, Lough Neagh Partnership 2023, South Staffs Water 2023, Tower Habitats 2023, Wensum Valley Birdwatching Society 2023).

6.1.3 Overwhelmingly those rafts have been deployed on lakes and calm sheltered coastal loughs or harbours, with no tidal action, though there are some examples of them being deployed in marine areas e.g. the Moray Firth. Another has been installed in Chichester harbour (Aquatic Engineering *pers. comms*.)

6.1.4 Any raft used on Strangford Lough must be robust enough to stand up to weather events and tidal conditions. Rafts will be sited carefully to take advantage of available shelter.

6.1.5 Any raft deployed *must* be of a model proven to be predator proof, or be made so.

6.2 Barges

6.2.1 There is relatively little in the literature around using barges for nesting terns. Collis *et al.* report a barge being used for nesting Caspian Terns in a riverine estuary.

6.2.2 The term 'barge' is quite wide-ranging, and may apply to barge boats, and flatbed transport barges. Superficially there is little difference between such low flatbed barge and a high-spec tern raft. However, such barges generally have low sides, so are not always suitable 'off-the-shelf' for terns. Work would be required to make such a barge predator-proof.

Case Study: Chichester Harbour

The Return of the Tern Project was initiated in 2021. It was a nature recovery initiative to restore the breeding population of terns to Chichester Harbour. It followed the Natural England SSSI Condition Review which found Chichester Harbour to be in an unfavourable declining condition. In the wake of the report, the Friends of Chichester Harbour secured funding for this project from the government's Green Recovery Challenge Fund. The natural nesting habitat has declined significantly in the past 20 years. Nest sites are regularly washed out on high spring tides and storm surges. The result has been a serious decline in the number of terns breeding within the harbour. The Return of the Tern project aimed to restore suitable breeding sites for *Common Tern*s and Little Terns by:

- Deploying further rafts around the harbour to support nesting pairs of *Common Tern*s.
- Increasing the elevation of a shingle island to prevent inundation by spring tides.

Tern rafts are artificial nesting platforms used to provide secure shingle habitat for birds like terns to nest on. First launched on Thorney Deeps in 2019, they were immediately successful, with 20 young *Common Tern*s fledging that year. The project funded 5 new rafts, bigger and more resilient than the originals (supplied by Aquatic Engineering). By 2022 there were 42 pairs of *Common Tern*s nesting on the rafts, resulting in 54 fledglings.

Chichester Harbour is very similar to Strangford Lough. It is approximately half the size, but is tidal with islands and channels, mudflats and saltmarsh. I

Figure 35 Tern raft in Chichester Harbour (source: Glyn Onione, Aquatic Engineering)

Figure 36 Chichester Harbour

Figure 37 Tern raft at Loch Spiggle (source: RSPB https://scotlandsnature.blog/2022/09/07/terrific-tern-rafts)

Figure 38 Tern raft (Source: https://www.greenfuturebuilding.co.uk/products/tern-rafts)

Figure 39 Tern raft at Ballyronan, Lough Neagh. (source: Lough Neagh Partnershiphttps://loughneaghpartnership.org/tern-raft-webcam/#:~:text=Lough%20Neagh%20Tern%2FBlack%2Dheaded,on%20the%20lough%20every%20year)

Figure 40 Fibreglass tern raft (source: https://coxsboatyard.co.uk/nesting-rafts/)

Figure 41 Concrete Mooring block (source: https://www.sealite.com/mooring-solutions/)

6.2.3 There are a number of manufacturers of these tern rafts, some of which are shown in the table below. Rafts can also be home built.

6.2.4 It is the author's opinion that, for the open shoreline of Strangford, the Aquatic Engineering heavy duty rafts are most suitable.

Table 8 Selection of raft manufacturers

Supplier	Website	Notes
Filcris	https://www.filcris.co.uk/product/mink-proof-tern-raft-122m-x-244m-x-660mm-high-ternmp1	These are very small rafts and two would need to be joined together to make a minimum sized small raft (this seems to be possible). It is not clear if these could stand up to the conditions. Relatively cheap. Filcris were contacted but did not respond.
Cox's Boatyard	https://coxsboatyard.co.uk/nesting-rafts/	Recycled plastic raft. Robust. Eric Bishop of the company feels the raft should cope with the conditions and would strengthen it to make sure. Also feels there is no reason it could not go 'dry' and refloat with no problems.
Aquatic Engineering	https://aquaticengineering.co.uk/	Provider of bespoke raft solutions. Declined to provide a price as they would engineer it to the site. Generally do not build rafts smaller than 4mx4m. Would likely build a very robust raft, and large, but possibly too large. Direct engagement would be needed.
Gileard	http://www.bird-hide.co.uk/products/tern-rafts/	Provider of relatively large rafts, which appear robust. Otter proofing. Gileard were contacted but did not respond.
Green Future Building	https://www.greenfuturebuilding.co.uk/products/tern-rafts	Provider of relatively large rafts, which appear robust. Otter proofing. Were only found at the end of the research process and have not been contacted.

Figure 42 A flatbed nesting barge floats in a pond along the Mississippi River near St. Louis. The barge is a floating flat surface covered in sand with a one-meter fence to keep predators out. Its sole purpose is to serve as nesting habitat for birds. Photo: Tara Hohman Audubon

Figure 43 Caspian terns on a commercial flatbed barge, Long Beach, USA

6.3 Tern platform

6.3.1 The concept of a tern platform is similar to the tern tables detailed above, A tern table is a small-scale platform placed to enhance an existing site.

6.3.2 Essentially a tern platform is a permanent stilted platform, usually set over water, upon which the birds will nest. Looked at another way, a permanent tern raft on stilts, rather than floating.

6.3.3 The most well know local examples are the platforms at Belfast RSPB WOW reserve, which have been successfully used by terns for many years. A platform was used to help protect a Little Tern colony from erosion In Albania (Albanian Ornithological Society 2023).

6.3.4 Another well known platform is the 'Torpedo Platform' at Lough Neagh. While originally for military use, once abandoned the platform was taken over by breeding gulls and terns,

6.3.5 Creating such platforms provides more challenges than introducing a raft, for example, but the permanence and strength of a structure could be an advantage in a tidal location.

6.3.6 While a proven concept, such a structure may require planning. There are also questions about how robust such a platform would be. It would require detailed design by a marine engineer and be installed in a safe place away from boats. While not impossible, it is probably unsuitable for the sites under consideration.

Figure 44 RSPB Belfast WOW Tern Platform (source: Tripadvisor)

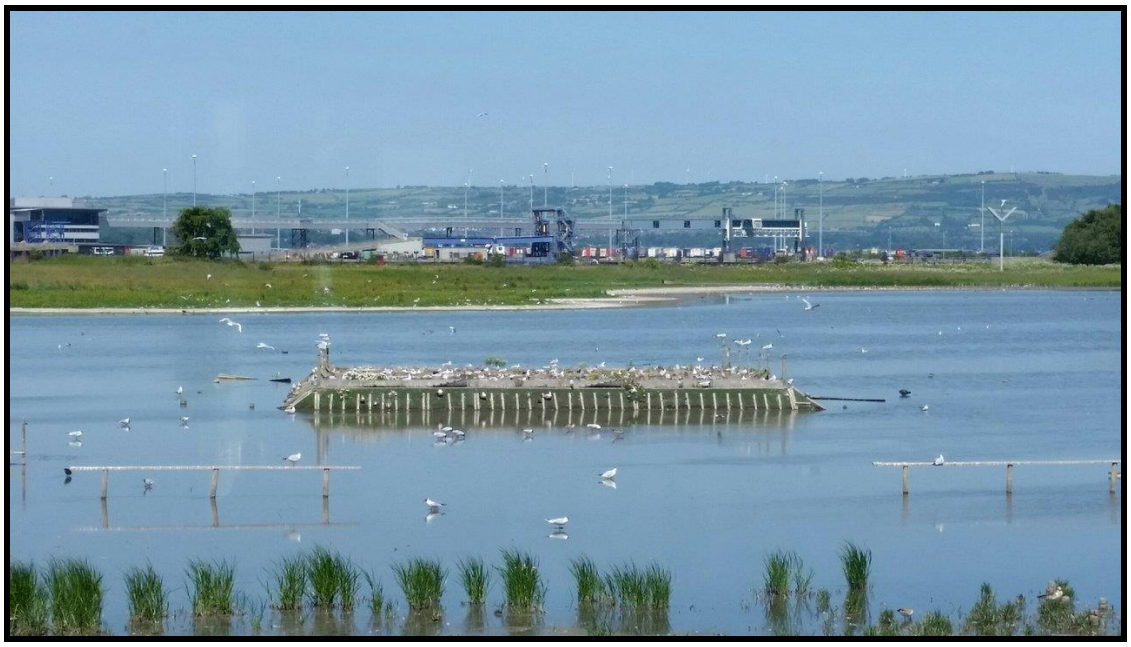


Figure 45 Torpedo Platform, Lough Neagh. (source: https://www.atlasobscura.com/places/lough-neagh-torpedo-test-platform)

Figure 46 Common Terns and Black-headed Gulls on the Torpedo Platform, Lough Neagh, summer 2023 (source: https://loughneaghpartnership.org/torpedo-platform-webcam/)

7. Site attraction

7.1 Decoys

7.1.1 A decoy is a model of a species used to attract wild birds, usually members of the same species to a particular area. A decoy is not necessarily a precise replica, the level of accuracy required depends on the species, but should imitate the size, shape, typical posture and major plumage features of the species. It needs to be made of fairly robust materials depending on the length of deployment, examples have been made from plastic, fibreglass, resin, ceramics, and wood.

7.1.2 Decoys have been shown to be an effective way to encourage terns to nest in new habitat (*pers. obs*., Babcock & Booth 2020c).

7.1.3 Deployment of decoys on new rafts or nesting areas would be used to encourage birds to use that habitat.

7.1.4 Decoys may be obtained from Mad River Decoys https://seabirdinstitute.audubon.org/decoys/mad-river-decoys-audubon and Restoration Decoys https://www.restorationdecoys.com/ but are expensive.

7.1.5 The appendix to Babcock & Booth (2020c) details the methodology to cerate plastic tern decoys, though that is a detailed technical process.

7.1.6 Recently RSPB Scotland and the University of the Highlands and Islands (UHI) collaborated to produce 3D printed Arctic Tern decoys https://www.nature.scot/3d-printed-birds-welcome-migrating-terns-scottish-breeding-sites. Using these decoys, or producing similar, is probably the cheapest way forward. There is scope for similar local collaboration.

Figure 47 Mad River Common Tern decoys (photo: Mad River decoys)

Figure 48 Restoration Decoys – Arctic Tern decoys (photo: Restoration Decoys)

Figure 49 3D printed Arctic Tern Decoy (photo: Highland Times)

7.2 Sound lures

7.2.1 A sound lure is a device playing sound recordings of bird songs or calls, normally to attract adult birds. These can be used to attract colonial birds to a breeding habitat. Sound lures played at a natural volume are thought to be most effective.

7.2.2 Decoys and sound lures to attract wild birds to suitable breeding habitat are generally considered to be most effective when used simultaneously.

7.2.3 The use of a sound lure will require a licence. Although a sound lure used to attract birds to nest may not need a licence, the use of sound lures after the birds have arrived may constitute disturbance.

7.2.4 The literature on decoys and lures suggests variable effectiveness.

7.2.5 Pynenburg *et. al.* (2017) tested decoys and lures to relocate breeding Common Terns to newly created islands. There was no significant difference between the effectiveness of the different call types between experimental and control islands.

7.2.6 Arnold *et. al.* (2011) attempted to test the relative importance of aural (sound recordings) and visual cues (decoys) in attracting Common Terns as part of a colony restoration project on Muskeget Island, Massachusetts, USA. No nests were built within decoy only plots, but there was an effect of sound lures.

7.2.7 Kress (1997) describes the restoration of two tern colonies in the Gulf of Maine, USA. On Eastern Egg Rock sound lures and decoys were used to attract terns from 1979 onwards, combined with removal of some gulls. By 1996, Eastern Egg Rock was the largest Common Tern colony in Maine with 1,374 pairs and Roseate Terns had increased to at least 126 pairs. On nearby Seal Island National Wildlife Refuge, from 1985-1989 5o decoys and a sound lure were deployed to attract Arctic Terns. By 1996, there were 956 pairs of Arctic Terns and 780 pairs of Common Terns at the colony.

7.2.8 Kress concluded that factors associated with recolonization included:

1. Presence and number of surviving birds with a memory of nesting at the restoration site.

2. A source of potential breeders with a history of nesting nearby.

3. Expanding regional populations producing a supply of prospecting young birds.

4. Disturbance at neighbouring colonies that result in poor productivity, encouraging birds to search for alternate nesting places.

7.2.9 Jeffries & Brunton (2001) found that New Zealand Fairy Terns *Sternula nereis davisae* were significantly more likely to land in experimental plots with tern decoy models compared to control plots, but that sound lures had little impact.

7.2.10 Freare *et. al.* (2015) found that a combination of decoys and sound lures was most effective at attracting Sooty Terns *Onychoprion fuscatus* to previously occupied sites in the Seychelles restored by habitat management.

7.2.11 The technology used for sound lures is constantly changing. Solutions must be solar powered, be able to be operate on a timer and ideally have a solar timer so they will deactivate at night. Systems must be weatherproof to IP56 standards. Generally, bespoke systems designed by an electrician are required. The RSPB has designed such a system and may construct them for third parties.

7.2.12 In 2024 bird-scaring devices have been repurposed to be used as attractants in conservation projects. The SCARECROW B.I.R.D. System, with a Scarecrow Solar Pack and 2M Stand is being used. The manufacturer has added tern calls to the system .

- https://www.pestfix.co.uk/scarecrow-b-i-r-d-4-speaker-bio-acoustic-bird-dispersal-system.asp
- https://www.pestfix.co.uk/scarecrow-solar-power-option-kit-(compatible-with-180-360-and-b.i.r.d.-not-included).asp
- https://www.pestfix.co.uk/free-standing-non-penetrating-speaker-mounts.asp

7.2.13 This system is promising and will be assessed in 2024.

7.2.14 Other commercial options are available for other species and there is a possibility they could be repurposed for terns, or similar devices constructed e.g. https://www.peakboxes.co.uk/post/attracting-swifts-sound-systems.

8. Operational management - prevention of predation

8.1 Overview

8.1.1 This chapter, and the following, deals with practical management actions for tern breeding sites, beyond their creation. That is, an existing island, or new island, site, or indeed a raft,

8.1.2 Operational site management options are actions which are concerned with protecting Those potential negative factors for which actions can be taken:

- Protection from predation;
- Protection from the elements;
- Prevention of disturbance;

8.1.3 See earlier for an overview of issues which may impact breeding terns at Cockle Island.

8.2 Anti-predator fencing

8.2.1 The most suitable design for an anti-predator fence depends on the ecology of the species being protected, the predator being excluded, the physical characteristics of the site and public access. Fences can either be solid barriers or electric fences.

8.2.2 Barrier fences are solid high tensile wire, dug into the substrate, and high enough to protect from predators. Such structures are usually intended to exclude Badgers and Foxes.

8.2.3 Electric fences combine a weak physical barrier and a psychological imprint to modify the behaviour of the predator. The animal associates the shock with the fence to create a psychological barrier that discourages it from touching it again. The size of the fence can vary but in most examples the fences have needed to be permanent or semi-permanent to succeed (Babcock & Booth 2020). This by necessity requires a larger site, and/or one clear of obstructions. For example, a temporary fence at Cemlyn Bay in North Wales protects the centre of a shingle island, but island and shoreline is relatively smooth and easy to defend. There are also permanent fence posts.

8.2.4 At Larne Lough otter proof combined barrier/electric fencing was installed on Blue Circle Island, but again Blue Circle is a large island, with a relatively flat interior.

8.2.5 Fences are problematic for small rocky islands. The National Trust has previously used electric fencing on Strangford Lough (Wolsey 2019), but the overall conclusion was that such fences were not suitable for the small rocky islands on the lough (Hugh Thurgate *pers comms*). Other studies (Babcock & Booth 2020) suggested that there were negatives from deploying electric fences as they required a lot of maintenance, resulting in increased disturbance. The fences are susceptible to shorting by materials linking the strands, and it has been shown that Black-headed Gulls dropping seaweed can be an issue (Babcock & Booth 2020), something which is very likely in the marine habitats in question.

8.2.6 The use of fencing is not viable for the majority of the very small islands of Strangford. Only on Swan Island and the Dunnyneills is it likely that electric fencing could be used in places.

8.2.7 The establishment of new 'green field' colonies *must* be accompanied by high tensile barrier predator fencing, before any work begins to attract birds into the site, and potentially electric fencing.

8.2.8 New rafts *must* have appropriate fences or baffles to stop the ingress of predators.

8.2.9 Additionally, any new raft colonies must deploy fencing or other blocking materials to ensure that they can be no egress of predators.

8.3 Anti-predator devices (mammals) – sonic deterrents

8.3.1 Sonic deterrents are general-purpose ultrasonic pest and animal deterrent, designed to repel Foxes, cats, dogs, rabbits and martens.

8.3.2 Motion sensor detects movement in the protected area up to a distance of 10m away.

8.3.3 The ultrasonic alarm does not harm the pests in anyway and also cannot be heard by humans. The deterrent only causes the animal a slight amount of distress and encourages them to leave the area. The device triggers a 10-second ultrasonic burst, which will repeat until the animals leave the protected area. Once the animal has left the area, the pest-free unit stops emitting and returns to its standby mode.

8.3.4 Sonic deterrents are advertised for martens, and in theory should work on Otters. They do not impact birds.

8.3.5 The author previously used these devices to prevent Otter predation on Copeland Bird Observatory (Leonard 2011). While there was no 'scientific study' of effectiveness, the practical effect of deployment was to almost immediately stop predation. The deployment was clearly effective in that instance. The National Trust used such devices on some islands in Strangford Lough in 2022. While again there was no scientific study, no islands with sonic deterrents deployed suffered mammal predation.

8.3.6 Sonic deterrents do require some visits to the colony, so may result in more disturbance, so this must be balanced with the requirement to protect the colony. They must also be employed in a sufficient density that all parts of the shoreline are covered.

8.3.7 The main issue is that the rocky nature of the islands means the sonic deterrents have a poor effective range and would need to be deployed at a very high density to avoid.

8.4 Predator removal - mammals

8.4.1 The Otter is a European Protected Species and has the highest level of protection in Northern Ireland. NIEA will not allow the removal (lethal or otherwise) of an Otter and will not licence that. Prevention and exclusion is needed in this case.

8.4.2 Similarly, the Pine Marten is a protected species. Prevention and exclusion is needed in this case. So far, Pine Marten has not been a proven issue at any site.

8.5 Predator removal and displacement - gulls

8.5.1 Much predation of terns by adult large gulls appears to be by individual specialist gulls, and targeted removal of these individual gulls has a significant impact on predation levels (Guillemette and Brousseau 2001; Scopel & Diamond 2017). Identifying such birds is an intensive job. Surveys over the last two years at Strangford (Leonard 2022, 2023) have shown that just single pairs of Great black-backed Gulls can destroy a colony. Overwhelming pressure from large gull colonies is also an issue.

8.5.2 The large-scale removal of gulls, through destruction of breeding adults, is not an acceptable solution, from a conservation or moral standpoint.

8.5.3 The small-scale destruction of particular individual birds *may* be required. It is not something that is advocated in this report, but it should be considered if required.

8.5.4 In the following assessment of current and potential nesting sites, the approach has been to avoid sites with moderate or abundant large gulls, unless the gulls are on a safe traditional tern breeding site and are at least partially a problem for the use of that island.

8.5.5 Recent work by Sullivan *et al.* suggested that Herring Gulls at a colony, missed with Common Terns, were not impacted by shooting as surviving individuals quickly habituated to avoid the hunting attempts. A combination of trapping adults and repeated nest removal, and overhead lines, caused sufficient disturbance that breeding attempts stopped and gulls relocated from the colony.

8.5.6 A number of techniques have been trialled to deter large gulls from breeding on Coquet Island, Northumberland, which is managed by the RSPB. These were reviewed in Morrison & Allcorn (2006) and the most effective were those incorporating loud bangs (which could not be used in the breeding season because of the disturbance to other species, but were useful pre-breeding when only the large gulls were present), gull distress calls which were moderately effective and could be used at any time of year, and physical human presence.

8.5.7 Laser hazing has recently been trialled as a method of deterring large gulls and other avian predators at a number of tern colonies in the UK and Ireland, including Coquet Island, the Skerries, Rockabill and Hodbarrow and Little Tern colonies at Gronant, the Long Nanny and Chesil. Lasers to disperse birds are sold under the trade names Agrilaser (for crop protection) and Aerolaser (a more powerful and expensive model intended for use at airports). The laser is aimed at the ground and the laser 'dot' moved toward the bird; a process referred to as 'hazing'. These systems are problematic in areas designated for conservation as all species become valid targets but could be used in a limited fashion in the early season when only gulls are present.

8.5.8 RSPB in Belfast (Donnell Black *pers. comms.*) have used handheld lasers to discourage nesting gulls.

8.5.9 The only site under consideration for work where this conflict occurs is on the Dunnyneills, which have a growing colony of large gulls, but which were an important traditional mid-lough breeding site for terns.

8.6 Brown rats

8.6.1 Rats are not thought to be a huge problem at colonies on Strangford, but in 2024 they have been found on Swan Island. There are known to be rats on many of the larger islands close to Whiterock.

8.6.2 It has not been proven that rats are even on many of the nesting islands, other than Dunsy.

8.6.3 For the existing islands, and any island where a new colony is to be founded, or where a raft is to be installed, a survey of rats (using chewsticks) should be carried out.

8.6.4 Should any rats be found on those islands, a control and monitoring plan should be developed, in order to control the rats.

8.6.5 Consideration should be given on a lough-wide strategy to remove rats and develop a biosecurity plan in line with Biosecurity for Life biosecurityforlife.org.uk guidance.

9. Site management and enhancement

9.1 Nest boxes

9.1.1 Wooden nest boxes have been deployed at many colonies, for example Rockabill and the Farne Islands (Babcock & Booth 2020a).

9.1.2 Nest boxes are favoured by Common and Roseate Terns but are generally not used by Arctic Terns

9.1.3 Nest boxes were first used at Roseate Tern colonies in the USA, in the late 1980's (Avery and del Nevo, 1991) before being adopted by Rockabill and then Coquet Island.

9.1.4 The exact design is considered less important than the positioning near Common Terns, the clustering of boxes, lack of disturbance and availability of food. Most boxes are made of plywood or marine ply, which is relatively light but does deteriorate with time in a marine environment. At Blue Circle Island, Larne Lough, Northern Ireland concrete boxes have been used. On Rockabill it was found that chicks tend to leave three-side boxes more quickly than more enclosed boxes (Newton & Glenister, 2008). Roseate Terns nesting in boxes on Rockabill study plots have consistently higher productivity

Figure 50 Tern nest-boxes (source: Brian Burke)

Figure 51 Nest box at Rockabill (source: Brian Burke)

9.2 Nest protection - position

9.2.1 Nests are vulnerable because the tern species involved (Arctic and Common) like to nest close to the high tide line. Indeed, they often nest below the high tide line. The author has observed frequent instances of nesting below the high tide line. In 2022 Common Terns on South Sheelagh in Strangford Lough, which had been washed out by a very high tide, re-laid two metres *below* that high tide level. Nesting failure was guaranteed. The same was observed on several islands in 2023. The author has observed similar behaviour in Arctic Terns on the Copeland Islands.

9.2.2 Frequently these terns will nest on seaweed along the tide edge, nesting on seaweed is favoured, which makes the nests vulnerable. Moving that weed further from the shore may encourage the birds to nest further from the water.

9.3 Nest protection – canes and wires

9.3.1 Sullivan *et al.* suggested the use of overheard lines, though which terns may fly but which gulls avoid, and showed them to be effective as part of a suite of measures to deter gulls.

9.3.2 Canes have been used to reduce large gull predation on the Farne Islands, Northumberland, since 2002 but the effect was not measured until 2018 (Boothby *et al.* 2019). In this one-year replicated study, four areas of the Arctic Tern breeding colony were each divided into three

sections: no canes (control), low-density cane grid (c.2m apart) and high-density cane grid (c.1 m apart).

9.3.3 The 1.5 m canes were inserted at an angle of 70° to the ground and large gull predation attempts were monitored daily during the 3-hour peak predation period. The study found approximately half the number of large gull predation attempts were made in the caned areas compared to the control areas. High-density cane areas saw a greater effect than low-density areas but the difference was not statistically significant. Canes did not reduce the likelihood of a predation attempt succeeding.

9.3.4 There is the possibility of gulls becoming habituated to canes.

9.3.5 Colonies at Port Edgar Marina Raft, Scotland, Dalkey and Coquet have all had canes deployed, but with no firm proof of success. Wardens at Coquet decided to discontinue their use as there was no form evidence they were effective

Figure 51 Port Edgar Marina tern raft canes at the start of the 2019 season (Chris Knowles)

9.4 Chick protection

9.4.1 The protection of chicks is from both predators and the elements. Severe weather events are the most common reason for total colony loss and high levels of breeding failure on open shore nesting species.

9.4.2 The commonest way to provide cover for chicks is to provide ready-made shelters. Other than the wooden nest boxes noted above, these are typically plastic piping or concrete ridge tiles.

These provide sheltered holes in which chicks shelter. The most permanent solution for a small offshore island is the use of roof ridge tiles, which are heavy and not subject to moving.

9.4.3 However, any suitable piece of wood or other material, as long as it is heavy enough, will provide a chick with shelter.

9.4.4 Shelters are of particular importance for rafts, where there is little cover.

9.4.5 Rendell-Read (2018), as part of the EU LIFE+ Nature Little Tern Recovery Project, conducted a review of Little Tern chick shelter use, which varied widely, as did the design of shelters, including boxes, simple A-frames, and pipes.

Figure 52 Triangular roofing tile (source: Roofing Superstore)

9.4.6 On Coquet Island vegetation growth in the breeding areas was limiting open areas available to breeding terns. To create gaps in the vegetation heavy board bases with elevated chick shelters running along the middle, were deployed early in the season while the grass was still short. The design of the vegetation-suppression shelters consisted of a large Formica tray which could be filled with sand or shingle topped with a peak roofed shelter.

9.5 Vegetation management

9.5.1 Natural sites should be a mixture of nesting substrate, low plants and some thick patches of vegetation. This makes them suitable for nests and chicks.

9.5.2 Scrub and larger trees nearby, which can be used as vantage points for predators, must be removed.

9.5.3 These measures will make the site more attractive.

9.6 Seaweed

9.6.1 Arctic and Common Terns like to nest on seaweed. It is therefore important that for any new sites, which may not be directly adjacent to the shore, seaweed is introduced to the site for birds to nest upon.

9.7 Disturbance prevention

9.7.1 Unauthorised landings by kayakers and boat-users in the summer must be prevented.

9.7.2 Utilisation of all legal avenues to prevent such disturbance should be followed.

10. Licences and consents

10.1 ASSI consent

10.1.1 If there are to be any major, permanent changes to sites, to create new colonies, then ASSI consents will be required. ASSI consent may also be required for temporary nesting terraces and for management options such as sound lures or deterrents.

10.2 Marine licence

10.2.1 Marine and Fisheries Division carries out licensing and enforcement functions in Northern Ireland territorial waters, under the Marine and Coastal Access Act 2009 (MCAA) Part 4.

10.2.2 The type of activities that could require a marine licence in Northern Ireland include:

- mooring
- harbours
- marinas
- jetties
- piers
- sea outfalls
- scour protection
- rock armouring
- beach replenishment
- land reclamation
- removal of objects from the seabed

10.2.3 DAERA Marine Division provided provisional comment that it is likely the activities would require consent, though a final decision could not be provided until more information is presented. Some aspects of the project may not be classed as falling within the marine licence If the project was split into smaller parts, that may require multiple applications to be made so is something worth considering in moving forward.

10.2.4 An application may be made here:
https://www.daera-ni.gov.uk/sites/default/files/publications/doe/APPLICATION%20%28FORM%29%20-%20Marine%20Construction%20Works%20in%20the%20Territorial%20Sea%20and%20Controlled%20Waters%20Adjacent%20to%20NI%20-%20LIVE%202021.pdf

10.2.5 In addition to the application form in the link above, you will be required to submit:

- A location map to include a red line outlining the area in which the work will be carried out.

- A Method Statement to include: a description or the works to be carried out; planning drawings to outline scale of the works; and details of the nature and source of the materials to be used in the work.
- A Habitats Regulation Assessment.
- Fee.

10.3 Habitats Regulations Assessment

10.3.1 Where a proposal involves a plan, project or policy with potential to affect an area that contributed to the UK national site network (formally Natura 2000*) sites such as a Special Area of Conservation (SAC) or Special Protection Area (SPA) - the appointed competent authority is legally obliged to carry out a Habitats Regulations Assessment (HRA), taking into account any advice given by DAERA.

10.3.2 SACs and SPAs in the UK no longer form part of the EU's Natura 2000 network. Instead, they contribute to a UK national site network on land and at sea, including both the inshore and offshore marine areas. UK Government Ministers have indicated that the UK's former Natura 2000 sites in the national site network will continue to be the UK's contribution to the Emerald Network.

10.3.3 A Habitats Regulations Assessment is a tool put in place to ensure that a project, plan or policy will not have an adverse effect on the integrity of any SACs and SPAs sites and must be carried out if there is any potential for the designated site to be affected.

10.3.4 A Shadow HRA may be required to be produced by the applicant to support an application and Marine Division have indicated this will be the case for this application, should it be deemed that it falls under their purview.

10.4 Planning permission

10.4.1 Planning permission may be needed for permanent new structures at any new colonies. It is not clear if planning permission would be need for a raft in the open lough. Planning consultants and local council planning officers should be consulted.

10.5 Wildlife licences and surveys, ecological assessment

10.5.1 Ecological surveys may be needed to ensure no other protected species will be impacted by the works.

10.5.2 Wildlife licences may be required, for example to displace gulls, use sound lures, monitor terns, use mammal deterrents.

10.6 Crown Estate

10.6.1 Permission may be required from the Crown Estate for the installation of new mooring points. Some of the seabed in Strangford Lough is privately owned.

11. Assessment of breeding sites (current and potential)

11.1 Overview

11.1.1 This section lists islands and other sites which have been considered as part of this project, for nesting terns. This includes many islands where terns do not currently breed, and which are currently unsuitable, but which represent potential safer nesting sites after management work.

11.1.2 This section does not include *all* islands on Strangford, rather a pre-filtered list of most likely sites. Sites which have been rejected up front include those:

- Considered too close to land (but not all such islands were rejected).
- Tidal and can be reached by foot at low tide. Again, not all such islands have been rejected, but only large islands have been included. Terns *will* nest on such islands.
- Small pladdies or rocks which will have the same problems as some of the current sites, or susceptible in the future.

11.1.3 Photos are provided where available. Site selection and action will be revisited later in the recommendations section.

11.1.4 When talking about breeding seabird species it is not intended to be an exhaustive record of other species present, rather a narrative overview.

11.2 Previous assessments

11.2.1 There have been previous assessments of potential tern sites in Northern Ireland, though none of these have looked at every island within Strangford.

11.2.2 RSPB (2020) produced a spreadsheet of Northern Ireland sites and factors influencing populations, and potential future use by nesting terns. A similar document, in a more summarised form was produced in 2023 (RSPB 2023). That document summarised colony potential a high level (e.g. all of Strangford Lough).

11.2.3 Overall, the conclusions of this report, even though at a finer scale at times, mirror those of those broader assessments.

11.3 Assessment

11.3.1 The assessment here is high-level and the objective is to firmly discount as many sites as possible. But it will hopefully add more detail.

11.3.2 All sites listed are assumed to be *potentially* impacted by:

- Otters.
- Avian predators.

- Weather related events.
- Restrictions due to designations.
- Human disturbance events.

11.3.3 These and other potential issues are discussed. For each island a narrative overview is presented, this is meant to be a brief 'scene setting' overview for the decision reasons, not a detailed examination of seabird populations.

Table 9 List of sites considered

Site	Approximate grid location
Current/recent historical breeding sites	
Black Rock	J 54325 55933
Castle Espie	J 49160 67208
Dunnyneill Islands	J 54755 53848
Dunsy Rock	J 49114 67252
Gabbock Island	J 56068 65608
Greenisland Rock	J 54407 60196
Green Island (Killyleagh)	J 53659 51123
Gull Rock (Boretrees)	J 54157 68290
Jackdaw Island	J 55627 50991
North Boretree Rock	J 54608 68313
North Sheelahs	J 57267 64592
Rat Island	J 52211 49966
Salt Rock (Boretrees)	J 54445 68245
Shones Island	J 52980 49591
South Sheelahs	J 56872 64159
Swan Island	J 59017 49849
The Chandries	J 54700 67444
Sites not known as breeding locations	

Bird Island	J 56910 61683
Boretree Island East	J 54268 68008
Boretree Island West	J 54001 67871
Calf Island	J 53248 63143
Chapel Island	J 55422 67281
Darragh Island	J 53742 60170
Drummond Island	J 55131 60875
Dunsy Island	J 54405 59086
Gores Island	J 51998 49335
Great Minnis's Island	J 55035 60058
Green Island (Whiterock)	J 54719 59669
Inishanier	J 54826 61406
Inisharoan	J 54341 61587
Islandmore	J 54119 58165
Island Taggart	J 53392 54653
Little Minnis's Island	J 55068 60356
Long Island	J 58315 57150
Parton Island	J 54103 60571
Pawle Island	J 54517 57583
Quoile River	J 50390 49026
Roe Island	J 54181 61043
Round Island	J 57697 56574
Salt Island	J 53064 50212
South Island (Greyabbey)	J 56793 66748
Trasnagh Island	J 53736 61972

11.4 Black Rock

Table 10 Black Rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	All three species have attempted to nest. Site has been, relatively, one of the more successful islands.
Other breeding seabirds	Yes	Small gulls with a few Herring Gulls. Single pair of Great black-backed gulls breed in some years
Site-specific issues	Yes	Low-lying, susceptible to high tides. Was over-washed in June 2023. Seaweed deposited in the centre of the islands. Loss of many eggs and chicks in 2024. Possible rats can reach the island from Pawle Island.
Viability of short-term remedial options	Yes	Suitable for the deployment of temporary terraces to increase the height of some of the breeding areas and protect nests.
Long-term options	No	Island will be lost, it is already becoming unsuitable due to high summer tides.

Figure 53 Black Rock

11.5 Castle Espie

Table 11 Castle Espie assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Small number of Common Terns in most years.
Other breeding seabirds	Yes	A large colony of Black-headed gulls has been present in recent years.
Site-specific issues	Yes	Mammalian predation. Some of the islands are inside a predator-proof fence, others are outside. Potential human disturbance from high visitor foot-fall.
Viability of short-term remedial options	N/A	
Long-term options	Yes	Castle Espie has good potential. There is a large shingle bank where many of the gulls breed, which is very suitable for terns. The site is reminiscent of sites like Minsmere. There is no good reason why Common and Sandwich Terns could not breed on the ridge. WWT already own some small tern rafts and these could be augmented. Ideally nesting will be within the predator proof fencing.

Figure 54 Castle Espie

11.6 Dunnyneill Islands

Table 12 Dunnyneill assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Common and Arctic Terns have used the site, though not in 2022/23.
Other breeding seabirds		
Site-specific issues	Yes	A growing colony of large gulls is present across the eastern island.
Viability of short-term remedial options	Yes	Short-term the centre of this island is high enough that it will survive tidal weather events. Some removal of vegetation needed. Discouragement of the small colony of large gulls needed. Temporary terracing
Long-term options	Possible	Long-term the island will suffer inundation from rising sea-levels and weather events. The island is, however, larger and higher than most others in the lough. This is a site where short-medium term management will assist populations in that time frame, additional long-term work can be revisited at a later date.

11.7 Dunsy Rock

Table 13 Dunsy rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Common and Arctic Terns nest on the island.
Other breeding seabirds	Yes	Usually a handful of black-headed gulls, herring gulls and a pair of great black-backed gulls.
Site-specific issues	Yes	Large gulls have been shown to predate tern nests. The two islets are joined by an ithmus, which is often inundated or over-washed.
Viability of short-term remedial options	No	The shape and composition of the islets make them difficult to protect. The northern islet seems to be much preferred, but it would not be possible to deploy anything but a very small terrace without damaging the shingle island. It is pointless to try and protect the ithmus. The island has annual evidence of gull predation.
Long-term options	No	Long-term the island will suffer inundation from rising sea-levels and weather events, which will make it unusable, or if used will result in nest losses.

Figure 55 Dunsy Rock

11.8 Gabbock Island

Table 14 Gabbock Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Common and Arctic Terns have used the site, though not in 2022/23.
Other breeding seabirds	Yes	A growing colony of herring and lesser black-backed gulls are making the island less suitable.
Site-specific issues	Yes	Gulls as above. One of the higher small islands but inundation around the edges will result in loss.
Viability of short-term remedial options	No	The centre of this island will be suitable in the short-term without any remedial actions, but the increasing population of gulls makes it much less suitable. It is recommended that no short-term remedial actions are taken.
Long-term options	No	Long-term the island will suffer inundation from rising sea-levels and weather events, which will make it unusable, or if used will result in nest losses. The gull population seems likely to grow. Also, access can be problematical low tides. There are better nearby options for short and long-term protection. The island may still be used by terns for years to come but is not easily defensible.

11.9 Greenisland Rock

Table 15 Greenislandrock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Common and Arctic Terns (mostly Common).
Other breeding seabirds	Yes	Black-headed gull
Site-specific issues	Yes	
Viability of short-term remedial options	Yes	This site has been consistently used by terns in 2022/23 but was probably completely inundated. It is reasonably flat and would thus be suitable for temporary terracing. The site will be one of the first to become completely unsuitable. Close to the largest Great black-backed Gull colony, though that does not seem to be an issue with this site in recent years.
Long-term options	No	The island is one of the lowest of those used by terns, high spring tides inundate the island edges, moderate tides with poor weather over-wash the islands. Long-term the island will be lost.

Figure 56 Greenislandrock

11.10 Gull Rock (Boretrees)

Table 16 Gull Rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Mainly Common Terns, small numbers of Sandwich Tern.
Other breeding seabirds	Yes	Black-headed gulls, small numbers of herring gulls.
Site-specific issues	Yes	Very low-lying island
Viability of short-term remedial options	No	The island is very susceptible to high tides, though it is protected from high southerly winds by other islands and a long shingle bank. Close to North Boretree which is higher and more easily defensible. Gull rock is also very rocky, with a lot of small and medium sized rocks/boulders. It would likely be difficult to put in temporary terracing without
Long-term options	No	The island is one of the lowest of those used by terns, high Spring tides inundate the island, moderate tides with poor weather over-wash the islands. Long-term the island will be lost.

Figure 57 Gull Rock

11.11 Jackdaw Island

Table 17 Jackdaw Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Predominantly Sandwich Terns, though none in 2023. This is a traditional nesting site with a long history of use.
Other breeding seabirds	Yes	Large colony of gulls, of all sizes.
Site-specific issues	Yes	Very close to the mainland and susceptible to mammalian predation
Viability of short-term remedial options	No	The island is likely to be available for terns much longer than many of the other current breeding islands. Management should be to monitor and protect from mammalian predators.
Long-term options	Possible	The lower parts of the island will certainly be inundated. In the very long-term only the hill and surrounds will be viable. The area for nesting will be much reduced but it is likely the island will remain viable as the shingle bank shoreline retreats. For now manage and protect, revisit in future years as required.

Figure 57 Jackdaw Island

11.12 North Boretree Rock

Table 18 North Boretree Rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Mainly Sandwich Terns, small number of Common Terns.
Other breeding seabirds	Yes	Black-headed gulls.
Site-specific issues	Yes	Has been shown to be vulnerable to great black-backed gull predation and disturbance.
Viability of short-term remedial options	Yes	Marginally higher than other nearby islands. It is the most easily accessible and defensible island in the Boretrees. Suitable for the deployment of temporary terraces to increase the height of some of the breeding areas and protect nest. Some issues with repeated Great black-backed Gull disturbance, but the island is currently favoured by Sandwich Terns. Other anti-predation measures to be deployed.
Long-term options	No	While this island may allow birds to nest for longer than at other sites it will become another ecological trap, allowing birds to start nesting, but failing due to weather related flooding. Long-term it will be lost.

Figure 58 North Boretree

11.13 North Sheelahs

Table 19 North Sheelahs assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Arctic Terns present in small numbers.
Other breeding seabirds	Yes	Small number of herring gulls.
Site-specific issues	Yes	Gulls and inundation.
Viability of short-term remedial options	No	The island is a long shingle strip, with only a thin line of shingle remaining at high tide. Very likely covered during spring tides, and probably over-washed in moderate southerly winds. Was near certainly completely over-washed several times in June 2024, resulting in loss of eggs and chicks. It is currently, in 2024, barely a viable nesting site.
Long-term options	No	The island will be inundated.

Figure 59 North Sheelahs

11.14 Rat Island

Table 20 Rat Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	None confirmed in 2022/23, only used occasionally.
Other breeding seabirds	No	
Site-specific issues	Yes	This island may have had one or two Common Tern pairs in 2023, but was not landed upon due to the presence of Harbour Seals. The island seems to be a favoured haul-out for that species. The island is reasonably low and flat-topped, though higher than many of the main breeding sites such as Greenislandrock. Close to the shoreline and potential access by mammalian predators.
Viability of short-term remedial options	No	The island has not been shown to be a preferred nesting site. In the short term the island is safe from sea-level rise and is one of the most sheltered areas of the lough, so birds can use the island with no intervention. The regular presence of seals makes visiting problematic. The island is privately owned.
Long-term options	No	Long-term the island will be lost.

11.15 Salt Rock (Boretrees)

Table 21 Salt Rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Arctic Terns only.
Other breeding seabirds	Yes	Small number of herring gulls. The nearby Boretree Islands have larger numbers of herring and great black-backed gulls.
Site-specific issues	Yes	Salt Rock (which is really a shingle bank) is the favoured loafing area of large gulls from the nearby colonies. The site is very susceptible to inundation and being over-washed by waves in strong winds.
Viability of short-term remedial options	No	This site is little more than a shingle bank, susceptible to being over-washed by waves, which happened in 2023. It is not a viable site in the medium-term.
Long-term options	No	Long-term the island will be inundated.

Figure 60 Salt Rock

11.16 Shones Island

Table 22 Shones Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	Mainly Common Terns and some Arctic Terns in 2023.
Other breeding seabirds	Yes	Common Gulls
Site-specific issues	Yes	There is a possible Otter holt on the island. The island can probably be walked to at low tide. The island is a small grassy centre with a lot of shingle around the edge.
Viability of short-term remedial options	No	This site suffered a heavy predation event in 2023, likely by an otter (though Fox and other predators cannot be discounted). It is close to the mainland. There are holes on the island which now seem to be an Otter holt. While in the medium term it may remain a viable site, the effort would be better spent maintaining other, safer sites.
Long-term options	No	Long-term the island will be inundated.

Figure 61 The Shones

11.17 South Sheelahs

Table 23 South Sheelahs assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	
Other breeding seabirds	Yes	Herring gulls, common gulls. Up to 60 adult herring gulls were resting on the island in 2023.
Site-specific issues	Yes	Population of Herring Gulls. Flooding and weather events are an issue for this low island
Viability of short-term remedial options	Yes	In 2024 a large number of nests were lost due to very high tide. At the highest tides the island is barely 10m and less than that wide, just above sea-level. Protection of the island using terracing could protect the colony in the short-term. The site is worth some short-term effort to protect it.
Long-term options	No	Long-term the island will be lost.

Figure 62 South Sheelahs

11.18 Swan Island

Table 24 Swan Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	Yes	All three species nest on the island. The most likely spot for any returning Roseate Terns. Traditional nesting site.
Other breeding seabirds	Yes	Black-headed and common gulls.
Site-specific issues	Yes	Site was predated by Otter in 2023. Close to human settlement. Sea-level rise and loss of part of the island. Rats have been found in 2024.
Viability of short-term remedial options	Yes	High tides already make the lower parts of the island unsuitable, with some nests on grass just above the waterline. Over the medium-term only the higher parts of the island will be viable. Some level of vegetation control is needed and terracing to build up the top of the island.
Long-term options	Yes	One of the few current breeding islands which will still be functionally useful as a tern colony. The 'temporary' measures considered above should be considered permanent. Should it be possible to negotiate, permanent terracing could be introduced. The top of the island can be 'recharged' with new nesting shingle. Management to maintain and enhance the site.

Figure 63 Swan Island

11.19 Bird Island

Table 25 Bird Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Large colony of cormorants.
Site-specific issues	Yes	There is a large colony of Cormorants on the island which are sensitive to disturbance. Long-term reduction and loss to sea-level changes. Privately owned.
Options for tern recovery	No	Excluded from further consideration.

11.20 Boretree Island East

Table 26 Boretree Island East assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	A population of Herring and Lesser black-backed gulls on the island.
Site-specific issues	Yes	A population of Herring and Lesser black-backed gulls on the island. Long-term reduction and loss to sea-level changes.
Options for tern recovery	No	Excluded from further consideration.

11.21 Boretree Island West

Table 27 Boretree Island West assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	A population of Herring, Lesser black-backed and Great black-backed gulls on the island.
Site-specific issues	Yes	A population of Herring, Lesser black-backed and Great black-backed gulls on the island. Long-term reduction and loss to sea-level changes.
Options for tern recovery	No	Excluded from further consideration.

11.22 Calf Island

Table 28 Calf Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Two pairs of Common Gull in 2023.
Site-specific issues	Yes	Long-term reduction and loss to sea-level changes. Close to the land. Privately owned.
Options for tern recovery	No	Long-term this small island will be rendered unsuitable. Excluded from further consideration.

11.23 Chapel Island

Table 29 Black Rock assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Connected to the mainland at low tide.
Options for tern recovery	Yes	Long-term this large island will lose some lower areas but the higher centre will remain. While connected to the mainland, all new colonies must be surrounded by predator-proof fencing. Owned by National Trust. Potential recovery site for a new colony.

11.24 Darragh Island

Table 30 Darragh Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Adjacent island can be accessed via shallow water at low tide, and that island is really part of the mainland. Badgers are present.
Options for tern recovery	Yes	Long-term this large island will lose some lower areas but the higher centre will remain. Sheltered from strong winds. Potential recovery site for a raft.

11.25 Drummond Island

Table 31 Drummond Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Herring and Lesser black-backed gulls.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe.

		Large gull population on this and adjacent islands. Rats present on the Whiterock group of islands.
Options for tern recovery	No	Large gull population on this and adjacent islands is the main issue. Excluded from future consideration.

11.26 Dunsy Island

Table 32 Dunsy Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Rats present on the Whiterock group of islands. Foxes likely present.
Options for tern recovery	No	Excluded from future consideration.

11.27 Gores Island

Table 33 Gores Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned and heavily farmed. Close to the mainland and potential predators, can be accessed via causeway at low tide. Foxes likely present.
Options for tern recovery	No	Excluded from future consideration.

11.28 Great Minnis's Island

Table 34 Great Minnis's Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Main Great black-backed gull colony, other large gulls present.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Large Great black-backed Gull colony. Rats present on the Whiterock group of islands.
Options for tern recovery	No	Excluded from future consideration.

11.29 Green Island (Killyleagh)

Table 35 Green Island (Killyleagh) assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	Owned by the National Trust.
Other breeding seabirds	Yes	Largest Herring Gull colony on the lough.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Large gull colony.
Options for tern recovery	No	Excluded from future consideration.

11.30 Green Island (Whiterock)

Table 36 Green Island (Whiterock) assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Large gull colonies on the islands to the north.

		Rats present on the Whiterock group of islands.
Options for tern recovery	No	Large gull colonies to the north. Although Dunsy Rock and Greenislandrock are nearby, no new colonies should be created so close to the main Great black-backed gull colony. Excluded from future consideration.

11.31 Inishanier

Table 37 Inishanier assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Small number of large gulls nesting.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Rats present on the Whiterock group of islands. Some gulls nesting but the surrounding islands represent quite a high concentration of gulls.
Options for tern recovery	No	Excluded from future consideration.

11.32 Inisharoan

Table 38 Inisharoan assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	Owned by the National Trust.
Other breeding seabirds	Yes	Small number of large gulls nesting.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Rats present on the Whiterock group of islands. Some gulls nesting but the surrounding islands represent quite a high concentration of gulls.
Options for tern recovery	No	Excluded from future consideration.

11.33 Islandmore

Table 39 Islandmore assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Rats present on the Whiterock group of islands. Foxes present. A large part of the island has been with trees, does not represent a safe surrounding habitat for a tern colony. The remainder is farmed.
Options for tern recovery	No	Excluded from future consideration.

11.34 Island Taggart

Table 40 island Taggart assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Some high hedges and scrub. Owned by the National Trust
Options for tern recovery	Yes	Large island with no big gull colonies. Owned by the National Trust. May require some hedgerow reduction. Large fields which would allow new terraces. Potential recovery site for a new colony.

11.35 Little Minnis's

Table 41 Little Minnis's Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	

Other breeding seabirds	Yes	Small number of Herring Gulls.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Small number of Herring Gulls but the surrounding islands represent quite a high concentration of gulls.
Options for tern recovery	No	Excluded from future consideration.

11.36 Long Island

Table 42 Long Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. A large population of Herrings Gulls on nearby Round Island. Privately owned.
Options for tern recovery	No	Excluded from future consideration.

11.37 Parton Island

Table 43 Parton Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	Close to Black rock.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Rats present on the Whiterock group of islands. Privately owned.
Options for tern recovery	No	Close to Darragh island. Islands to the east and north have large gulls, rats present. Excluded from future consideration.

11.38 Pawle Island

Table 44 Pawle Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned.
Options for tern recovery	No	Large open island. Close to the colonies at Dunsy Rock and Black rock. No large gulls.

11.39 Round Island

Table 45 Round Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	Yes	Only a handful of Herring Gulls, large colony of Common Gulls.
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. A large population of Herrings Gulls.
Options for tern recovery	No	Excluded from future consideration.

11.40 Salt Island

Table 46 Round Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Near to Green Island which has a large Herring Gull population – but no gulls on Salt. The site is owned by the National Trust, but there is a bothy on the island where people can stay. The disturbance from this and land management

		may be the reason why there are no large gulls. In theory, people would disturb terns. But, if a tern colony was established and visitors excluded from a buffer area, there is no real reason why terns would not stay. The Farne Islands shows that birds will habituate to humans.
Options for tern recovery	Yes	Salt Island would be a good site, no gulls, relatively easy to reach, easy to erect protective predator fencing, sheltered from the weather. A potential recovery site for a new colony and/or a raft.

11.41 South Island (Greyabbey)

Table 47 South Island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Connected to the mainland by a causeway.
Options for tern recovery	Yes	There are no nearby large gull colonies. Any new colony will be protected by full predator fencing. Human disturbance from Greyabbey is a possibility (this is an area known for kite-surfers). On balance the site is little different than Chapel Island. In the northern part of the lough where there are limited potential sites. While not perfect it is a potential recovery site to explore further.

11.42 Trasnagh Island

Table 48 Trasnagh island assessment

Site	Yes/no	Notes
Breeding Terns (since 2019)	No	
Other breeding seabirds	No	
Site-specific issues	Yes	Long-term reduction and loss of some areas to sea-level changes, but higher areas will be safe. Privately owned. Looks managed and grazed, with structures for livestock. Large gull colonies on the islands to the south-east. Rats likely present.
Options for tern recovery	No	Excluded from further consideration.

12. Recommendations – the plan

12.1 Overview

12.1.1 This section takes the information previously reviewed to form the outline elements of a plan to conserve and enhance the tern breeding population in Strangford.

12.1.2 The recommendation detailed here are to meet the aims and objectives outlined previously.

12.1.3 A number of factors have been taken into account when assessing the options listed above for further consideration, including:

- Short-term options.
- Evidence base of best practice.
- Marine safety and yacht clubs.
- Potential for public concern or opposition.
- Possible planning requirement (and time/costs associated with that).
- Licensing requirements.
- Impact of implementation of a designated site.
- Impact of non-implementation of any option on a designated site.
- Time to implement.

12.1.4 This section identifies areas where works are to be undertaken, as specifically as possible. This is a broad study, and there are scores of islands on Strangford, so whether any particular island outside ownership could be used will only be determined after detailed discussion s with specific landowners directly by the National Trust. The study has narrowed it down to a number of choices. The intent is not that *all* potential new sites or rafts are implemented, but that a significant proportion of the sites suggested would need to be implemented to achieve a positive long-term impact.

12.1.5 Actions to implement the conservation methods, across all proposed sites, are also detailed.

12.1.6 This plan should take into account the report for tern nesting sites on the Outer Ards coastline, prepared by the author (Leonard 2024).

12.2 Management ethos and the 'Do Nothing' scenario

12.2.1 The aim of these recommendations is to transform the management of nesting terns within Strangford Lough from largely *passive* management management to *active* management.

12.2.2 Passive management has been the monitoring of tern colonies, often to annual disaster, with some limited interventions against predators on some islands, as resources allow. The long-term 'Do Nothing' outlook for the lough, passive management, with rising sea-levels, is the loss of most

nesting islands. Birds will use deteriorating islands, where laying is possible, but eggs and young are lost to flood waters, leading birds into an ecological trap. Ever decreasing numbers of breeding birds are then more susceptible to one-off events such as Otter or Gull predation. This will result in the long-term decline of nesting terns and eventual extinction on the lough.

12.2.3 Active management is interventionist. Existing colonies are actively protected from rising sea-levels, in the short-term. Other existing colonies are managed as best as possible, for habitat and predators. New man-made colonies are established, both on islands and rafts. Birds are artificially encouraged to move to the existing and new sites which offer the best chance for protection. Concentration of larger numbers of birds is beneficial for nesting terns, for natural site protection from avian predators. While much is outside the influence of the local conservationist (e.g. food supply), and predation and poor weather will always impact nesting birds, an active management approach gives terns the best chance to succeed. An active management mindset is required.

12.2.4 A do-nothing approach will ensure that the objectives of the Seabird Conservation Strategy and Action Plan for Northern Ireland are not met, and it is highly likely the condition of the Special Protection Areas will deteriorate.

12.3 Project management

12.3.1 The work outlined here are comprehensive and involve a considerable effort in co-ordination for site identification, sourcing and delivery of materials, site design, funding, monitoring, co-ordination. The delivery of these items is a full-time job, at least in the short-term. The view has been taken that this project is a deliverable unit, which should be delivered as a whole.

12.3.2 When considering this, the position would also cover the Outer Ards islands.

12.3.3 National Trust to establish a tern recovery project co-ordinator to manage the implementation of the project.

12.3.4 A Working group should be established incorporating all groups involved with the project. This working group should also cover the sites on the Outer Ards. This should largely be a *practical* working group for those dealing with practical issues of site protection and management. It will support the work of the project co-ordinator.

12.4 Breeding colonies – overview

12.4.1 Several different levels of work, over different timescales. The assessment identified:

- Existing sites which are considered not to be worth additional resources at this time.
- Existing breeding islands to maintain in the short-term, so that terns remain breeding in the lough. Those measures planned to be short-term.

- Islands to maintain in the medium-term. These are islands which are slightly higher and will be more resilient, in the short-term, to sea-level rises. Short-term enhancements and management. Longer-term an assessment can be made whether to retreat or carry out further remedial management.

- Long-term mainland sites currently used (i.e. Castle Espie).

- Potential sites for new, sea-worthy, rafts.

- Potential islands which could host new land-based colonies.

12.4.2 Island satellite shots from xxx under licence https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/.

12.5 Existing sites – no actions

12.5.1 The following known breeding sites are, long-term, considered 'lost' at this time. This does not mean that terns will not nest on these islands in the short and medium term, but it is assessed that at this time it is not worth carrying out any remedial works.

Table 49 Existing breeding sites discounted for further effort

Site	Reason for exclusion
Gabbock Island	Large gull colony. Long term loss.
Green Island (Killyleagh)	Largest Herring Gull colony on the lough.
Gull Rock (Boretrees)	Inundation and weather-related events in the short-term. Long-term loss. North Boretree is nearby and a slightly higher island, and will be protected.
North Sheelahs	Borderline unusable at this time. medium-term loss.
Rat Island	Occasionally used site. Harbour Seals commonly present making work difficult. Long-term loss.
Salt Rock (Boretrees)	Inundation and weather-related events in the short-term. Long-term loss.

	North Boretree is nearby and a slightly higher island, and will be protected.
Shones Island	Occasionally used site. Can be walked to at low tide. Probable Otter holt now on the island.
The Chandries	Inundation and weather-related events in the short-term. Long-term loss. North Boretree is nearby and a slightly higher island, and will be protected.

12.6 Existing sites – short-term

12.6.1 Actions will be taken to maintain the following existing sites short-term (approximately five years) while the other actions are being implemented. It is up to the National Trust how many of these sites are protected. The actions taken are all *temporary* and can be removed, though there is the possibility that some sites could be maintained, but the aim of the National Trust is not to have any permanent structures on islands which will be lost to sea-level rise.

Table 50 Existing sites – short-term effort

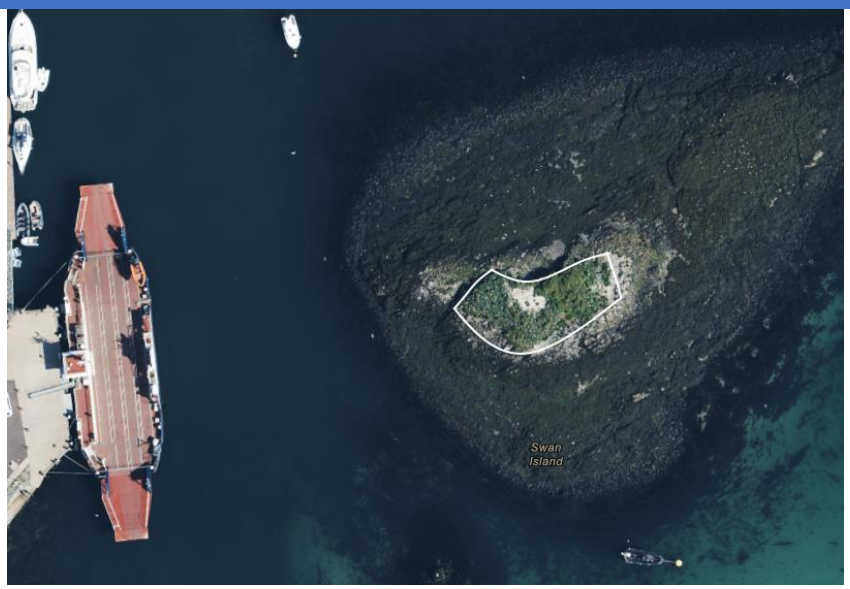
Site	Redmedial action	Island
North Boretree	Small temporary rock basket terraces to improve nesting substrate and lift some nesting areas above high tides/waves. Protect the temporary terraces with angled canes to prevent gull predation. Figure 64 North Boretree	

South Sheelahs	Small temporary rock basket terraces to improve nesting substrate and lift some nesting areas above high tides/waves. Protect the temporary terraces with angled canes to prevent gull predation. Figure 65 South Sheelahs	
Greenislandrock	Small temporary rock basket terraces to improve nesting substrate and lift some nesting areas above high tides/waves. Protect the temporary terraces with angled canes to prevent gull predation. Figure 66 Greenislandrock	

Dunsy Rock	Small temporary rock basket terraces to improve nesting substrate and lift some nesting areas above high tides/waves. Protect the temporary terraces with angled canes to prevent gull predation. Figure 67 Dunsy Rock	
Black rock	Small temporary rock basket terraces to improve nesting substrate and lift some nesting areas above high tides/waves. Protect the temporary terraces with angled canes to prevent gull predation. Figure 68 Black rock	

12.7 Existing sites – mid-term

Table 51 Existing sites – mid-term effort

Site	Redmedial action	
Swan Island	Minor vegetation management to clear the top of the island and provide more nesting habitat. Much of the island is very thick grass which has reduced suitability. Temporary rock basket terraces on top of the island, in some places, to provide new shingle but some it washing off. Deploy chick shelters. Consider electric fencing for Otters. Consider rat removal plan. Figure 69 Swan Island	

Jackdaw Island	Maintain the site as it is at present. Note the potential for a nearby raft detailed below. Figure 70 Jackdaw Island	
Dunnyneills	Dunnyneill East has traditionally been used by terns which have become displaced by vegetation and a small colony of large gulls. Clearance of vegetation from the island Discouragement and removal of nesting gulls to make the island gull-free. Use of electric fencing to protect against otters. Temporary rock basket terraces on top of the island, in some places, to provide new shingle but some it washing off. Deployment of	

	decoys and sound lure to encourage birds to use this island and remain on the island. Figure 71 Dunnyneills	

12.8 Existing sites – mainland (long-term)

Table 52 Existing sites – mainland

Site	Redmedial action	
Castle Espie	At least one new, larger raft and a smaller raft. Deployment of decoys and sound lure to encourage birds to use the raft and the gravel ridge. Figure 72 Castle Espie	

Figure 73 Existing sites to be maintained (short and long term)

12.9 Tern rafts

12.9.1 The following are *potential* sites for new rafts. They have been identified as being sheltered and having water at very low tide and being outside the main access routes for yacht clubs. Sites near National Trust islands have been preferred.

- All new raft sites will be deployed with decoys, sound lure, nest boxes and chick shelters.
- All rafts must be fully predator proof from water-based predators.
- Consider the use of canes to protect against aerial predation, at all raft sites.

Raft selection and site selection proceed

12.9.2 The raft design for Strangford Lough must be robust and seaworthy. The identification of safe deployment sites is paramount. Experience in deploying rafts in open areas is required.

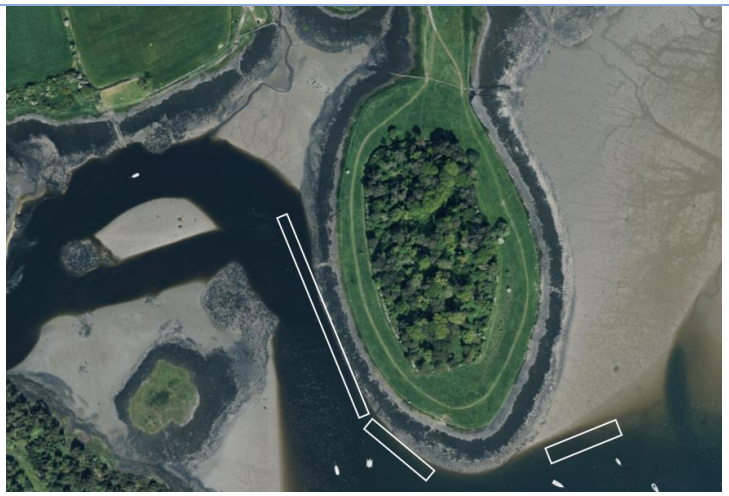
12.9.3 There are relatively few rafts deployed in tidal areas. The most seaworthy rafts appear to be those from Aquatic Engineering. Aquatic Engineering also have the advantage of being an engineering firm.

12.9.4 It is recommended that the National Trust contract Aquatic Engineering to carry out site visits and assess the potential sites listed here, for their suitability for rafts, in order to draw up a short-list of initial deployment sites and using their experience to identify any issues.

Table 53 Potential raft sites

Site	Notes	
Darragh Island	Close inshore at north-west corner of the island. Figure 73 Darragh Island	

Island Taggart	Close inshore at north-west corner of the island. The area is fully tidal up to the north end of the island. Figure 74 Island Taggart	
Ringdufferin	Opposite the end of Island Taggart. Seabed may be privately owned. Figure 75 Ringdufferin	

Jackdaw Island area	There are small bays at Jackdaw Island e.g. to the east of Jackdaw is sheltered deep water where small yachts sometimes anchor. Figure 76 Jackdaw Island	
Gibb's Island	Highly tidal but sheltered. There is likely room at the southern end for a raft. Figure 77 Gibb's Island	
Salt Island	Highly tidal but sheltered. There is likely room at the western end for a raft. Figure 78 Salt Island	

Delamount	Highly tidal but sheltered. There is likely room on the shore side at Delamount for a raft. Figure 79 Delamount	
Quoile	Non-tidal site, though subject to flooding so needs to be robust. Calm, relatively sheltered. 1-2 rafts possible. Figure 80 Quoile	
Castle Espie	WWT possess some small Filcris rafts. New larger raft (s) to be deployed to complement those rafts. Ideally in predator-proof area. Figure 81 Castle Espie	

Figure 82 Potential raft sites

12.10 Potential sites for new colonies (natural sites)

12.10.1 The following have been identified as *potential* sites for land-based colonies.

- Avoided areas with moderate or greater numbers of large gulls, on the island or nearby islands.

- Sites *known* to have rats have been avoided though for most islands in the lough, whether connected to the mainland or not, they will always be a potential issue.
- The assessment is not concerned with mammalian predators as all would be fenced.
- One - two sites identified for such a permanent colony.
- Rafts not deployed at same site.

12.10.2 Northern areas in particular are not suitable for rafts due to the open aspect of the area.

- All new raft sites will be deployed with decoys, sound lure, nest boxes and chick shelters.
- All rafts must be fully predator proof from water-based predators.

Table 54 Potential new colonies

Site	Notes	
Chapel	Long-term the lower part of the island will be lost so a new colony would need to be on the upper part of the islands. New permanent 'Rockabill/Coquet' style terrace, fully predator proofed. There are no suitable sites in the northern part of the lough and a permanent new colony is likely the only option. Island can be accessed at low tide which would assist site development. Rat control would likely be required. Figure 83 Chapel Island	

South Island	Long-term the lower part of the island will be lost so a new colony would need to be on the upper part of the islands. New permanent 'Rockabill/Coquet' style terrace, fully predator proofed. There are no suitable sites in the northern part of the lough and a permanent new colony is likely the only option. Island can be accessed at low tide which would assist site development. Rat control would likely be required. Figure 84 South Island	
Pawle	Pawle is a relatively open island with no large gulls, a new small colony of Common Gulls, and a lot for room for a new colony. New permanent 'Rockabill/Coquet' style terrace, fully predator proofed. Rat control would likely be required. Figure 85 Pawle Island	

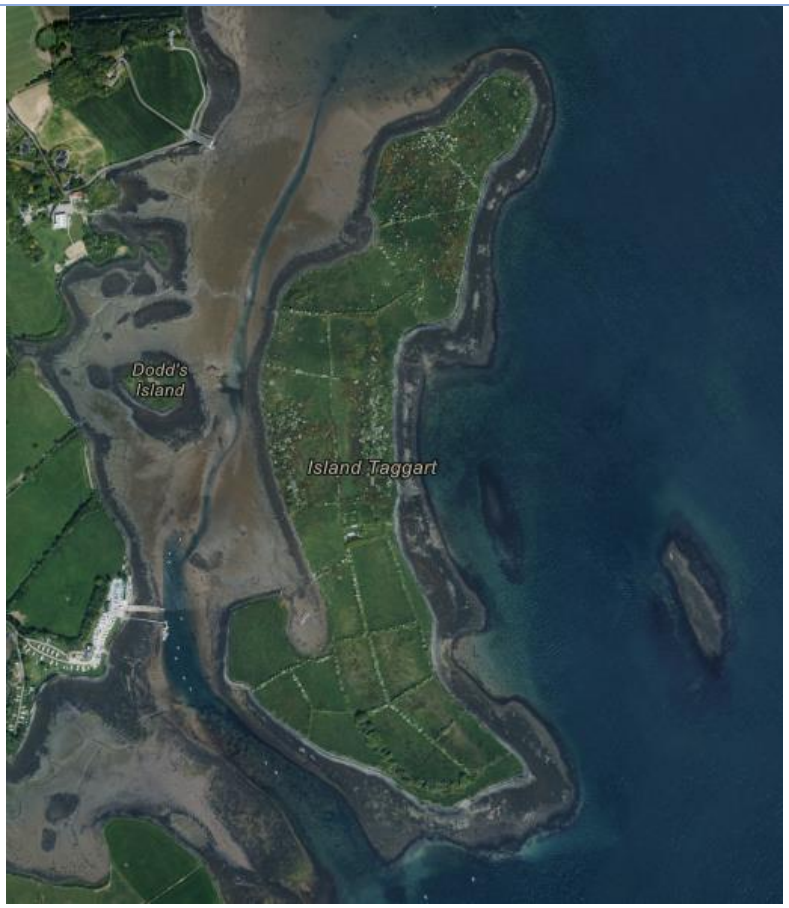
Island Taggart	Island Taggart is a relatively open island, large. New permanent 'Rockabill/Coquet' style terrace, fully predator proofed. Rat control would likely be required. Foxes present. Figure 86 Island Taggart	
Salt Island	As an alternative to a raft a new colony could be created on the island. New permanent 'Rockabill/Coquet' style terrace, fully predator proofed. Rat control would likely be required. Easily accessed. Figure 87 Salt Island	

Figure 88 Potential sites for new colonies

12.11 Specific actions for new colonies

12.11.1 Identify islands, based on the short-list in this report, to take forward as new colonies.

12.12 Specific actions for rafts

12.12.1 Engage Aquatic Engineering for a site visit to assess the sites listed in this report for installation of rafts.

12.12.2 Engage Aquatic Engineering (or another provider of suitable rafts).

12.13 Specific actions for tern terraces

12.13.1 Develop a finalised design for temporary tern terraces. Deploy the terraces as detailed in this report.

12.13.2 Develop a finalised design for permanent tern terraces at new colonies.

12.14 Actions for decoys

12.14.1 Decoys may be obtained from Mad River Decoys https://seabirdinstitute.audubon.org/decoys/mad-river-decoys-audubon and Restoration Decoys https://www.restorationdecoys.com/ but are expensive.

12.14.2 Recently RSPB Scotland and the University of the Highlands and Islands (UHI) collaborated to produce 3D printed Arctic Tern decoys https://www.nature.scot/3d-printed-birds-welcome-migrating-terns-scottish-breeding-sites.

- Contact University of the Highlands and Islands (UHI) to see if they would be open to collaboration or providing the 3D model for the terns.
- Alternatively explore a similar option with either a local institute, or a professional 3D modeller.
- If these options fail, purchase from the two firms above

12.14.3 Using these decoys, or producing similar, is probably the cheapest way forward. There is scope for similar local collaboration.

12.15 Actions for sound lures

12.15.1 Review the results of the Copeland Bird Observatory use of a modified bird scarer in 2024. Depending on the results further develop the relationship with that manufacturer, or work with RSPB and a local electrician to develop a robust weatherproof system.

12.16 Actions for nest boxes and chick shelters

12.16.1 National Trust to identify sources of nesting boxes (these are easy to construct by National Trust volunteers).

12.16.2 National Trust to identify sources of chick shelters (local builder's yards are easiest).

12.17 Gull displacement at the Dunnyneills

12.17.1 The proposed approach is one of 'disturbance and displacement'. Under licence eggs will be removed from gull nests at regular intervals during April/May/June, in order to bring the breeding success to zero. Repeated actions, year-on-year will gradually reduce the number of adult gulls using the island. More rapidly, adult gulls will move to a better nesting site.

12.17.2 Ongoing discouragement will be required. A similar approach may be required on a small scale under licence at other colonies.

12.17.3 For the Dunnyneills the National Trust should consider:

- Agricultural lasers (manual).
- Gas guns or similar less loud sound deterrents, taking into account the potential to cause issues for seals.

12.17.4 These deterrents to be deployed late February to mid-April only, to deter gulls.

12.18 Action on site disturbance

12.18.1 The Protected Area Conservation Management Plan for National Trust properties within Strangford Lough European Designated Sites 2020-2025 (Allen & Mellon 2020) states that:

"All unauthorised landings during the breeding season must be prevented. This will involve liaison with user groups, including boat and sailboard users, canoeists (see link for current advice[2] which is not totally comprehensive and includes at least one "safe to land" site which supports terns – Green Is Quoile), Councils, etc. No-go areas should be clearly marked on all material such as tourist and user group maps."

12.18.2 Actions should be taken, or continued, to meet the requirements of the management plan.

- Liaison with stake-holders particularly local yacht clubs and councils.
- Warning signage.
- Interpretative signage.
- Raising awareness in print (e.g. council newsletter and local Spectator newspaper).
- Enforcement by council and PSNI (e.g. PSNI boat based patrols).
- Engagement events.

12.19 Monitoring

12.19.1 The National Trust to continue with the annual monitoring of tern numbers.

12.19.2 The National Trust to continue with the annual monitoring of tern productivity.

12.19.3 The National Trust to record the impact of management measures on tern distribution, numbers and breeding success.

12.19.4 Trail cameras will be deployed to monitor the breeding birds and the measures undertaken.

Table 55 Potential future consultees

Consultee	Organisation	Expertise
Andrew Upton	British Trust for Ornithology [redacted]	Former National Trust manager responsible for Strangford
Ards & North Down Borough Council	Ards & North Down Borough Council https://ardsandnorthdown.gov.uk/	Permissions, support, funding
Clive Mellon	Allen & Mellon Ltd clive@allenmellon.com	Prepared Strangford management plan
Donnell Black Monika Wojcieszek	RSPB [redacted]	Term conservation and site management
East Down Yacht Club	https://edyc.co.uk/contact/	Recreational use of the lough
Fraser McConnell	[redacted]	Crown Estate representative.
Glyn Onione	Aquatic Engineering [redacted]	Raft specialist
Hugh Thurgate	National Trust	Strangford Lough site warden
Isabel Hood	Quoile Yacht Club	Quoile
Killyleagh Yacht Club	secretary@killyleaghyachtclub.co.uk	Recreational use of the lough
Judith Hassard	Strangford Lough and Lecale Partnership Newry Mourne and Down District Council	AONB and Geo Park Officer Strangford and Lecale AONB
Liz Pothanikat	Northern Ireland Environment Agency [redacted]	NI Seabird Seabird Strategy
Maurice Turley	Wildfowl & Wetlands Trust [redacted]	Site management at Castle Espie
Newry, Mourne and Down Council	[redacted]	Permissions, support, funding
NIEA Marine	Northern Ireland Environment Agency Marine Division	Marine Division requirements, marine licences.
Portaferry Sailing Club	https://www.facebook.com/portaferrysailingclub/	Recreational use of the lough
PSNI Wildlife Liaison Officer	https://www.psni.police.uk/safety-and-support/advice-and-information/animal-welfare-and-wildlife/animal-and-wildlife-liaison-officer	Legal protections

Quoile Yacht Club	https://quoileyachtclub.com/contacts/	Recreational use of the lough
Richard Weyl	Northern Ireland Environment Agency Natural Heritage [redacted]	Bird, ASSI designations and consents.
Steven Fyffe	Northern Ireland Environment Agency, ornithology [redacted]	NIEA ornithologist
Strangford Yacht Club	Strangford Yacht Club office@slyc.co.uk	Recreational use of the lough

12.20 Permissions and consultations

12.20.1 As noted above, conservation actions will require National Trust to acquire the following licences or produce supporting reports. The requirements will be site and proposal specific across the lough. At a minimum the following may be required:

- Landowner permission
- ASSI Consents
- Wildlife surveys
- Habitat Regulations Assessments
- Marine Licence
- Wildlife licences
- Permission from the Crown Estate (for rafts)

12.20.2 The following list of contacts will assist when progressing the project in the next phase. Consultation may be needed at different parts of project development. Potential consultees going forward are outlined below.

13. Objectives

13.1 Overview

13.1.1 The aims, as detailed at the start of this document are:

7. Maintain Strangford Lough as a breeding site for Sandwich, Common and Arctic Terns.
8. Establish new tern breeding sites, natural and non-natural, within Strangford Lough.
9. Develop a network of natural and non-natural breeding sites within Strangford Lough.
10. Take management actions to maintain as high a breeding success as possible.
11. Maintain breeding sites to be suitable for potential use by Roseate Terns.
12. Further develop a long-term monitoring and population maintenance capability within the National Trust.

13.1.2 Timescales are included within the specific objectives.

13.2 Objectives

13.2.1 The objectives are the project, based upon the plan outlined above, are as follows. Objectives are broken down into groups as above. The use of specific population figures has been avoided as they are essentially meaningless and not within the gift of the conservationist to deliver. Rather, objectives are to set the conditions where terns may be attracted, supported and thrive.

Existing colonies (short-term)

13.2.2 By 2025 establish protective measures (temporary terrace etc.) to at least half of the colonies listed.

13.2.3 By 2026 establish protective measures (temporary terrace etc.) to all of the colonies listed.

13.2.4 The existing colonies outlined above maintained until at least 2030.

Existing colonies (mid-term)

13.2.5 By 2025 establish protective ana management measures to at least one of the colonies listed.

13.2.6 By 2026 establish protective ana management measures to all of the colonies listed.

Existing colonies (mainland)

13.2.7 By 2026 establish management measures to attract breeding terns to the gravel ridge at Castle Espie.

13.2.8 By 2026 have installed at least one new raft at Castle Espie.

13.2.9 By 2027 have installed two new rafts at Castle Espie.

New colonies

13.2.10 Establishment of one new island-based colony by 2027.

13.2.11 Establishment of two new island-based colonies by 2030.

Rafts

13.2.12 Establishment of one new nesting raft, with associated management measures, by 2026.

13.2.13 Establishment of two new nesting rafts, with associated management measures, by 2027.

13.2.14 Establishment of at least four new nesting rafts, with associated management measures, by 2028.

Productivity

13.2.15 The mean number of chicks produced to fledging per AON, for each species, will on average be higher in the period 2028-2030, than the baseline years of 2022-2023.

Monitoring

13.2.16 National Trust to continue population monitoring and productivity monitoring of all existing and new sites.

Management

13.2.17 Establish a position within National Trust to manage the implementation of the project, by 2025. This position will also cover the sites on the Outer Ards.

13.2.18 Establish a Working group incorporating all groups involved with the project, by 2025. This working group should also cover the sites on the Outer Ards.

Overall

13.2.19 Maintain and increase the populations of all three main breeding tern species by 2030.

13.2.20 Ensure the Special Protection Area is in favourable condition by 2030.

14. Funding

14.1 Funding

14.1.1 Potential funding options are outlined below. Depending on the structure of the tern recovery project, some of these options may be best applied for by partner organisation.

Table 55 Potential funding options

Name	Explanation
PeacePlus	PEACEPLUS is a cross-border funding Programme supported by the European Union, the Government of the United Kingdom of Great Britain and Northern Ireland, the Government of Ireland, and the Northern Ireland administration. Cross-border co-operation and elements would be required https://www.seupb.eu/peaceplus
LIFE	EU funding for nature conservation. https://cinea.ec.europa.eu/programmes/life_en
NIEA funding streams	Core funding of which National Trust already avail. Long and shorter term project funding. Underspend funding. Environment Fund 2023 - 2028 | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
National Lottery	Outside the scope of a pure biodiversity project, but community benefit and buy-in could be built in to a project https://www.tnlcommunityfund.org.uk/funding/northern-ireland
National Lottery Heritage	Large environment related projects https://www.heritagefund.org.uk/funding/national-lottery-heritage-grants-10k-250k
Ards and North Down Borough Council	Likely small amount of funding could be available, leverage for other funding.
Newry, Mourne and Down District Council	Likely small amount of funding could be available, leverage for other funding.
Esmee Fairbairn	Improved species health and habitats is a key strand. https://esmeefairbairn.org.uk/
Sea Changers	Small grants up to £2500 that could be used for project equipment or materials. https://www.sea-changers.org.uk/how-to-apply

Landfill Communities Fund	Part of the project must be within 15 miles of an active landfill site https://www.entrust.org.uk/landfill-community-fund/
North Channel Wind	Proposed offshore wind farms. No communities fund as yet, but a possible source of funding if it proceeds. https://northchannelwind.com
Patagonia	Small conservation grants, up to approximate £10,000.

15. Bibliography

The following documents were consulted, though not all are directly referenced in the text.