Slapton Ley National Nature Reserve

Management Plan 2020 - 2030

Contents

Figures

*Maps
Some maps are also available in Centre files

PLAN SUMMARY

Slapton Ley National Nature Reserve (NNR) has both national and regional importance for wildlife and attracts many thousands of visitors each year for its wildlife, educational opportunities, amenity and stunning landscape setting within the South Devon Area of Outstanding Natural Beauty (AONB).
This management plan updates the previous 10-year plan and covers the period 2020 -2029. It also provides the consent for management of the site from Natural England under Schedule 9 28E of the Wildlife and Rights of Way Act, as amended under the Countryside & Rights of Way Act 2000.
The National Nature Reserve NNR agreement was originally signed in 1991, renewed from 1 April 2011 and expires in 2035. It is enabled by a policy document that relies on a management plan agreed by all parties. The NNR signatories are Wild Planet Trust (formerly Whitley Wildlife Conservation Trust until 2019), Field Studies Council FSC, Natural England NE and South Hams District Council SHDC.

Aims

The aims of this management plan are to provide a practical document for the implementation of work programmes to meet key NNR objectives. These are to:

1. Maintain and enhance the important habitats and species of the site to good condition whilst recognising climate change is likely to influence the status of some of these habitats.
2. Demonstrate practical conservation management for educational purposes.
3. Provide high-quality field sites for education and research in a safe and secure setting.
4. Maintain and enhance public enjoyment of the site through good public access and visitor experience.
5. Conserve the distinctive landscape character and spirit of place the site has.
6. Place Slapton Ley NNR within the wider landscape setting and seek opportunities to influence environmental opportunities outside the reserve so that its intrinsic interest is not isolated and fragmented features.
7. Provide relevant information to help inform the management plan.

Vision

Slapton Ley NNR is a place where diverse habitats thrive; its network of wetlands and woodlands are a sanctuary for wildlife and a place that continues to inspire successive generations to engage with the natural world. The shingle ridge demonstrates how natural processes have created the distinctive habitat inhabited by nationally-important plant and invertebrate communities. The habitats and wildlife of the nature reserve remain at the heart of what the Field Centre has to offer as an environmental education centre.

A. GENERAL İNFORMATİON

This section A comprises the background and description pertaining to the site, which informs the active management detailed in section B.

1. Legislation & policy/compliance

1.1. Relevant authorities

Details of relevant authorities given in the table below.

Site name	Slapton Ley NNR
Area (ha)	NNR is 209.3 ha (also see other land holdings and boundaries beyond the NNR to which this plan pertains)
Grid ref (centre of reserve)	SX 826441
County Council	County Hall, Topsham Road, Exeter, Devon EX2 4QD
District Council	South Hams, Follaton House, Follaton Road, Totnes, Devon
Parish Councils	Slapton; Stokenham; Strete
Parliamentary Constituency	Totnes
Environment Agency office	Manley House, Kestrel Way, Exeter, Devon EX2 7LQ
Natural England	Ground Floor, Stirling House, Dix's Field, Exeter EX1 1QA

1.2. Designations

Slapton Ley was designated as a Site of Special Scientific Interest (SSSI) in 2004 for the following attributes for which it is nationally important:
Coastal geomorphology (shingle barrier beach enclosing a coastal lagoon), open water, vegetated shingle, reed-bed, tall herb fen and fen woodland plant communities, an assemblage of breeding birds of lowland open waters and their margins, a breeding population of the rare Cetti's warbler *Cettia cetti*, non-breeding passage birds, wintering bittern *Botaurus stellaris*, a vascular plant assemblage, and a lichen assemblage. For a summary of the Natural England SSSI condition report for the three units within the SSSI see the **online** information. The three units were last assessed in 2010 as unfavourable recovering. For a list of reportable SSSI features see Appendix 1.

Additional Designations

1. National Nature Reserve
2. Heritage Coast
3. Area of Outstanding Natural Beauty
4. Geological Conservation Review
5. Nature Conservation Review
6. Water Framework Directive (WFD)

1.3. Tenure

Leasehold:

Sites owned by Wild Planet Trust and leased to the Field Studies Council (FSC). For place names see figures 14 and 15 (maps).

Site	Area	Date of Acquisition
Slapton Ley	191.37ha (472.68ac)	6 November 1956
Rush Marsh	Less than 1acre	25 April 1967
Frittiscombe Farm	3.3ha (8.14ac)	13 July 1973
South Parks Marsh (pt Slotts Farm)	0.82ha (2.02ac)	22 Dec. 1980
South Grounds Marshes	6.68ha (16.51ac)	31 Jan 1978
Ireland Cottage	0.158 ha (0.39ac)	12 February 1986
Big Hill Little Hill	6.5ha (16.06ac)	1988
Lower Summer Gaps Hedgelands	5.3ha (13.1ac)	2004
Peaseditch	1ha (2.47ac)	July 2018

Sub Leases. From FSC to South Hams DC from 2010

Sites owned by Wild Planet Trust

Site	Area	Duration
Shingle ridge	31.7ha (78.3ac)	25 years Rent reviewed every 5 years

Sites owned by FSC

Site	Area	Date of Acquisition
Strete Gate	1.3ha (3.21)	28 September 2017

Tenancies

Site	Tenant	Area	Duration
Bird ringing hut	DEVON BIRDS	0.1ha	Ongoing - 6 months' notice either side

Licences

Licensor: The Official Custodian for Charities and the present Trustees of Wild Planet Trust and the Field Studies Council.

Land/right	Date	Licensee	Area	Term & review/expiry date
Field No. pt1426	01/04/2004	B. Lethbridge	1.60ha	Current Licence Executed 22/04/04
Field No. pt1427 Grazing licence Hartshorn Ley side Fringes (Francehorn)	31/12/2004			

Land rights owned by Wild Planet Trust and part of NNR/SSSI

Land/right	Date	Tenant	Area	Term & review/expiry date
Slapton Ley NNR	2010	Field Studies Council	209.3ha	2035

1.4. Policies

The policies of FSC are outlined in its Operational Codes of Practice (OCoP). There are a number of OCoPs relating to the NNR, which are outlined below. These documents are available from the SLFC shared drive 'Badger'.

B04 Tree Safety
B12 Vehicles
B14 Use of boats on inland waters
E03 First aid provision
E09 RIDDOR
W07 Manual Handling
W08 Risk assessments for non-educational activities

1.5. Revenue and grants

There are two main areas of funding for conservation of key habitats and species on the NNR: a Countryside Stewardship grant scheme covering five years; and, mitigation funds from the realignment of the road along the shingle ridge, as a result of storm damage in 2018 providing funding for habitat and infrastructure work until 2029.

Source	Organisation	Dates	Area under agreement	Comment
Higher Level Countryside Stewardship Scheme	Natural England	2019-2029	Slapton Ley NNR 209.3ha	See CS agreement for details of payments and works. Funded works also included in work programme.
A379 Road Realignment Mitigation	Devon County Council	Until 2023	Various areas on specific projects.	See section 6 for details of where and what management the mitigation funds are used for.

1.6.Health and safety rationale

Specific hazards & risks

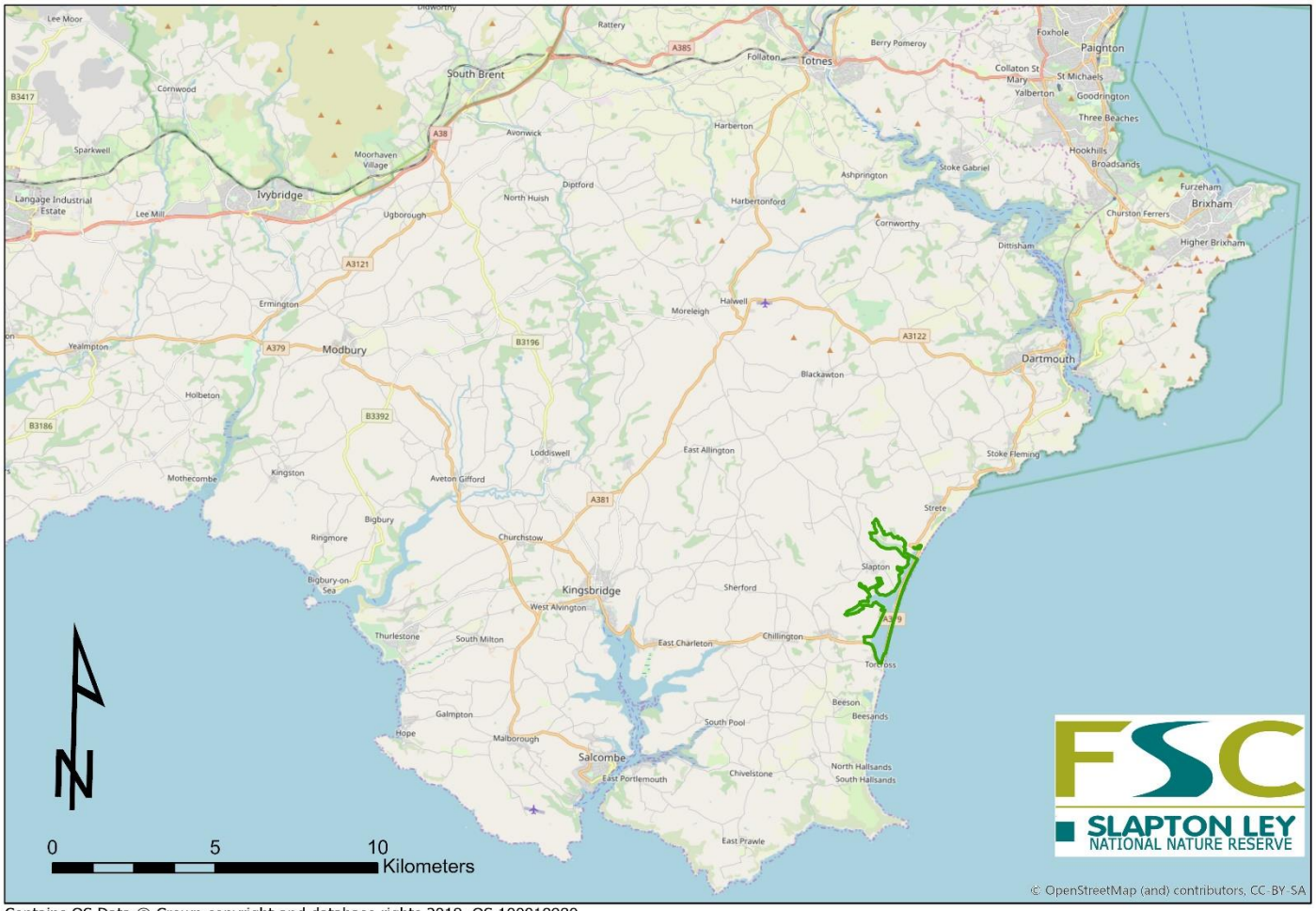
- Public access through woodland, coastal and wetland margins.
- Algal blooms are an environmental health risk for visitors in late summer.
- NNR infrastructure maintained in safe condition. Some liaison with DCC required.
- NNR staff & volunteer use of tools, machinery & chemicals.
- Use of boats by volunteers and staff for monitoring and survey work.
- Educational use of boats by students and visitors.
- World War 2 military ordnance on site. See External Influences.

The Field Studies Council OCOPs used to inform and guide all aspects of reserve work to ensure a safe working environment

- Safety assessment timetable created for nature trail and other public areas with regular checks and remedial work carried out within 2 weeks – to include regular risk assessment for timber visitor infrastructure.
- Tree safety inspections completed annually and updated after storms (OCoP B04)
- Safe use of machinery & record appropriately (OCoP B11)
- Complete FSC Contractor Packs for all new contractors and update annually.
- Events & activities risk assessed (OCoP L06P) & staff/visitor incidents recorded (OCoP E05)
- Annually review lone working (OCoP W04), COSHH (B06), boats (OCoP B13&B14) & manual handling (W07).

2. Site Description

2.1. Location



Contains OS Data © Crown copyright and database rights 2018. OS 100019980.

Figure 1. The location of Slapton Ley NNR

2.2. External influences affecting management of the NNR

Factor	Issue	Strategies
Climate Change	Higher sea levels, increased storm frequency and wave height are affecting the shingle ridge that separates the freshwater ley from the sea. A breach of the shingle bar would potentially affect the water levels and salinity of the freshwater ley and thus the nature conservation and infrastructure features of the site.	Managed retreat of coastline. No further road realignment. Adaptation of habitats & Field Centre activity. Being ready & prepared to adapt to single storm events.
Plant Pathogens	Several diseases/pathogens identified nationally currently affect/might infect trees on NNR in the future. This would influence management of woodland/ individual veteran trees that have a high nature conservation/landscape interest. Diseases/pathogens include: Ash Die Back - a fungus and already present at Slapton Acute Oak Decline -stress related. Sweet Chestnut Blight -a fungus recorded in Devon 2017. Emerald Ash Borer -a beetle rapidly spreading towards Europe. *Phytophthora ramorum* – a fungus that causes extensive damage and mortality to a wide range of trees.	Monitor for the presence of the disease and report as necessary. Fell diseased trees near highways/public rights of way Look to build resilience within woodlands through selection, management and planting in the future.
Military Ordnance	Left over from the World War 2 and likely to be present in Ley/reed beds/shingle bar. Timber in woodland areas is also affected by shrapnel and cannot be sold.	Limited excavation in ley and reed bed area, with MOD Ordnance Survey in advance. Liaison with Coastguard & MOD for public safety.

Recreational pressures	Increased dog walking and general visitor pressure leading to disturbance to wildlife and trampling.	Reduce trampling by use of fencing on the shingle ridge. Use of dead hedging to limit access to sensitive areas.
Future Funding	Increasing pressure on all funding sources. Post-Brexit Review of Agri-Environment Schemes. Devon County Council A379 Road Mitigation funding secured for 10 years.	Commercial approach to maximise sources of income where appropriate. Meet funder requirements. Continued efficiencies & savings. Take opportunities for external funding, e.g. private funders.
Water Quality	Water quality of Ley is at risk from agricultural runoff from surrounding catchment, which affects the nature conservation interest of site.	Continue monitoring water quality. Work with landowners, statutory organisations to ensure water quality continues to improve.
Deer	Increasing deer numbers affecting the woodland structure/herbs.	Monitor deer and any damage using exclosure plots.
Legal Obligations	Cross Compliance (e.g. CS, SFP) Felling licences Protected species Health and Safety issues	Comply with all legal obligations.
Isolation and Fragmentation	Slapton NNR needs to be part of the wider landscape and not an isolated entity. Potential to connect to other local habitats and landscape features.	Look to work with neighbouring landowners and other agencies to create landscape scale connectivity. Wild Planet Trust to purchase additional adjacent land where possible.

3. Environmental information

3.1. Geology & soils

Important geology/geomorphology
The Lower Devonian Meadfoot group slates were laid down as silts and muds in a shallow sea about 360 million years ago. The rock strata, as seen exposed at, for example, Southgrounds Quarry, slope down to the margins of the Ley. Lower Devonian Dartmouth group slates underlie the northernmost part of the Slapton Wood area. North of the Ley, fragments of early fossil fish have been found in Dartmouth slates.

The shingle bar is an important example of a shingle barrier beach, and is described in the Geological Conservation Review. It was formed in immediate post-glacial times by the 'Flandrian Transgression' pushing a predominantly flint and quartz shingle ridge onshore. When this ridge joined the headlands at Strete (GR:845465) and Torcross (GR:823417) a tidal freshwater lagoon was formed. The system is further described by Hails (1975). The ridge is a geologically recent construct and it is to be expected that it will be dynamic, especially at a time of rising sea levels (Royal Haskoning, 2007).

The first freshwater peats have been carbon-14 dated at 2,889 ±50 BP (ref. IX), though marine incursions have occurred since then. The gentle, mostly vegetated slopes that were the interglacial sea-cliffs form the landward shore of the Ley. These cliffs are now degraded to heights not exceeding 10m (35 ft) above the height of the Ley.
The highest point of the reserve is at 98 m (325 ft.) ASL at Eastergrounds Farm in Slapton Wood.

Soils
The soils derived from Devonian slates are deep, and rich in silt and clay, a mixture which makes them easy to cultivate except when they are wet. Where true soils exist (i.e. non-alluvial) on the reserve they are of the brown-earth type, shallow and moderately acid (pH 5.0 - 6.5). Trudgill (1983) described the soils of Slapton Wood, which are acid (pH 3.8 - 4.6) and nutrient poor with a high content of silt-sized particles and slate fragments.

3.2 Hydrology

The Slapton Catchment area is 46 km^2 of agricultural land, largely pasture except where arable dominates on the plateau. The catchment is sparsely populated with 4 settlements and 2 Sewage Treatment Works (at Blackawton & Slapton). The major rivers and stream draining into Slapton Ley have been gauged from the early 1970s to better understand the causes of eutrophication of the Lower Ley. The largest is the River Gara with a gauged catchment area of 23 km^2. The Slapton Wood stream joins the Gara further downstream. Whilst only 1 km^2 in area, this basin is of some significance because of the detailed hydrological research carried out there (Burt et al., 1983). The River Gara drains though the Higher Ley (0.14 km^2) to reach the Lower Ley; the Higher Ley is now largely reed swamp with an open channel flowing through it, having been largely open water in 1945. The Lower Ley (0.77 km^2) comprises open water fringed by reed swamp or marsh; its maximum depth is 2.9 m. The Start (10.8 km^2) and Stokeley Barton (1.5 km^2) streams both drain directly into the Lower Ley. The Lower Ley drains through a culvert at Torcross when the water level is high

enough; otherwise, drainage is through the shingle ridge to the sea (van Vlymen, 1979).

A Diffuse Water Pollution Plan between Natural England and the Environment Agency was created in 2010 (Natural England, 2010) and updated in 2015 (Natural England, 2015). This summarises details of the catchment and includes the objective: *Natural England and the Environment Agency commit to work together to gather evidence and implement necessary remedy measures as guided by this plan, in order to maintain an improving trend in nutrients and sediment in the Slapton Ley catchment, so that SSSI condition targets are achieved in the future*

4. Habitat and species review

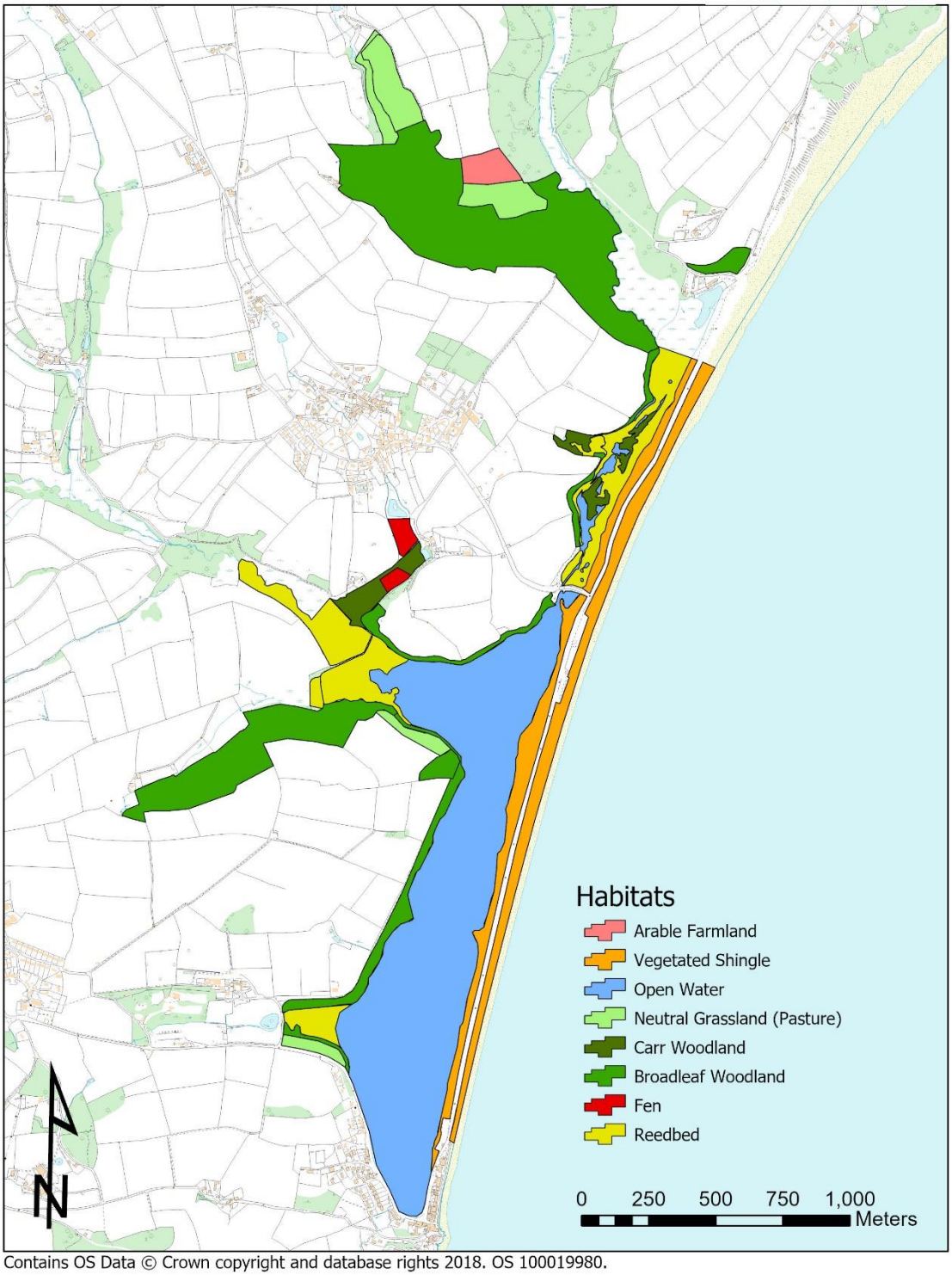


Figure 2. Main habitat types of Slapton Ley NNR

4.1. Coastal vegetated shingle

The 'Shingle Ridge' is a shingle bar of roughly 3.5km long, which stretches between Torcross in the South and Strete Gate in the north, of which, 31.7ha sits within the boundary of the NNR. Shingle is a globally restricted sediment type with few occurrences outside north-west Europe, Japan and New Zealand. In the UK, shingle beaches are widely distributed around the coast, but in most cases, they are within reach of storm waves and vegetation is unable to establish making vegetated shingle a nationally and globally important habitat (Sneddon & Randall, 1993). Increasing coastal erosion to the ridge crest continues to reduce the size of this area of vegetated shingle habitat and visitor amenity (car parking and paths) due to greater and more frequent storm events. We continue to work with stakeholders to adapt our management of the road and mitigate the effects of previous road realignments on these key features of the SSSI.

There are three zones of the shingle ridge, which run along the length of the bar: the seaward face, the ridge crest and the 'backslope'. Each zone has different abiotic conditions, primarily due to the proximity to, and influence of the sea, giving rise to three distinct plant communities:

The seaward face is a very high-stress environment and only the most pioneering plant species are able to colonise, such as sea spurge *Euphorbia paralias,* sea kale *Crambe maritima* and yellow horned poppy *Glaucium flavum* but even these species are only abundant outside the boundary of the NNR at Strete Gate, where the beach is broader and the gradient shallower. Along the majority of the shingle ridge, wave action and trampling has resulted in the seaward face remaining largely unvegetated.

The ridge crest is the more species-rich area between the highly stressful, highly specialist seaward face and the largely generalist communities of the backslope. It is stable enough that vegetation has been able to establish but experiences enough disturbance, both natural (storm events) and human (trampling) that it has retained its diverse, specialist plant communities. Studies of exclosure plots have shown that while too much trampling damages the habitat leading to unvegetated bare shingle, too little disturbance – such as that found in established exclosure plots – results in a rank sward of coarse grasses, a decline of specialists and a reduction in diversity (Silvester, 2005; Fletcher *et al,* 1987; Beeley, 1991). The best examples of species-rich vegetated shingle are the 400m south of Strete Gate and 800m stretch south of the memorial car park. These sections of the ridge crest are broad enough that any footfall is spread across a wider area. In these areas, where a grass sward exists, it is primarily short, *Festuca rubra,* alongside a diverse community of forbs including viper's bugloss *Echium vulgare,* wild carrot *Daucus carota,* sea mayweed *Tripleurospermum maritimum,* sea campion *Silene uniflora,* rest harrow *Ononis repens,* broomrape *Orobanche sp.* and rough clover *Trifolium scabrum.*

Unfortunately, this most valuable habitat is also the most threatened. A number of large storm events (e.g. 2001, 2014 and 2018) have reduced the area of the ridge crest. A reduction in area risks concentrating the trampling pressure, damaging what is left and with climate change, it is likely that these large storm events might become more frequent.

The backslope is grassland dominated by a species-poor community of false oat grass *Arrhenatherum elatius,* red fescue *Festuca rubra* and sea radish *Raphanus raphanistrum ssp. maritimum* and a combination of scrub communities containing blackthorn *Prunus spinosa*, gorse *Ulex europaeus* and sycamore *Acer pseudoplatanus*. This species-poor MG1a grassland has replaced a more species-rich, *Festuca rubra*-dominated turf in the absence of grazing by sheep (pre-war) and probably maintained by rabbits until the 1950s. There are still remnants

of the *Festuca rubra*-dominated community, but it is becoming increasingly rare (Wilson, 2002). These shifts have also resulted in the loss of several rare species of lichen in the genus *Cladonia* (Dobson & Hawksworth, 1996). The scrub communities that have developed now sustain important populations of Cetti's warbler *Cettia cetti*, cirl bunting *Emberiza cirlus*, linnet *Linaria cannabina* and dormouse *Muscardinus avellanarius.*

Invertebrates

As well as its plant community, the shingle ridge is nationally important for its invertebrate assemblage, containing a range of red data book and nationally scarce invertebrates as well as many species of regional and county importance. The majority of these are found associated with the bare shingle at the strandline and the sparsely vegetated ridge crest, the backslope being of only local/regional importance (Alexander 2004).

Of particular importance for invertebrates is the ca. 800m stretch of ridge crest south of the middle car park. This area is valuable because of its combination of bare ground, short species-rich sward and rank tussocky vegetation. It is likely that the presence of the exclosures here and the resulting pattern of footfall has created a mosaic of optimal structural diversity. Here the importance of bare ground created by trampling should be stressed (Boyce, 2017).

While the continuing good management of the ridge crest is important in retaining the botanical and invertebrate interests, considering the increasing magnitude and frequency of storm events, better management of the backslope (through scraping, cutting or grazing) is the only way to ensure their long-term conservation.

4.2. Freshwater lagoon and margins

The freshwater lagoon of Slapton's Lower Ley, at 66ha, is the largest freshwater lake in South West England. The catchment of Slapton Ley is 4,560ha, which can be divided into four main drainage basins: **the Gara** (2,680ha), which is the largest catchment and enters the Ley from the north; **Slapton Wood stream** (122ha) joins the Gara at the northern boundary of the NNR; **Start stream** enters the Lower Ley at Ireland Bay; **Stokeley Stream (**1.67ha) enters the Lower Ley at the South near Torcross. There is a further 3.08ha of minor drainage basins.

Succession

The natural succession of the wetland habitats has been proceeding at different rates over the last 1000 years (Cannell 1992). Most recently, the creation of the toll road along the shingle ridge in 1886 and the raising of the Torcross sluice in the 1920s have combined with massive agricultural 'improvement' by ploughing and fertilising in the catchment to cause very high rates of sedimentation and eutrophication.

Water quality

The water quality of Slapton Ley is the single most important ecological driver. It affects the species composition of the plants, invertebrate, fish and birds. It has been very well documented, with a continuous dataset as far back as 1982. The nutrient status of the Ley began to deteriorate in the 1940s (accelerating in the 1960s) and sedimentation has progressed at pace. There are a number of sources of nutrient pollution including sewerage systems, primarily Blackawton sewage treatment works, which discharges into the Gara; septic tanks; agriculture; avian faeces and 'internal loading' which refers to the release of nutrients stored in the sediment (Dobson *et al*, 2015).

A combined effort from a number of organisations including Natural England, Environment Agency and Westcountry Rivers Trust has resulted in a significant improvement in water quality coming from the catchment (figure 3). Despite this long-term trend in water quality, current concentrations of various pollutants remain higher than the relevant targets to achieve 'good' status under Water Framework Directive (WFD) targets (also see targets in section 6.1). It is believed that this is due to internal loading and that there could be a lag time of decades before improvements in catchment input are seen in the Ley.

A result of the eutrophication of the Ley is the periodic occurrence of algal blooms; species of Cyanophyceae include *Microcystis flos-aquae, Anabaena circinalis*, *Anabaena spiroides* and *Gloeotrichia echinulate*. The impacts of algal blooms at Slapton Ley are both human and ecological. The toxicity of some species of Cyanophyceae represents a health risk to visitors, their pets and livestock as well as restricting the teaching opportunities. The main ecological impact is to shade out the macrophytes on which much of the ecosystem is dependent, including wintering wildfowl.

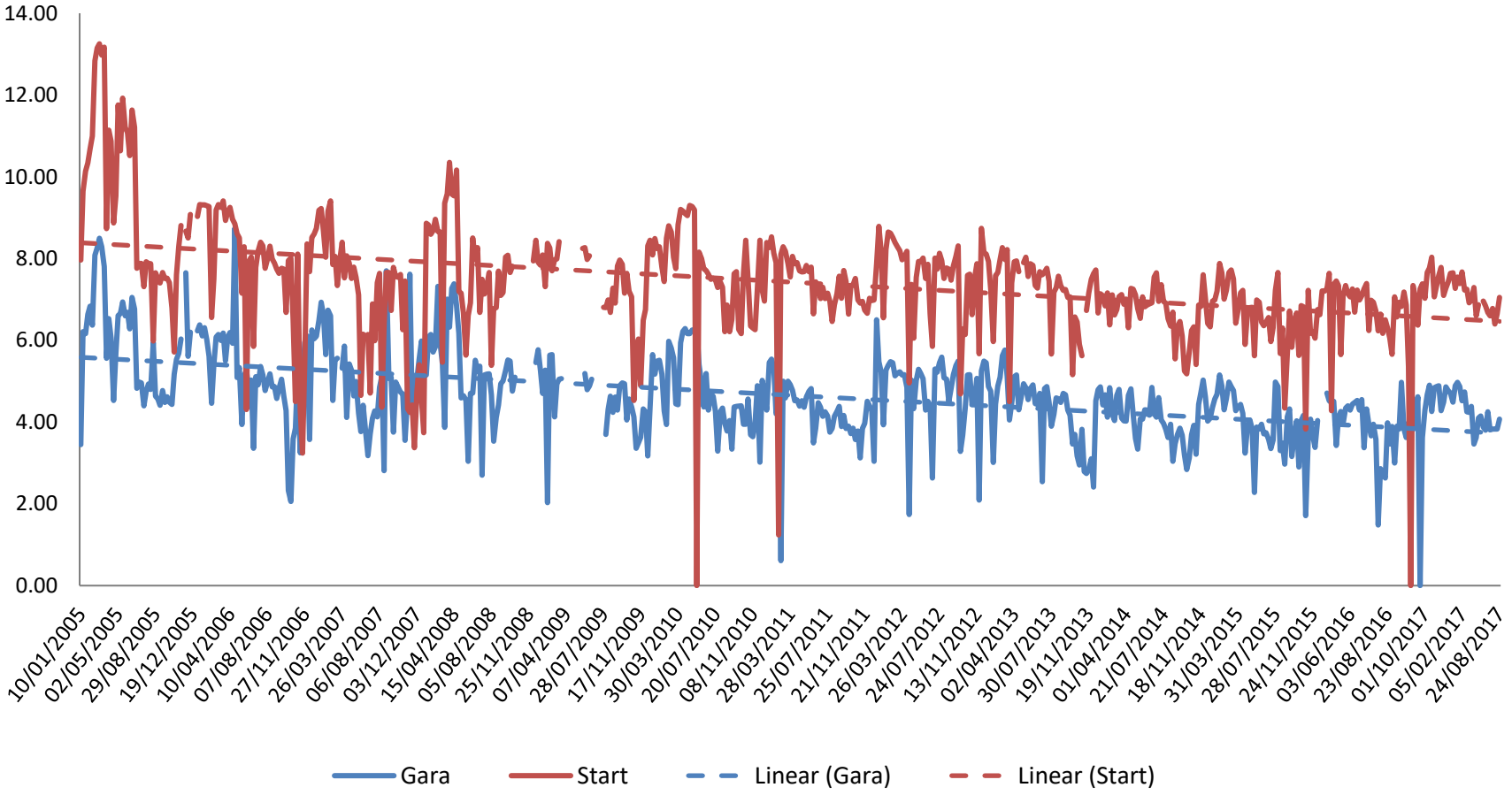


Figure 3. Nitrate concentrations in mg/l NO_3-N from Higher North Mill (representing the Gara catchment) and Deer Bridge (representing the Start catchment).

Plants

A number of important species of aquatic macrophyte have been recorded in the Lower Ley since the first major botanical survey was carried out by Brookes and Burns (1969). The change in species over this period shows a shift from mesotrophic to eutrophic conditions (Johnes and Wilson, 1996), a trend that has been well-documented in other literature. A species of conservation importance that is still present is the stonewort, *Chara connivens*, which is monitored as part of the annual macrophyte survey. This survey focuses on the relative abundance of *Elodea spp., Potamogeton spp*, *C. connivens* and filamentous algae. See appendix 2 for species list of key macrophytes.

An important plant species to the NNR is Strapwort C*orrigiola litoralis*; Slapton Ley was the only known site for this species until it was reintroduced to Looe Pool (2015-2020) from seed collected from the Slapton NNR. It is a small prostrate annual with glaucous leaves and tiny white flowers. It grows on the edges of lakes and large rivers that have significant seasonal fluctuations of water level. It relies on the bare substrate exposed as water levels drop in the summer; disturbance by cattle (or people) exposes buried seed and helps prevent colonisation by perennials, which very quickly outcompete this light-demanding plant.
Historically, it was very widespread around the ley fringes when livestock had free access to the water but over the course of the 20th century these areas have declined: the backslope has not been grazed since before World War 2; Southgrounds shore has been fenced off for visitors since the site has been a nature reserve and a buffer strip of trees was planted along America Road in the 1970s to improve water quality. This has led to vegetation colonising the vast majority of the shoreline until Strapwort was confined to a single site at the boat mooring, where bare ground was maintained by visitors, boat users and students; however, it never thrived there due to the effect of excessive trampling during the growing season.

There have been a number of attempts to restore the population: in the 1990s cattle access was reinstated along the nature trail using livestock from Southgrounds Farm but there were concerns about the safety of visitors. Subsequently cattle access was removed from Southgrounds shore.

Wild Planet Trust have been heavily involved in the project and have propagated seed at Paignton Zoo and plug-planted to supplement falling numbers (2006 - 2011), and from 2014 Natural England has provided funding through the Species Recovery Programme. Towards the end of the 2010-2019 management plan, success was achieved using diggers to create bare ground, grub out trees and reprofile the shoreline. In 2017 this technique yielded good results at Hartshorn and again in 2018 at the boat mooring (see figure 4); in these instances, there was no propagation and plug planting required. In these areas, bare ground is maintained by cattle access (Hartshorn) and manual clearance (boat mooring).

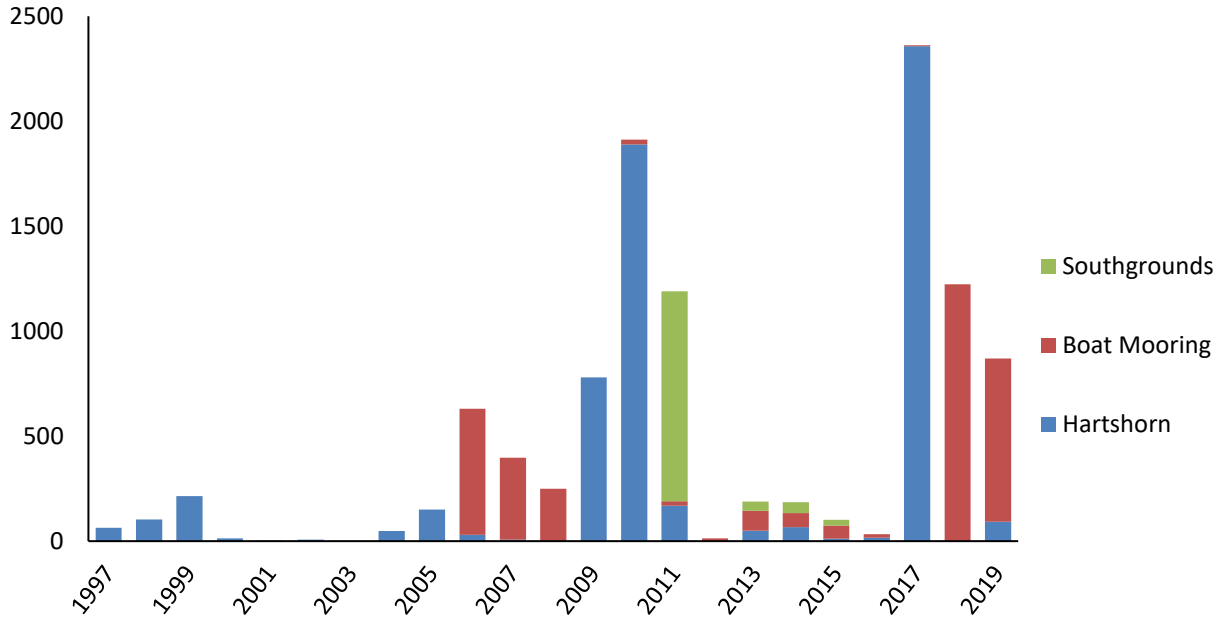


Figure 4. Strapwort numbers at three sites on the NNR showing success of two interventions: plug planting in 2010 and 2011 and bare ground creation / re-profiling in 2017 and 2018.

Birds

Two of the SSSI features for the NNR relate to birds: breeding birds and 'non-breeding passage and wintering'. The breeding bird assemblage of the Lower Ley includes gadwall *Mareca strepera*, mute swan *Cygnus olor*, tufted duck *Aythya fuligula*, coot *Fulica atra*, pochard *Aythya ferina* and great crested grebe *Podiceps cristatus*. The band of reed that fringes the ley is important for passage migrants including hirundines and warblers. Wintering birds include wigeon *Mareca penelope*, goldeneye *Bucephala clangula*, little grebe *Tachybaptus ruficollis* and occasionally teal *Anas crecca*, black-necked grebe *Podiceps nigricollis* and shoveler *Anas clypeata*.

Invertebrates

Slapton Ley is considered a nationally important site for its dragonflies (Stevens, 1998), with 18 18 species of *Odonata* at Slapton Ley, 12 of which were confirmed or presumed to be breeding.

Fish

Slapton Ley contains primarily perch *Perca fluviatilis*, pike *Esox lucius*, roach *Rutilus rutilus* and rudd *Scardinius erythrophthalmus*. Historically, it was known as one of the best locations in the country for pike. The fish populations of Slapton are well documented thanks to decades of angling returns; data from between 1970 and 1995 were analysed by Kennedy (1996), in which he was primarily concerned with the population dynamics of roach and rudd in the presence of

the tape worm *Ligula intestinalis*, which parasitizes roach. During the 1960s, eutrophication reached a level that resulted in an expansion of roach, reversing the historic dominance of rudd and leading to a reduction in the size of pike and roach. The abundance of small fish attracted large numbers of breeding great crested grebe. With the grebes came *L. intestinalis,* this decimated the unhealthy and stunted roach population, after which the rudd population recovered and the grebe numbers declined. This cycle has continued ever since, punctuated by episodes of winterkill and hyper-eutrophication. This cycle is evident in the grebe population, which exhibits a boom and bust dynamic, mirroring that of the roach.

4.3. Terrestrial wetland communities

The NNR contains a wide diversity of wetland communities and associated wildlife. The majority of these communities exist where the rivers and streams level out and join the open water; the more botanically interesting and diverse areas tend to be those which have historically been managed by cutting or grazing, such as Little Marsh and Southgrounds.

Swamp Communities

A major swamp community is reed swamp (S4), which is a relatively species-poor community botanically but one which has important associated fauna. The NNR contains roughly 22ha of reed swamp excluding the reed fringing the ley; the main blocks of reedbed are at Ireland Bay and the Higher Ley with a smaller reedbed at Stokeley Bay. The Higher Ley is a mosaic of reedbed, open pools and carr woodland. It was open water as recently as recently as 1900 but through the process of sedimentation, which accelerated from the 1960s, it developed into a reedbed community; it is now considered a dry reedbed cut bisected by a fairly distinct channel. The second major block of reed is at Ireland Bay, which starts near Deer Bridge, where it transitions up the valley into carr woodland, and stretches towards the Lower Ley, where it transitions into open water. North of The Causeway it exists in a complex of other swamp communities and willow scrub but below The Causeway it is a fairly uninterrupted reedbed. It also extends some way up the valley of France Wood. Until 2005, the reedbeds were managed through a combination of cutting and burning. The large block of reed at Ireland Bay was managed with burning and a number of blocks were cut on rotation, including at Little Marsh, south of the Causeway, north of Slapton Bridge.

There are a number of important reedbed species at Slapton Ley. Arguably the most important is Cetti's warbler; with between 35 and 45 breeding pairs (see figure 5) the NNR contains roughly 2% of the UK population making it a nationally important site for the bird. It is also the only individual breeding bird listed as a SSSI feature. The population is most dense in the Higher Ley, where the combination of reed, open water and scrub is optimal, however, they are also found at Ireland Bay, Stokeley Bay and the narrow strip of reed around the fringe of the ley. Management objectives that benefit Cetti's have involved rotational scrub cutting on the backslope to maintain extent and structure.

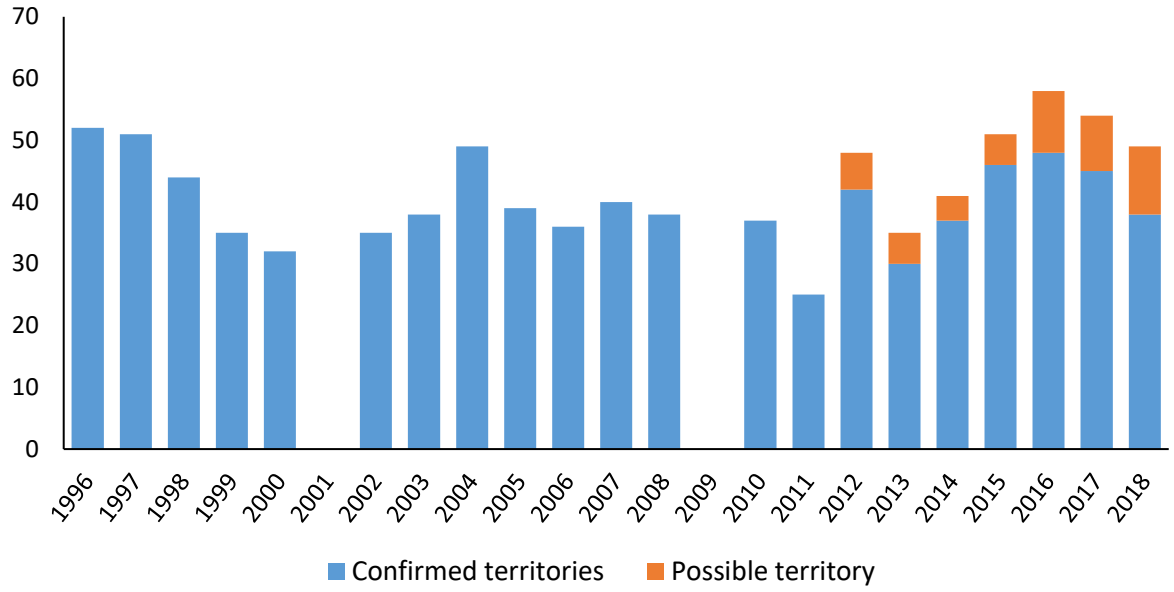


Figure 5. Breeding pairs of Cetti's warbler on the NNR; stable and fluctuating around 40 pairs.

Another SSSI feature is the non-breeding and passage bird assemblage; within this feature, the species relevant to reedbed are bitterns *Botaurus stellaris* and starlings *Sturnus vulgaris*. Bitterns have been known to use Higher Ley and Ireland Bay. They have a preference for wetter, early successional reedbed and while their winter habitat preference is less demanding than for breeding it is likely Higher Ley has, and will continue to become less suitable for bittern. Large numbers of starlings – up to 100,000 – roost in the reedbed from October. The Higher Ley also contains good numbers of warblers including reed warbler *Acrocephalus scirpaceus*, sedge warbler *Acrocephalus schoenobaenus*, whitethroat *Sylvia communis*, blackcap *Sylvia atricapilla* and garden warbler *Sylvia borin* as well as reed and cirl bunting *Emberiza cirlus*. There are around 10 pairs of water rail *Rallus aquaticus* across the reserve, with highest numbers at Higher Ley.

Another swamp community on the NNR is sedge swamp dominated by greater tussock sedge (*Carex paniculata*), which is the second most common swamp community after reed bed-swamp dominated by common reed (*Phragmites communis*). It occupies parts of the Higher Ley as well as parts of the Start Valley bottom between Deer Bridge and Ireland Bay Causeway. This community is a species-poor community and associated with slow-moving eutrophic water (Bennett 2011a).

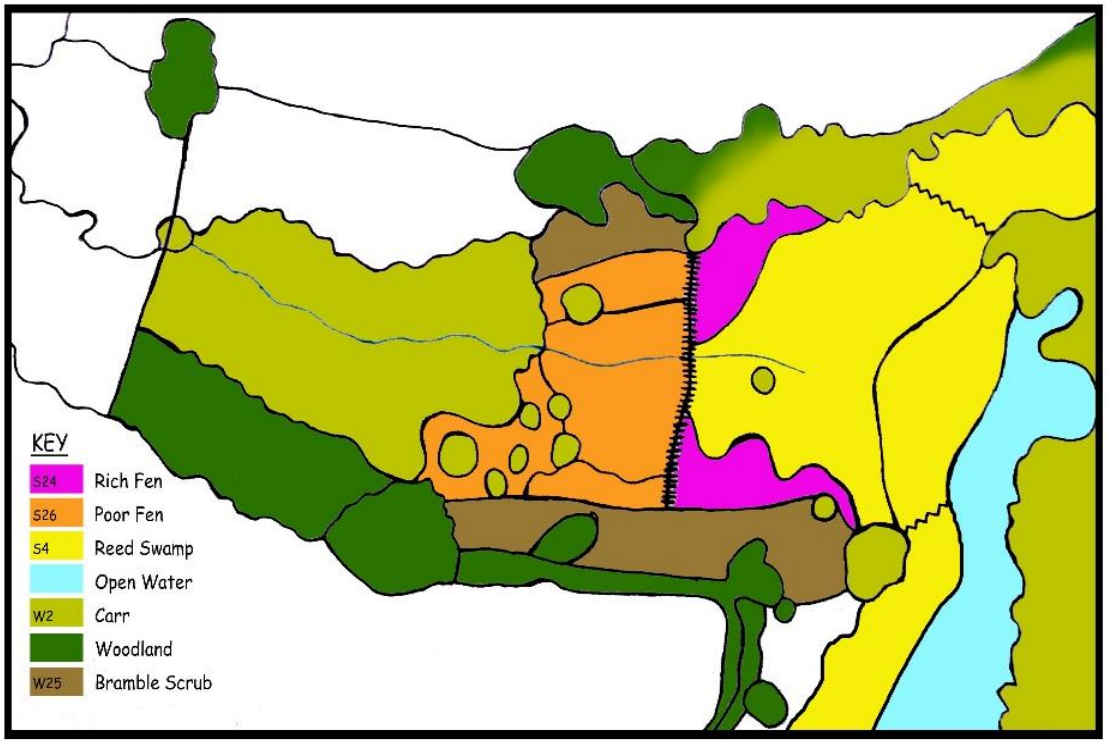
North of the causeway (Start valley fen) is a complex of swamp communities including those dominated by common reed *Phragmites australis*, marsh bedstraw *Galium palustre*, Bulrush *Typha latifolia* water mint *Mentha aquatica*, branched bur reed *Sparganium erectum* and marsh speedwell *Veronica scutellate*. "The rich diversity of swamps around the Causeway reflects a healthy abundance of water. Even so, the four swamps that have been identified are all

represented by their most diverse sub-community - an indication that succession is progressing towards communities of progressively drier habitats." (Ros Bennett, 2010).

Tall herb fen

Tall herb fen communities are rare on the NNR and the only location where it is truly represented is Little Marsh. Little Marsh contains four main communities: *Phragmites australis* swamp (S4), willow carr (W2 or W5 depending on whether you look at the tree species or ground flora) and two tall herb fen communities (S24 and S26). The tall herb fen communities are found around the edges of the marsh where the waterlogged reed swamp transitions in the drier farmland. During the 70s much of Little Marsh would have been the species-rich S24 community. "This community, in its purest state, reflects a healthy habitat that receives plenty of un-enriched fresh water to provide a moderately high summer water table (at 0 to - 30cm below) and some winter flooding" (Bennett, 2011). It was maintained by grazing when the livestock from the surrounding farm had free access to the marsh but a fence was erected in the 1990s or 2000s and grazing was halted. As a result, the S24 community has developed through succession into either the species-poor tall herb fen community S26 or the tall weed community OV26 (Bennett, 2011; see figure 6). A report was written in 2011 recommending that management be reinstated in order to restore the habitat and as a result a fence was installed to protect the boardwalk and newly planted woodland. In 2017 reed cutting was reinstated and in 2018 grazing was returned with the permission of the landowner and grazier.

A



B

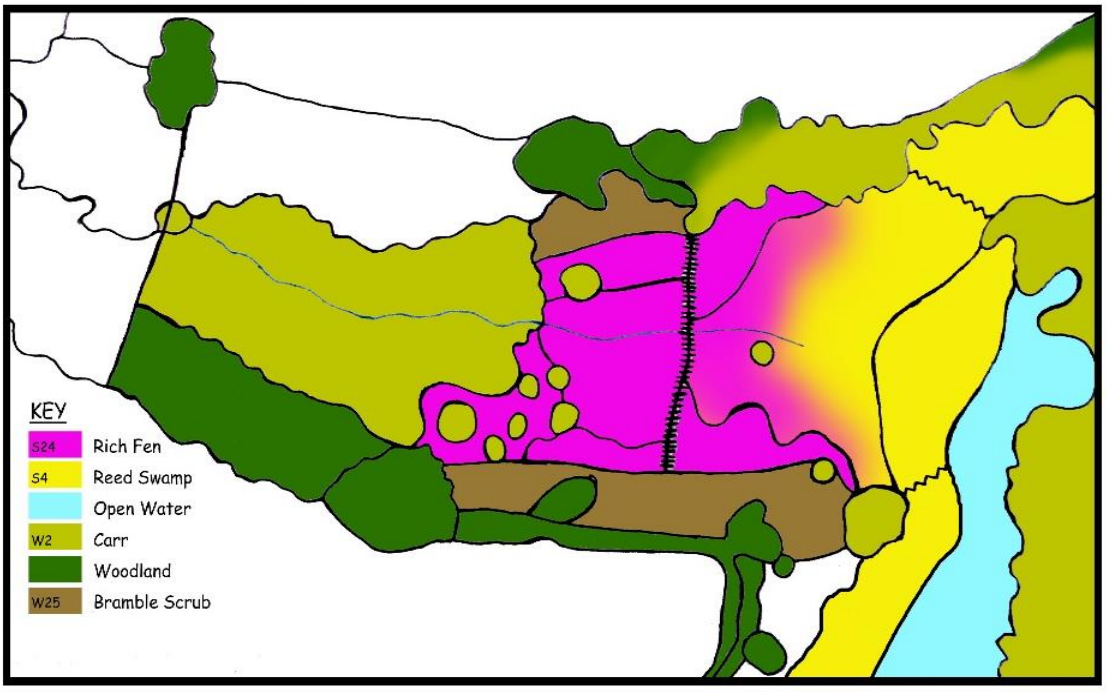


Figure 6. **A**: The extent of NVC communities at Little Marsh in 2011. **B:** the potential extent of the species-rich S24 community following recommended grazing regime (Bennett, 2010).

Fen Meadow

Slapton Stream is one of the minor drainage basins, which runs through Slapton Village and joins the Start Stream north of the Causeway. It flows into a large pond just south if the village before it levels out and forms the flat waterlogged habitat of the Southgrounds fen meadows. It is an L-shaped fen complex 500m long and 70m wide. It contains a fen meadow (Southgrounds upper fen) that has been managed through a cutting regime for a decade or so, which contains a good diversity of plants, invertebrates and amphibians. A barbastelle bat *Barbastella barbastellus* was recorded along the footpath towards the village in 2018, which suggests it may be used as a foraging habitat for this very rare BAP species. It also contains southern marsh orchid *Dactylorhiza praetermissa*. There are another two areas of unmanaged fen meadow within the Southground/Start stream basin, which contains a fairly homogenous stand of hemlock water-dropwort *Oenanthe crocata* and horsetail *Equisetum spp.* as well as few other species including southern marsh orchid *Dactylorhiza praetermissa.*

The Causeway Mire

Along Ireland Bay Causeway there are remnants of M28a *Iris pseudacorus-Filipendula ulmaria* mire: *Juncus* sub-community containing yellow flag iris *Iris pseudacorus*, meadowsweet *Filipendula ulmaris* and marsh skullcap *Scutellaria galericulata*. This attractive and diverse community was once widespread along the causeway and across the marsh to France Wood. It is maintained by cutting and has declined in character and extent since this management has been scaled back. It used to be present along the route of the boardwalk but since it was installed, regular cutting and removal of the vegetation stopped (though some characteristic species such as ragged robin *Lychnis flos-cuculi* are still present).

4.4. Semi-natural broadleaved woodland

Slapton Wood

Slapton Wood is a 28ha ancient broadleaved woodland. It occupies a 1.5km section of the valley of Slapton Wood Stream at its confluence with the Gara. It is broken up into a number of compartments, some of which are relatively recent secondary woodland on abandoned fields and others are plantations of beech *Fagus sylvatica* and sweet chestnut *Castanea sativa*. There is roughly 18ha of Slapton Wood on the southern valley-side which is considered 'ancient'; this section contains a high proportion of oak (predominantly *Quercus petrea*) relative to other compartments and has a ground flora indicative of ancient woodland, including bluebells *Hyacinthoides non-scripta*, wood anemone *Anemone nemorosa*, opposite-leaved golden saxifrage *Chrysosplenium oppositifolium*, wood sorrel *Oxalis acetosella*, great wood-rush *Luzula sylvatica* and several fern species. The presence of the sunken Wood Lane linking the wood to Slapton Village also hints at its long history. There is an area around the Keeper's Cottage and the turning circle where oak is dominant in the canopy, but by far the most abundant canopy species throughout the wood is sweet chestnut. There is more or less ubiquitous hazel *corylus avellana* and/or holly *ilex aquifolium* understory. Kitchin (1983) shows that there is almost no oak regenerating in Slapton Wood. Sycamore *acer pseudoplatanus* and to a lesser extent sweet chestnut are the species that fill canopy gaps following wind-throw. It appears that sweet

chestnut is more susceptible to wind-throw than oak. There are some compartments where beech dominates, such as at Eastergrounds and an area of Loworthy Brake, which we can assume were plantations. The nature of the southern valley-side is of a mature, high canopy, damp and cool woodland. The northern valley-side has a different character: it is not considered 'ancient', indeed some compartments, i.e. Valley Bottom, Eastergrounds Brake and Square Brake are abandoned fields which are little older than 100 years (Kitchin, 1983). Contrary to the report by Kitchin (1983), Loworthy Brake is substantially older than these other compartments, appearing, as woodland, on maps from 1887, where the others are still showing as fields. Most trees in Loworthy Brake were planted at the turn of the century but differences in age suggested there had been natural regeneration since then; it can therefore be assumed that Loworthy was at some stage felled and replanted. The abandoned fields contribute to the structural diversity within Slapton Wood, containing low, dense, scrubby areas of blackthorn *prunus spinosa*, bracken *Pteridium aquilinum* and bramble *Rubus fruticosus*, which contrast the mature high forest of the southern valleyside and Loworthy Brake.

Management in Slapton Wood has been fairly minimal: previous management regimes have carried out some coppicing at Loworthy Brake, while more recently (until 2020) low-level sycamore removal has been carried out in the ancient woodland compartments.

Mammals

At least 12 species of bat have been recorded in and around Slapton Wood including both horseshoe species (greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros*), both long-eared species (brown long-eared bat *Plecotus auritus* and grey long-eared bat *Plecotus austriacus*) and Bechstein's bat *Myotis bechsteinii*. In 2018 common or hazel dormice *Muscardinus avellanarius* were recorded in Slapton Wood for the first time in Loworthy Brake and Square Brake.

Fungi and lichens

The Slapton Fungal Survey has involved at least 64 mycologists since 1969; Dobson and Hawksworth (1996) reported that there had been 2,344 species of fungi have been recorded (including lichenised fungi, slime molds etc.) with 21 new to science. They estimate the total number to be 3000. Hawksworth's paper (1986) included an index of ecological continuity (NIEC), which provides an indication of the ecological continuity of mature deciduous trees based on old-forest indicator lichen species (the index is 0-100, <25 suggesting clear-felling and planting in the last 200 years); the results suggest that the carr woodland at the valley bottom acted as a repository for old-forest lichen, which recolonised the adjacent dry woodland following replanting.

Lichen are an important SSSI feature for the NNR, which have experienced a significant decline since first surveyed in the 1960s. Some causes have been unavoidable but others are directly linked to management such as removal of elder *Sambucus nigra* by previous management regimes; this reinforces that fact that care should be taken to remain aware of the locations of these species and bear them in mind when implementing new management regimes. Edwards (2009) found three RDB species, eight NIEC species in Slapton Wood but reiterated that Slapton Wood was secondary in importance for lichens compared to the willow carr, the Nature Trail

cliff trees and Marsh Lane from Deer Bridge to Ireland Bay.

There are very few records of bryophytes for the site, which is a gap in the data; this is an area for future survey efforts.

France Wood

France Wood is a secondary woodland dating back to the 18th century. It is a mix of broadleaved species including sweet chestnut, oak, ash *Fraxinus excelsior*, sycamore, hazel and holly. It has been subject to a '100 year plan', which originally involved felling and replanting but that changed to allow natural regeneration. This was halted for the 2020 plan.

Southgrounds

Southgrounds copse is a 0.5ha compartment containing a diverse mix of trees and shrubs including hazel, elm *Ulmus sp.*, oak, sycamore, sweet chestnut, birch *Betula pendula*, cherry *Prunus avium*, holly and spindle *Euonymus europaea* as well as herbaceous ancient woodland indicators including moschatel *Adoxa moschatellina* and primrose *Primula vulgaris*. Dormice have been monitored at southgrounds for many years as part of the National Dormouse Monitoring Programme and has seen numbers declining from a high of 15 in 2005 to zero in 2012 (see figure 7). One potential cause that has been suggested is disturbance by dogs; in response to this, a combination of hedge laying and dead hedging along the path started in 2017. The site is linked along the Nature Trail to a known dormouse population at Slapton Bridge so it is thought that when the situation improves, dormice might return.

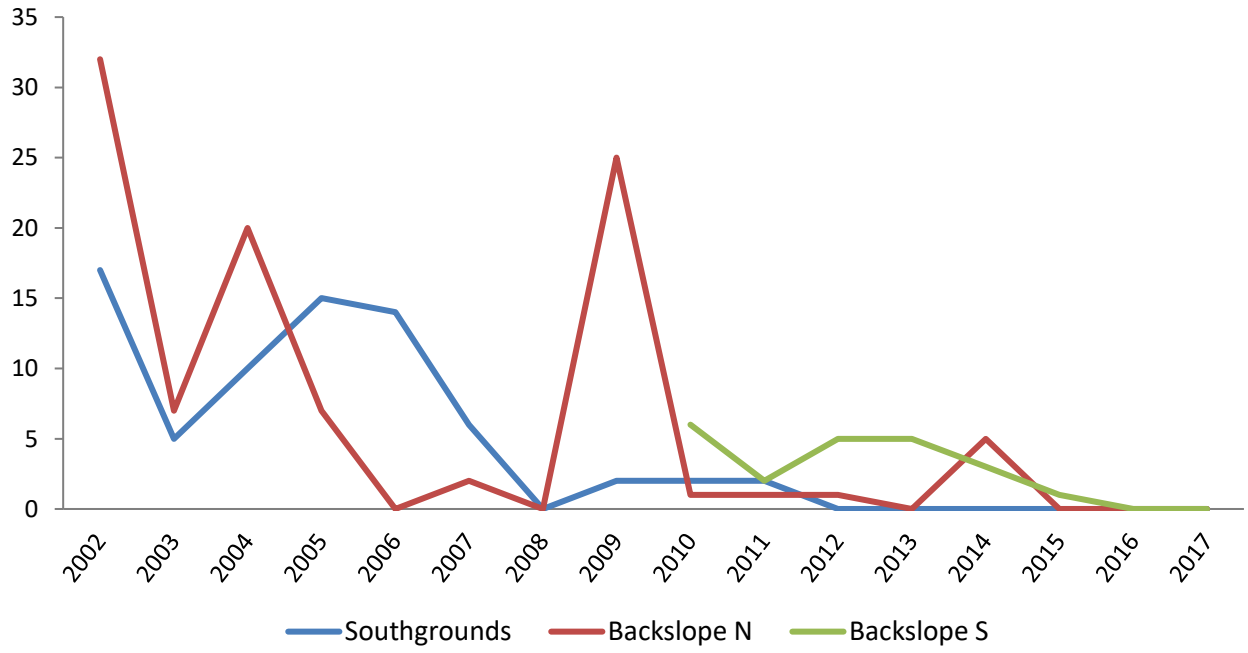


Figure 7. Dormouse signs (dormouse or nest present) from nest box surveys at Southgrounds copse, and the backslopes of the shingle ridge.

4.5.Semi-natural lowland grassland and boundaries

Loworthy fields consist of two areas of grassland that were acquired by Wild Planet Trust in 2004. Hedgelands (3.18ha) and big hill (4.45 ha); (also referred to as big hill/ little hill). The lowland grassland habitat is found in these two areas, which are separated by part of Slapton wood (Loworthy Brake). Big hill is south west facing with scattered scrub, mainly gorse and bounded by woodland, hedgerow and stock fencing. Hedgelands is south facing, sloping down to Slapton wood.

These fields are part of the land holdings of Wild Planet Trust but are situated outside the NNR and SSSI boundaries. This parcel of land also includes an area of rough grassland/scrub and arable land (totalling approx. 2.4 ha), see section 3.6 Arable Farmland (Lower Summer Gaps). In 2010 it was formally included in the lease to Field Studies Council, and consequently the Slapton Ley NNR Management Plan and Higher Level Stewardship Scheme. On acquisition, these fields had a recent management of improved pasture. The management aim for big hill and hedgelands was to increase floristic diversity through the reintroduction of grazing with no fertiliser additions. Four soil scrapes were excavated in hedgelands in an attempt to reduce soil fertility (particularly phosphate) in these experimental plots.

Due to the aspect and location of these fields they were also considered as possible sites for an introduction of the large blue butterfly *Phengaris arion.* Surveys of the ant populations by the University of Sheffield (Guillem, Drijfhout and Martin, 2012) showed the presence of *Myrmica sabuleti*, the required host for the larvae of the large blue and two fenced plots were erected (big hill) to introduce common thyme *Thymus polytrichus*, the other larval requirement.

These activities occurred alongside various attempts to graze the sites, firstly with Dartmoor ponies (2006) and subsequently using a neighbouring grazier's sheep. The grazing prescriptions for the large blue are a short (<3cm) sward to allow the thyme to flourish. The grazing has always been problematic, since the acquisition of the site, due to a lack of control over stocking density and access to preferential grazing species.

The large blue ambitions were discontinued when the thyme failed to establish and the management committee agreed that the site was not ideal for a number of reasons (see various reports). A broader aim of increasing overall biodiversity, floristic and invertebrate primarily, is the current aim.

To this end, the hemiparasitic herb, yellow rattle *Rhinanathus minor,* was introduced to Hedgelands as part of the stewardship prescriptions. This native plant of hay meadows has been used successfully as a restoration tool due to the way it reduces the vigour of competitive grass species, allowing other plants to establish. However, it is not necessarily appropriate for a grazed pasture, since it needs to flower and set seed without grazing. Due to the lack of grazing it has become established and given rise to noticeably diverse patches of forbs.

To increase the areas of scrub and allow development of the lower woodland edge, stock fencing was erected in both fields in 2010. This area in Hedgelands has now become bracken dominated, with few tree saplings evident.

Overall, the grassland requires a grazing regime, preferably using cattle or ponies, where short periods of intensive grazing will not allow selective grazing of certain species. This is especially

the case if using sheep, which will preferentially select certain plants, resulting in an overall reduction in floristic diversity. The historic, extensive grazing by few elderly sheep over prolonged periods has not been beneficial.
Another beneficial management tool would be to take a late summer hay cut followed by aftermath grazing in autumn. This is problematic due to the steep nature of the site making bailing difficult.
Notable species using the grassland are cirl buntings, which nest in the surrounding hedges. The development of invertebrate-rich grassland is key to supporting the summer nesting birds. Dormice occur in the adjacent areas of Loworthy Brake and likely also use the connecting hedgerows.

4.6. Arable farmland

Lower Summer Gaps consists of two arable fields (1.8ha) separated by a hedge, planted when the land was acquired. The land is managed primarily for the benefit of cirl buntings, specifically wintering cirl bunting, as their diets shifts from insectivorous during the summer to granivorous in the winter. Typically, spring cereal crop (containing millet, barley etc.) is sown in April; for many years this was topped in autumn but this practice was halted in 2017 as there was no evidence it had any benefit. Originally, the two fields were alternated, each having a fallow year, but this was changed so that both fields were managed every year. The number of cirl buntings using these fields during the winter has steadily increased, which suggests a growing population within the wider landscape. The arable plant community has never been investigated but this could be another priority feature.

4.7.İmportant plant & animal species

4.7.1. Plants

See Brookes and Burns (1969) for an account of the flora and list of vascular plants. Over 490 species of vascular plant have been recorded, as well as 197 species of mosses and liverworts.

Species	Status	Comments
Strapwort *Corrigiola litoralis*	WCA 8 & RDB (Critical))	One of only two sites in UK.
Prickly Sedge *Carex muricata ssp. muricata*	RDB (CR)	New survey needed to establish status.
Three-lobed Water Crowfoot *Ranunculus tripartitus*	RDB (V)	New survey needed to establish status.
Convergent Stonewort *Chara connivens*	RDB (Endangered)	Noted as rare in 2018 survey.
An aquatic macrophyte *Ceratophyllum submersum*	RDB (V)	Only site in Devon. New survey needed to establish status.
Many-fruited Beardless-moss *Weissia multicapsularis*	RDB (CR)	New survey needed to establish status.
Cryptolechia carneolutea	RDB (V)	Lichens surveyed by NE, most recently 2012
Parmelina quercina	RDB (V)	New survey needed to establish status.
Southern Grey *Physcia tribacioides*	RDB (E)	New survey needed to establish status.
Golden-hair Lichen *Teloschistes flavicans*	RDB (V)	New survey needed to establish status.

4.7.2. Birds

BOCC and other key species related to Slapton habitats
UK population figures taken from British Birds 2013- Musgrove et al.
Wildfowl population estimated using standard BTO field survey protocol- full survey in 2012.
BOCC – Birds of Conservation Concern BAP – Biodiversity Action Plan
SPEC – Species of European conservation concern

BREEDING BIRDS			
Species	Population Size	Status	Comments
Cetti's warbler *Cettia cetti*	38 territories (2018)	SSSI Feature	1.8% of UK population (2009).UK population now over 2,000 prs. SSSI feature figure from 2009 should be amended.
Cirl bunting *Emberiza cirlus*	3prs (2018) Up to 6prs have bred and wintering population 25 birds 2017/18.	BAP priority	Breeds around reserve - numbers have increased.
Linnet *Linaria cannabina*	Nesting in various places but pop'n size unknown	BAP Priority	Added to Red list in 2010
Aquatic warbler *Acrocephalus Paludicola*	Passage only	Globally threatened	Site may be important staging post on migration. However, Rarely seen.
Garganey *Spatula querquedula*	1 pair 2013	SPEC BAP priority	Irregular nesting
Tufted duck *Aythya fuligula*	Max summer count - 53 birds (2018) Max. winter count- 321(2018)	SPEC	2012 survey
Little Egret *Egretta garzetta*	1 pair	BAP priority	Nested 2011 - possibly still breeding in heronry
Reed bunting *Emberiza schoeniclus*	c.8 prs	BAP priority	Last count 2005

NON-BREEDING BIRDS			
Habitat: Reedbed/fen			
Marsh harrier *Circus aeruginosus*	1-2 passage/winter	**Amber** for both breeding and Wintering. Regional importance	Spring/autumn passage only. No breeding records.
Bittern *Botaurus stellaris*	Possibly bred 1998	BAP Priority	May nest again if UK population Increases. Regular winter visitor.
Kingfisher *Alcedo atthis*	Last confirmed nest 2002	SPEC BAP priority	Regional importance. Regularly seen all year round
Hirundine roost	2,000 peak count (2016)	SSSI feature (passage bird assemblage) Regional and national importance	Very variable each year.3rd top UK site (2002) but declining strongly.
Habitat: Open water Winter populations (Average of peak counts last 5 yrs (mainly late summer and winter peaks)			
Mallard *Anas platyrhynchos*	c. 65 (315 in summer - 2016)	SSSI assemblage. Regional importance.	Wildfowl numbers considerably lower than 20 years ago, apart from the winter of 2013-14 when water crowfoot rafts attracted peak numbers.
Pochard *Aythya ferina*	c. 20 (2016)	SPEC SSSI assemblage	Wildfowl numbers considerably lower than 20 years ago, apart from the winter of 2013-14 when water crowfoot rafts attracted peak numbers.
Shoveler *Anas clypeata*	5	SPEC SSSI assemblage. Regional importance.	
Wigeon *Mareca penelope*	c.50 (2016)	SSSI assemblage. Regional importance.	
Teal *Anas crecca*	c. 12 (2016)	SSSI assemblage	

OTHER SPECIES OF REGIONAL IMPORTANCE			
Species	Population Size	Status	Comments
Great crested Grebe *Podiceps cristatus*	c.7 breeding prs. (2016)	SSSI assemblage	Regional importance. 2012 survey
Grey heron *Ardea cinerea*	4prs	SSSI assemblage	Regional importance. Stable colony
Mute swan *Cygnus olor*	6prs bred 2017. Up to 70 non-breeders present in spring.	SSSI assemblage	Regional importance. 2012 survey
Coot *Fulica atra*	c.13 breeding prs. (winter count 354 (2016))	SSSI assemblage	Regional importance (main Devon breeding site) plus important winter numbers.
Water rail *Rallus aquaticus*	c. 12 breeding prs.	SSSI assemblage	1% UK 2012 survey

4.7.3. Mammals

Species	Status	Comments
Common Dormouse *Muscardinus avellanarius*	WCA 5, EPS & RDB (Red)	Woods and shingle ridge gorse
Otter *Lutra lutra*	WCA 5, EPS & RDB (Red)	See Riley (1996) for a review of the work on otters spraint counts
Bats – Lesser Horseshoe *Rhinolophus hipposideros* Greater Horseshoe *Rhinolophus ferrumequinum* Noctule *Nyctalus noctula* Barbastelle *Barbastella barbastellus* Bechstein's *Myotis bechsteinii* Daubenton's *Myotis daubentonii* Common pipistrelle *Pipistrellus pipistrellus* Soprano Pipistrelle *Pipistrellus pygmaeus* Nathusius' Pipistrelle *Pipistrellus nathusii* Whiskered *Myotis mystacinus* Brandt's *Myotis brandti*	4 bats on Annexe II of the EU Habitats directive - All other bats are listed on Annex IV	Legally all bat species are EU protected.

4.7.4. Invertebrates

Invertebrate groups best represented in records for the reserve are probably the Lepidoptera (thanks to the use of light traps) and the freshwater invertebrates. Studies on the latter have been made by Lamont (1985), Smith (1990), and Chatfield (1972) *inter alia*. Odonata are also well represented with 18 species recorded including the uncommon Hairy Dragonfly *Brachytron pratense*.

The Invertebrate Site Register lists 88 species for Slapton Ley, comprising 1 vulnerable, 7 rare, 2 notable A, 39 nationally scarce and 28 local, with a further 11 species needing further information on either status at Slapton, or status of the species.

The area (NNR and environs) is very rich in oribatids (moss mites) with 100 species recorded in 1996 This is 32% of the known oribatid fauna of the British Isles, and includes 6 species newly recorded in Britain. Recent surveys have been done by Boyce (2017) and Clark and Beccaloni (2018 as shown in table below.

Key species are listed below:

Species	Status	Comments
A Rove Beetle *Actocharis readingii*	Red Data Book	Found on Shingle Ridge 2017
A Rove Beetle *Ocypus fotrunatorum*	IUCN Threatened	Found on Shingle Ridge 2017.
Malachite Beetle *Clanoptilus marginellus*	IUCN Near Threatened	Found on Shingle Ridge 2017.
Pollen Beetle *Brachypterolus antirhini*	Red Data Book	
Smooth Ram's Horn Snail *Planorbis laevis*	IUCN Red list. Red Data Book	No recent records. New survey needed.
Shining Rams Horn Snail *Segmentina nitida*	UK BAP Priority species	Unsubstantiated and no recent records. New survey needed.
A millipede *Anthogona britannica sp nov*	Nationally Rare Endemic	Recorded Slapton Wood in 1992. New to science when found at Slapton. New survey needed.
A spider *Rugathodes instabilis*	Nationally Scarce	Recorded in 2014 in Slapton Wood.
Jersey Tiger Moth *Euplagia quadripunctaria*	Nationally Scarce	Recorded Slapton Wood in 2014.

Biological data for the NNR is held both at the field centre both electronically and in the research library; iRecord is used to record casual records and sightings.

5. Stakeholders & engagement

5.1. Stakeholders

The Field Studies Council is committed to having good working relationships with neighbouring landowners and tenants work closely with key statutory bodies, conservation organisations and other interested parties to maintain the conservation integrity and natural features of the National Nature Reserve.

Stakeholder	Interest
Wild Planet Trust Totnes Road Paignton TQ4 7EU 01803 697513	• Owner of Slapton Ley • Financial contribution towards management • Overseeing management of SSSI and associated features. • Collaborating to achieve management of Countryside Stewardship Agreement.
South Hams District Council Follaton House Plymouth Road Totnes Devon TQ9 5NE 01803 861234	• Management of AONB • Shingle Ridge leased from SHDC by FSC. • Beach Warden funded by SHDC (managed by FSC). • Management of Beach safety (through RLNI) • Provision and maintenance of 2 car parks. • Maintenance of car park toilets. • Provision of Dog Warden service. • Coastal defence of Car parks. • Agreed signage.
Devon County Council County Hall Topsham Road Exeter Devon EX2 4QD	• Highways-Torcross to Strete Road (A379)
Natural England Ground Floor Stirling House Dix's Field Exeter EX1 1QA 0300 0603900	• Overseeing management of SSSI and associated features. • Overseeing management of Countryside Stewardship Agreement. • Catchment sensitive farming • FSC facilitation of NE workshops

Environment Agency South West Office Manley House Kestrel Way Exeter EX2 7LQ 0370 8506506	• Water quality of Slapton Ley catchment.
Devon Birds	• Lease of Bird Ringing hut. • Bird ringing and ornithological recording of Ley.
Stokenham Parish Council	• NNR located within Parish. • Management of duckery and leyside path.
Slapton Parish Council	• NNR located within Parish.

5.2. Visitors

5.2.1. The visitor experience

Shingle ridge
Excellent panoramic views around the bay. Long-distance footpath from Torcross to Strete Gate runs along the stretch of ridge between the road and the Ley (backslope) allowing views of both the higher and lower Ley. Although not an official path, visitors can also walk along parts of the shingle ridge between the road and the sea allowing views of sea. Along the ridge there is an enclosed area of 2500m² which protects the weakest parts of the shingle ridge. Here visitors walk on a narrower section. The walkways on both sides of the road run through various shingle ridge habitats with yellow-horned poppy, sea holly *Eryngium maritimum*, gorse *Ulex sp.* and other typical flowers.

Nature Trail
Popular and varied circular walk from Slapton Bridge to Slapton Village via fringe of the Lower Ley and wet woodland. Allows views of open water, reed beds, coppice woodland, wet meadow and woodlands. Flowers and birds to see all year round. Some sections are steep and not suitable for all abilities

Strete Gate
Small woodland and scrub habitat with picnic area. Raised viewpoint with great views of Start Bay looking south to start point. Trails around woodland narrow and uneven include steps so not all accessible. Picnic area on relatively level ground (not flat) so has potential to be more accessible.

Hides, viewpoints and interpretation

There are several hides, viewpoints and interpretation areas. The most easily accessible is the Torcross bird hide, this hide overlooks the open water of the lower ley with waterfowl always in view. Other hides and viewpoints provide panoramas across other areas of open water or reed beds but require walking a short distance to get to them. There are interpretation points at all bird hides and at the fisherman's hut at the entrance to the nature trail at Slapton Bridge.

5.2.2. Existing visitor numbers, profile and trends

Car park usage from 2014 to 2018

Yearly pattern of pay and display tickets issued at 4 carparks on Slapton sands. There are factors affecting this data including pay and display machines being broken (summer of 2015/2016) which clearly skew the results and the 2018/19 data are only up to October 2018.

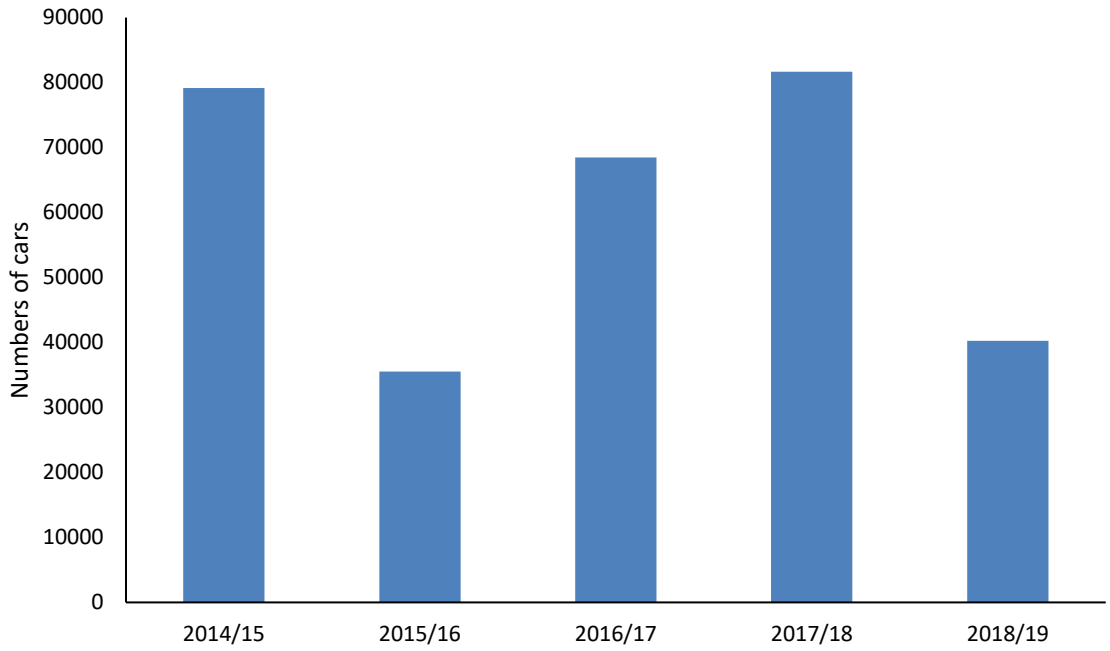


Figure 8. Total car park usage across all car parks 2010 – 2019. Taken from tickets issued.

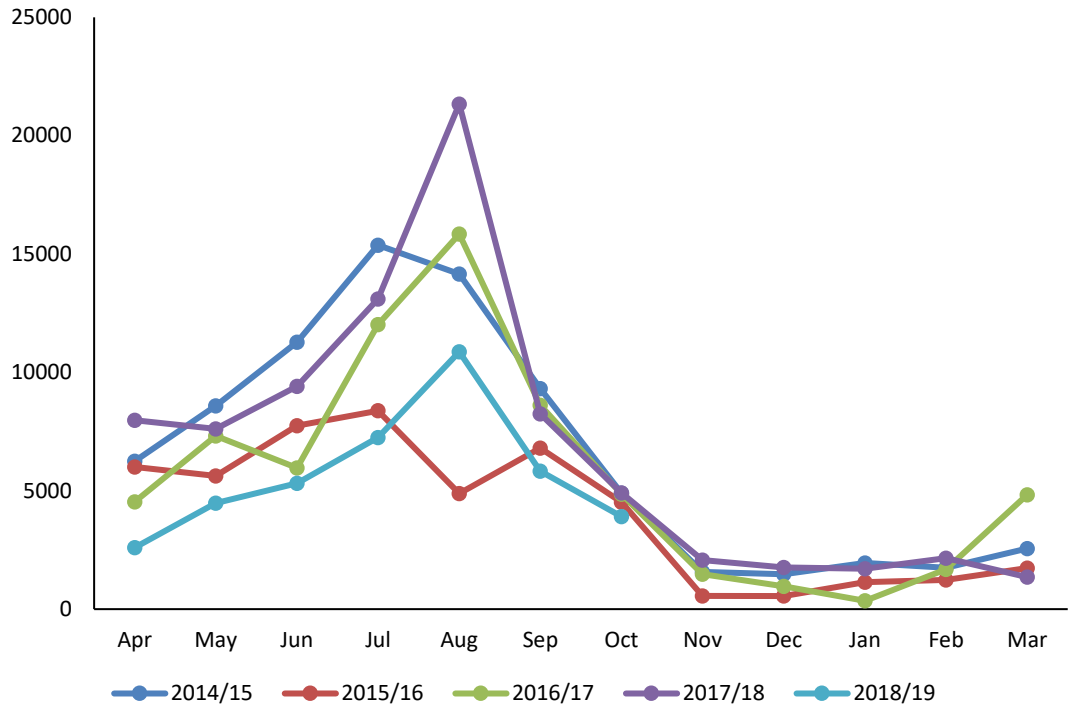


Figure 9. Car park usage over a 12-month period across years**.**

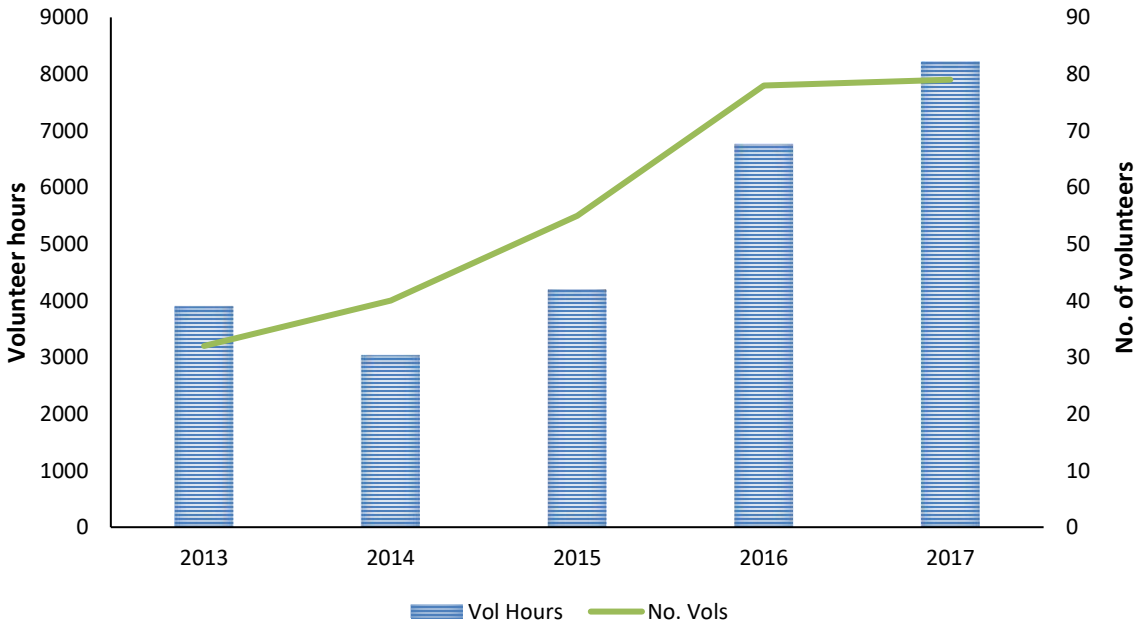


Figure 10. Volunteer numbers and hours 2013 - 2017

5.2.3. Visitor facilities

Information for visitors can be accessed through the information trailer during summer holidays, which is manned by volunteers, and through informal visitor contact by reserve staff and volunteers

Details of all visitor facilities are given in the tables below. Accessibility is shown where easily accessible by both car and bus. The majority of site is not accessible by visitors with mobility issues especially wheel chairs.

Asset	Comments
Torcross bird hide	Built 2003, renewed 2010; Wheelchair and accessible via ramp
Stokeley bird hide	Built 1993 – rebuilt 2013; Not wheelchair accessible: unsurfaced path and stairs
Ireland Bay hide	Built 2013; Accessible from Nature Trail
Slapton Bird Observatory	Responsibility of DEVON BIRDS
Fishing hut at Slapton Bridge	Formerly a Lime Kiln, stone built and extended. Refurbished 2004 and used for storage of sundry items.
Interpretation points and signage	
Fisherman's Hut interpretation shelter	
Torcross bird hide	
NNR Signage on A379	
Welcome to NNR signage on entrances to NNR	
Board walks	
150m from nature trail to marsh lane	
Short elevated section along ley shore	
Pond Dipping Platform	
Seating	
Horseshoe benches at fisherman's hut (c.2014)	
Horseshoe benches at Strete gate (new 2018)	

Horseshoe benches butterfly glade on Nature trail	
Benches along Nature trail x 2	
Viewpoints for visitors	
South Grounds Viewpoint	
Ireland Bay Carved hand rail viewpoint	
Observation platform – Slapton bridge	Access from Slapton Bridge
Slapton Bridge (unofficial view point looking both N and S)	
Pond Dipping platform	

Car parks	Responsibility for maintenance
Small carpark at Slapton Bridge capacity 6 cars	FSC
Torcross tank	SHDC
Torcross layby	SHDC
Memorial	SHDC

5.3. Volunteers

SLFC has a large volunteer resource, which has been growing steadily. Broadly, the volunteer workforce can be broken down into three groups:

- Contribute to the practical conservation work on the NNR and maintenance of the reserve infrastructure (Weds).
- Carry out monitoring and do small-scale maintenance and occasionally practical conservation tasks (Tues).
- Individual volunteers, whose responsibilities include bird surveys, garden maintenance and practical work.

FSC also recruits between one and two residential volunteers for the summer who help with public engagement, running and organising events and practical conservation work. These volunteers are managed by the Volunteer Coordinator but also work closely with the NNR Ranger. Volunteers are given training where appropriate, which has included providing external brush cutter qualifications, external monitoring courses and internal wildlife identification courses. Developmental roles also include close working with staff, which increases confidence, knowledge and skills.

5.4. Education use of Slapton Ley NNR

The Field Studies Council (FSC) field centre in Slapton village is a route to achieving the FSC's aim of bringing environmental understanding to all. The field centre currently hosts approximately 30,201 visitors annually on residential and day educational visits. Many of these visitors will visit locations on the NNR as part of their courses delivered by experienced FSC tutors or associates. The areas currently used regularly as field sites where visitors are taken to illustrate aspects of biology, geography, environmental education and similar subjects are within Slapton Wood and along the Shingle Ridge, Slapton Ley and Slapton Wood Stream.

The majority of groups investigating areas on the reserve are A-level students. Quantitative data collected by these students at sites includes flora and leaf litter invertebrate taxa and abundance in Slapton Wood and flora taxa and abundance and associated environmental factors on the Shingle Ridge.

Throughout the duration of this plan, fieldwork sites and their uses may vary; use of sites in Slapton Wood are rotated to allow time for sites to recover from disturbance, the managed areas of back slope on the Shingle Ridge will be used and other sites within the NNR may be used on an occasional basis.

The educational use of sites on the NNR has resulted in a pool of data collected in these areas and used by students in follow up work, but could be used for additional purposes in the future. There is scope to use student data in a similar capacity to Citizen Science projects with a

significant amount of data collected that could illustrate patterns or changes in habitats on the reserve.

Other visitors using areas of the NNR for education include university groups (mainly undergraduates), key stage 2, adult courses and placement students collecting data for specific projects. This range of visitors has contributed to the wealth of anecdotal and quantified knowledge of the NNR.

5.5. Research at Slapton Ley NNR

The purpose of research on SLNNR is intended to inform and evaluate the management of the NNR and education programmes delivered on the NNR. Coordinating all research projects is the responsibility of a PhD placement student joint funded by FSC and Exeter University. This role involves liaising with universities and students interested in carrying out research as well as encouraging research by promoting opportunities. A list of research priorities is held by the FSC.

B. CONSERVATİON MANAGEMENT

Section B outlines what positive aims we hope to achieve over the period of the management plan: these are the 'Management Outcomes'. The 'Management Actions' describe how these will be achieved. The 'Monitoring indicators' show the success criteria that will be measured throughout the period of the plan. For details of the monitoring method and target parameter details for the performance indicators see the relevant monitoring protocols and reports held in the FSC databases.

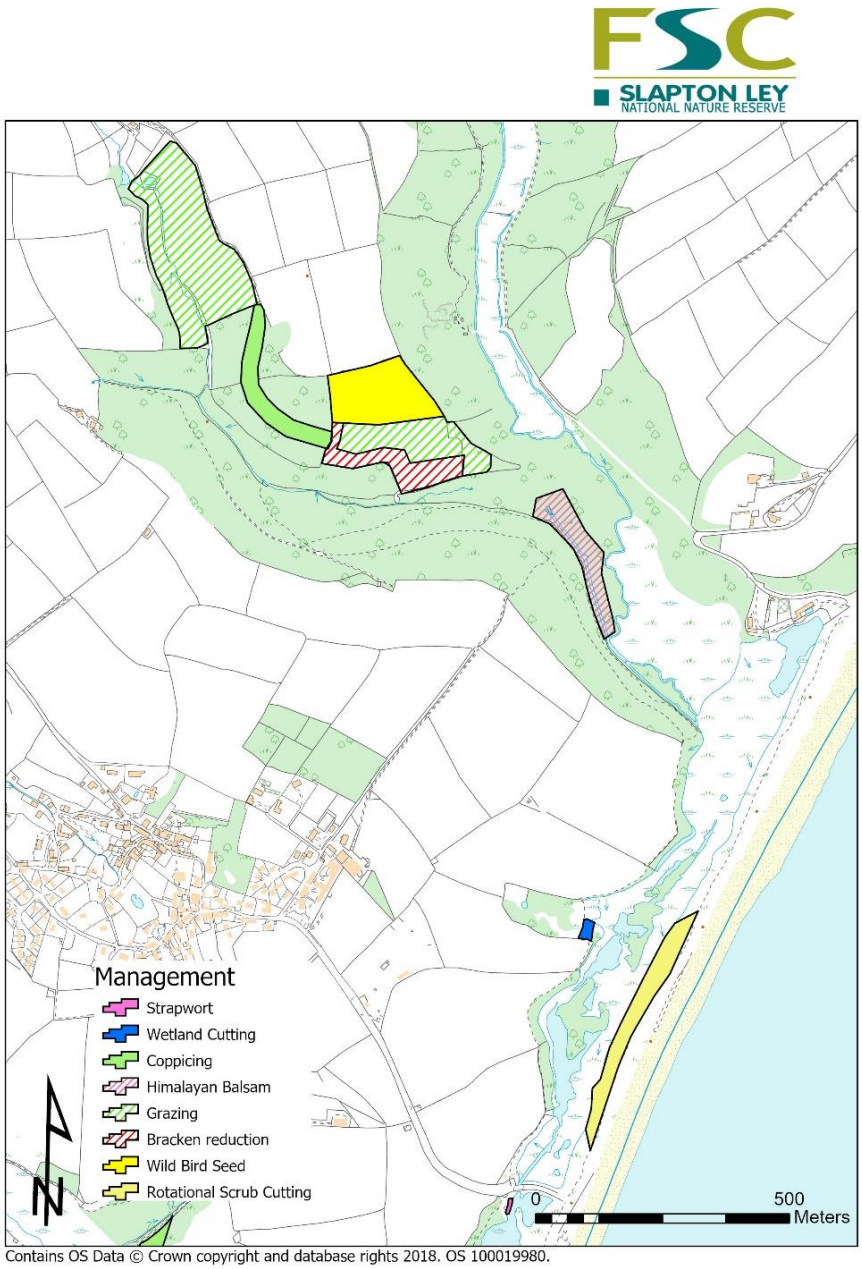


Figure 11a. Sites of active management (North).

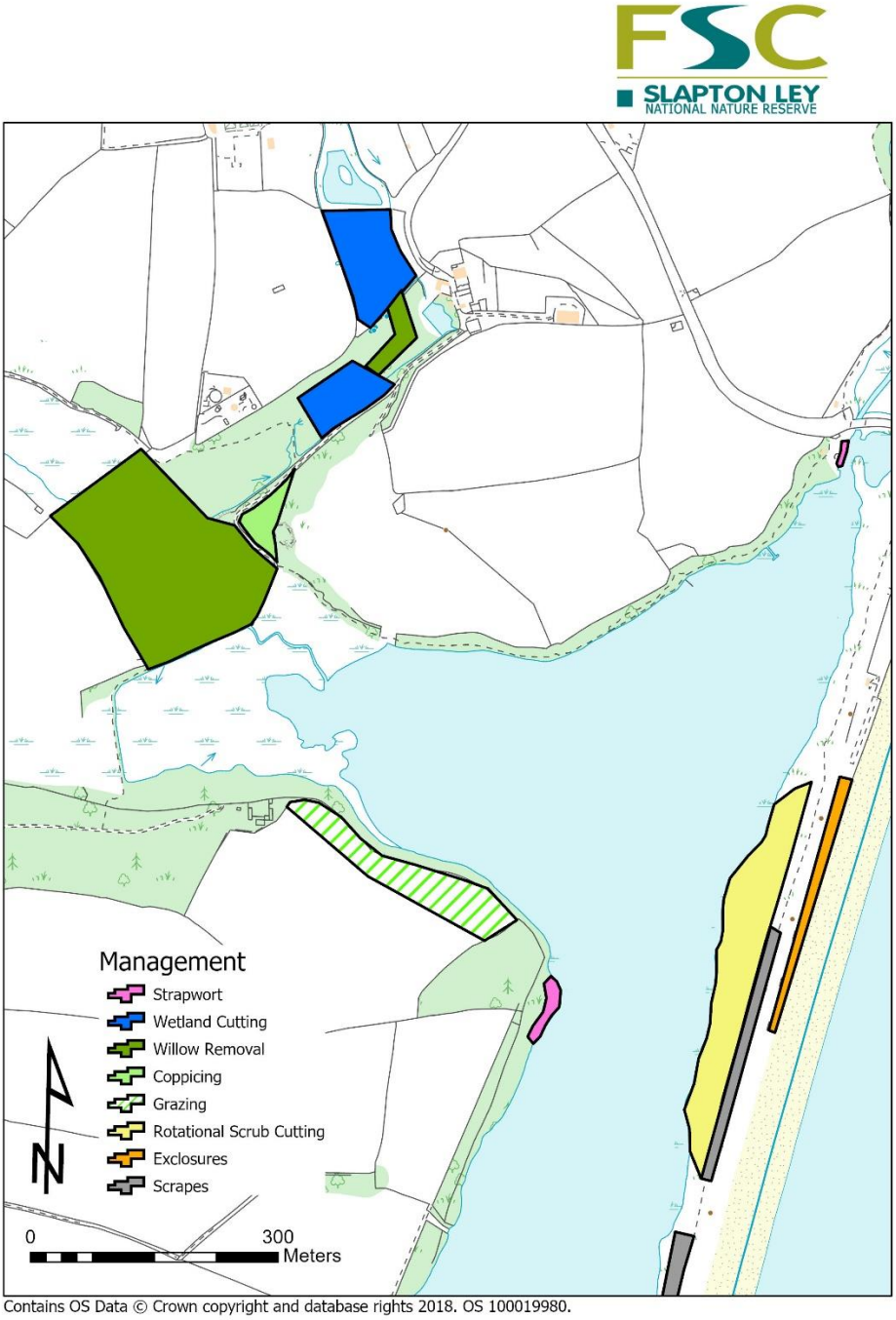


Figure 11b. Sites of active management (Reserve centre).

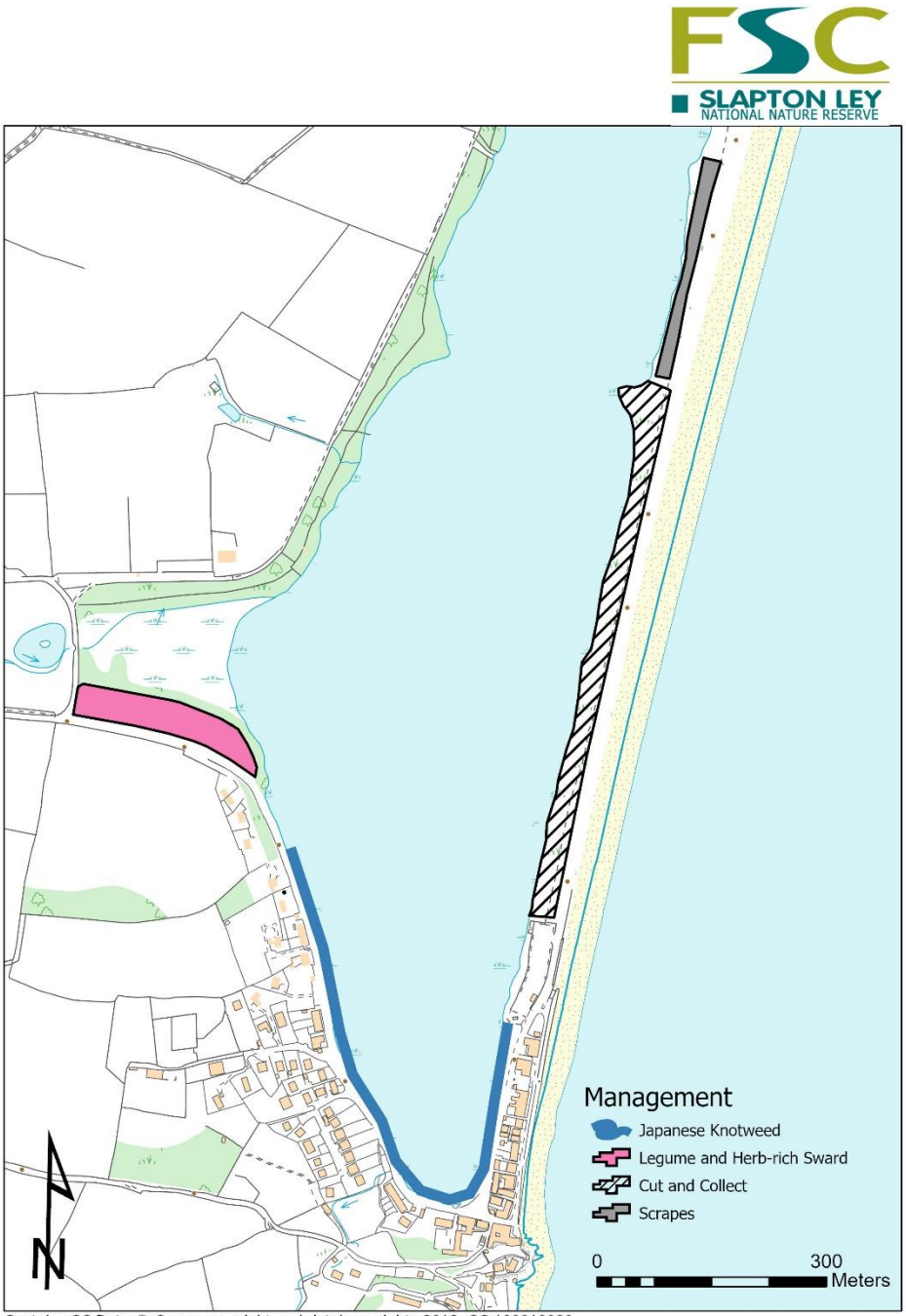


Figure 11c. Sites of active management (South).

6. Habitat management: key habitats, associated species and management outcomes and actions

6.1. Freshwater lagoon

Extent: 66.6ha

Vision: The freshwater lagoon of the lower ley will have a macrophyte assemblage containing a stable population of *Chara connivens* and reduced blooms of *Elodea spp.* and cyanobacteria. During summer, falling water levels will expose the margins of the ley, which will support a stable population of strapwort *Corrigiola litoralis* as well as other species associated with the drawdown zone. The breeding and passage/wintering bird assemblages will be in favourable condition.

Associated Features	Designation
Strapwort *Corrigiola litoralis*	SSSI; nationally important
Convergent Stonewort *Chara connivens*	RDB (Endangered); IUCN Vulnerable; BAP
Breeding bird assemblage	SSSI; Nationally important; BAP; Regional importance
Non-breeding and passage bird assemblage	SSSI; Regional importance.
Otter	Annex IV; SSSI; BAP.
Fish Populations	

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.1.1	Maintain 100m^2 of favourable habitat (bare, disturbed substrate at the start of the growing season) for strapwort at the **boat mooring** from year 1 of the plan to year 10	Hand-pull the summer's vegetation growth and heavily disturb 100m^2 of shingle substrate with mattocks at the boat mooring (SX 82781 44330)	Annual presence of flowering strapwort plants at two sites within the NNR.	SSSI	Work with Natural England & Environment Agency

6.1.2	Maintain 75m^2 of favourable habitat (bare, disturbed substrate at the start of the growing season) for strapwort at **Hartshorn**.	Allow cattle access to the ley at the Hartshorn site (SX 82414 43649) between September and March.			
6.1.3	Increased area of favourable habitat for strapwort at Hartshorn from 75m^2 to 150m^2 by year 10 of the plan.	Fell and grub out 200m^2 of ley-side trees south of the current Hartshorn site and extend fencing to allow cattle access.			Extent dependent on funding.
6.1.4	Eradication of Japanese knotweed *Fallopia japonica* from the NNR.	Treat Japanese knotweed at Torcross twice a year (June and September) until eradicated	Annual survey: decreasing extent of Japanese knotweed	CS	
6.1.5	Improve water quality by measurable reduction in nitrate and phosphate in water bodies. Water Framework Directive targets for the ley are: Total Phosphate (TP): <39µg/l Total Nitrate (TN): 1.5mg/l Summer pH <9	Work with external partners to improve water quality to enhance invertebrate, fish and charophyte populations. Run workshops/seminars to share data information on water quality.	• Water quality at Torcross weir. • Annual monitoring of fish populations. • Annual macrophyte surveys	SSSI	Work with Natural England, West Country Rivers Trust.

6.2. Terrestrial wetland communities: reed swamp, tall herb fen and fen meadow

Extent: 37.1ha

Vision: Little Marsh will show a reduction, over the duration of this plan, in terrestrial plants such as bramble, bracken, nettles, bittersweet, hairy willowherb and bindweed in favour of S24 indicators hemp agrimony, meadowsweet, marsh bedstraw, water mint, purple loosestrife, gypsywort, wild angelica and marsh woundwort. At Southgrounds, species-rich fen meadow communities will dominate the series of wet meadows along Slapton Stream. Small scrapes will provide habitat for a wide variety of invertebrates, amphibians and birds.

ASSOCIATED FEATURES	DESIGNATION
Breeding bird assemblage	SSSI Feature
Non-breeding and passage bird assemblage	SSSI Feature
Otter	Annex IV; SSSI; BAP.
Bat assemblage (incl. barbastelle)	EU Habitats directive annex II & IV

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.2.1	Little Marsh Restoration of 0.2 ha to S24 by year 10 of the plan.	Small-scale late-summer reed cut and grazing by cattle (excluded from May to August).	Increased representation of NVC S24. One survey by 2029. Indicators of OV26 and S26: great hairy willowherb *Epilobium hirsutum*, stinging nettle *Urtica dioecia*, bindweed *Calystegia sepium* and bittersweet *Solanum dulcamara*) only occasional or rare. Indicators of S24: purple loosestrife *Lythrum salicaria*, yellow flag *Iris pseudacorus*, and	CS	

			meadowsweet *Filipendula ulmaria*) frequent or abundant.		
6.2.2	Southgrounds fen meadows: Increase plant and invertebrate diversity in 0.35ha of fen meadow.	Cut and remove at least 0.35ha of Southgrounds wet meadows annually.	Baseline NVC survey to inform monitoring parameters. Walkover surveys for indicator species.	CS	NVC community and associated indicator species to be established in 2019.
6.2.3	Increase extent and connectivity of Southgrounds fen meadows	Remove 0.35 ha of willow scrub between Southgrounds upper and lower fen (SX822444).	GIS mapping/ Aerial photography	CS	CS Capital item: must be completed and invoiced before end of second year of agreement.
6.2.4	Increase extent of reedbed in the **Start marshes** by 0.7ha.	Reduce willow cover in the Start marshes reedbed (SX 819 442) from 20% to 10% (I.e. removal of 0.7ha of willow scrub) in the first two years of the plan.	GIS mapping/ Aerial photography	CS	CS Capital item: must be completed and invoiced before end of second year of agreement.

6.3.Semi natural broadleaved woodland

Extent: 64ha

Vision: The mature high forest of Slapton Wood's south valleyside and France Wood will be characterised by humid, shady conditions containing abundant standing and fallen dead-wood, favouring non-vascular plants, saproxylic invertebrates, bats and birds. Ancient woodland indicator plants will be abundant on the woodland floor. The secondary woodland of Slapton Wood's north valleyside will contain open glades and sunny rides, with abundant nectar sources used by bees, hoverflies, butterflies and other thermophilic invertebrates.

Southgrounds copse will be a prime example of managed ancient woodland demonstrating how woods have been managed historically and why this form of mangement is beneficial for wildlife: a mosaic of varying structure with open flower-rich areas and dense scrub under well-developed oak standards.

The carr woodlands of Southgrounds, Slapton Wood and Higher Ley, maintained as non-intervention, allowing natural processes to continue.

ASSOCIATED FEATURES	Designation
Dormouse	SSSI Feature
Bat species	SSSI Feature
Lichen assemblage	SSSI Feature

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.3.1	Southgrounds Copse Structural diversity including open glades and high-density understorey suitable for dormice.	Coppice 0.07ha every other year at Southgrounds and expand regime into sweet chestnut-dominated area, leaving oaks as standards. Hedges to be laid alongside the path when coppicing path-side coupes.	Dormice present by end of management plan; Butterfly abundance increased by 10% on 2019 baseline by end of plan.	CS	
6.3.2	Larch absent from **Slapton Wood** by year 5 of the plan	Removal of 1-2 larch trees from Slapton Wood annually.	Larch survey in year 6 to confirm absence	CS	

	to reduce risk of *Phytophthora ramorum*.				
6.3.3	Develop a mosaic of varying structure with open flower-rich areas and dense scrub under well-developed oak standards.	Coppice 200m^2 every other year alongside Loworthy Brake main ride; strim 'zone 1' annually	Dormouse present and butterfly abundance increased by 10% from start of plan	CS	
6.3.4	Reduce extent of Himalayan balsam in Slapton stream and Gara catchments by 10% by end of plan.	Pull Himalayan balsam before plants have set seed annually.	Survey extent at years 5 and 10, reduction of 10%	CS	

6.4. Semi natural lowland grassland and boundaries

Extent: 10.9ha

Vision: Loworthy fields: Hedgelands, Big Hill and Little Hill will be excellent examples of florally diverse, invertebrate rich, semi-natural grass pasture with a diverse structure that attracts abundant invertebrates on which cirl buntings feed throughout the summer. Nesting cirl buntings will also occupy the dense scrub and hedges that surround the fields. The connectivity created by these large hedges will allow colonisation by dormice and will be used by greater horseshoe bats, which will forage in the fields.

ASSOCIATED FEATURES	DESIGNATION
Cirl bunting	BAP; red list
Bat assemblage (including greater horseshoe)	EU Habitats directive annex ii & iv

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.4.1	**Hedgelands**: Increase in vascular plant species diversity by year 10. Target of MG5 (NVC). Maintenance of invertebrate population.	1) Early spring and late summer grazing by livestock (cattle and sheep). An occasional late-summer hay cut may be taken to reduce thatch. 2) Remove fence line to allow scrubby margins to be grazed.	Annual butterfly survey; standard JNCC site assessment monitoring survey; cirl bunting territory mapping	CS	NVC community and indicator species to be assessed in 2020
6.4.2	Reduction of bracken cover in **Hedgelands** by 80% (0.25ha to 0.05ha) by year 10	Cut bracken in Hedgelands using BCS mower and/or brushcutter and remove cuttings before senescence	Survey using GPS or aerial photography	CS	
6.4.3	**Big Hill**: Increase of diverse scrub cover by 0.75ha	Install 650m of stock fencing; plant 0.75ha of scrub/hedge species.	Farmland breeding bird survey focusing on cirl buntings.	Mitigation SDDC	

6.4.4	**Little Hill:** Prevent further scrub encroachment and improve sward structure and diversity	Install gate and culvert to allow reintroduction of grazing to Little Hill.	Farmland breeding bird survey focusing on cirl buntings.	CS	CS Capital item: must be completed and invoiced by second year of agreement.

6.5. Arable farmland

Extent: 1.8ha

Vision: Lower Summer Gaps managed as an arable field will have a diverse community of arable weeds. Left uncut in the winter, it will provide forage for a range of farmland birds including cirl buntings and linnets. Peaseditch will contain a sward rich in flowering plants during the summer, utilised by a wide range on invertebrates.

ASSOCIATED FEATURES	DESIGNATION
Cirl Bunting	SSSI feature
Linnets	BAP; red list

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.5.1	**Lower Summer Gaps** arable fields (SX 8252 4594) used by wintering cirl buntings.	Sow crop of wild bird seed at Lower Summer Gaps in April; do not plough until following March	Mean number of cirl buntings at winter visit not below 10 and stable or increasing over period of plan. Method: Monthly counts of winter passerine use.	CS	
6.5.2	**Peaseditch** (SX 8187 4267) to contain a sward rich in flowering plants, providing food source for invertebrates.	Establish a mixed sward of grasses, legumes and herbs and wildflowers in the first 12 months of the agreement. The sward to be managed by annual cutting and/or grazing.	Bumblebee transect	CS	

6.6. Coastal vegetated shingle

Extent: 31.7ha

Vision: The ridge crest is managed to conserve the nationally important plant and invertebrate communities; using exclosure plots, visitor footfall is harnessed to create an optimal mosaic of bare shingle, short sward and long vegetation. These exclosures extend on to the seaward face encouraging pioneer plant species to develop. The gorse and blackthorn scrub on the backslope will have a diverse structure, managed to maintain an early successional stage for cirl buntings, cetti's warbler and dormice as well as open areas for reptiles, ground flora and invertebrates. The open areas of the backslope will resemble the ridge crest, with a patchy, short sward of diverse specialist plants amongst some longer tussocky vegetation.

ASSOCIATED FEATURES	DESIGNATION
Cirl bunting	BAP
Cetti's warbler	SSSI; national importance
Linnet	Red list
Dormouse	Annex IV; BAP
Vascular plant assemblage	SSSI
Invertebrate assemblage	National importance

MANAGEMENT OUTCOMES		MANAGEMENT ACTIONS	MONITORING INDICATORS	PRIORITY	NOTES
6.6.1	**Backslopes**: No closed-canopy sycamore by year 10. Dormice and breeding cirl bunting present.	Clear up to 0.3 ha of mature scrub before the end of 2021 (funded as capital works); from 2022, clear 300m^2 of sycamore/over mature scrub from the back slope annually.	Maintain presence of breeding dormice, cetti's warbler, cirl bunting and linnet. Method: Dormouse nest box survey; breeding bird survey.	CS	Funding is available through CS to clear up to 0.3ha in the first two years. A claim needs to be submitted before the end

					of the second year.
6.6.2	**Backslopes**: Reversion of 0.5ha of *arrhenatherum elatius* grassland to *Festuca rubra* community.	Cut *at least* 0.5ha of grassland (at SX 8250 4308) and remove cuttings.	Positive indicator species (including *Festuca rubra*, *Echium vulgare, Daucus carota, Tripleurospermum maritimum, Silene uniflora*) to be *at least occasional* by year 10 of the plan. No scrub encroachment. Method: Annual vegetation survey; Invertebrate survey at years 5 and 10 of the plan)	CS	
6.6.3	**Ridge crest:** 0.5ha of dynamic mosaic comprising bare shingle, pioneer community, short-sward, species-rich grassland and rank vegetation.	Maintain a 250x20m exclosure along the ridge crest south of the memorial carpark extending on to the seaward face; this will be altered to form a series of 6 10x15m exclosure plots along the ridge crest at roughly year five of the management plan	Increase indicator (pioneer) species on the seaward face (*Glaucium flavum, Crambe maritima, Calystegia soldanella, Euphorbia paralias* etc.) from *absent* to *present*; on the ridge crest, increase the area of vegetated ground relative to bare shingle. Method: Annual vegetation survey; Invertebrate survey at years 5 and 10 of the plan.	CS	

	0.4 ha of pioneer community vegetation by year 10.	Create one 20x20m scrape per year to a total of 10 scrapes by year 9 of the plan. Create two 4x100m scrapes at year 1 and 5 of the plan.	Increase positive indicator species (Echium vulgare, Daucus carota, Tripleurospermum maritimum, Silene uniflora, Glaucium flavum, Calystegia soldanella) from rare to at least occasional; negative indicators (*Dactylis glomerata* and *Raphanus raphanistrum*) from *dominant* to *at most occasional.* Method: Annual vegetation survey; Invertebrate survey at years 5 and 10 of the plan	Mitigation	

7. Stakeholder management

7.1. Key stakeholders

Actions needed to build and retain support from key stakeholders.

Stakeholder	Actions
Wild Planet Trust	Report to Wild Planet Trust and FSC trustees at Slapton annual meeting and land management sub-committee 2 times per year.
South Hams District Council (SHDC)	• Contribute to AONB websites and newsletters, incl. Slapton Lines. • Regular review with SHDC over car park issues, via Land Management subcommittee and ensure annual report and car-parking data are received. • Report to Land Management Sub-Committee 2 times per year. • Work with AONB and provide /contribute information to websites.
Devon County Council County Hall (DCC)	Work with Highways department to clear shingle blocking Torcross outfall.
Natural England	• Support implementation of Diffuse Water Pollution Plan (DWPP). • Attend annual committee meeting when relevant. • Sign off Slapton Ley NNR management plan.
Environment Agency	• Support implementation of Diffuse Water Pollution Plan (DWPP). • Attend annual committee meeting when relevant.
Devon Birds	• Liaise with Slapton Bird Observatory (SBO) over ringing activities. • Annual report received from SBO – 2 meetings per annum. • Agree new route for ringing site. • Allow minimal removal of willow carr to facilitate ringing activities by SBO. • Report to be received from SBO ringing group each year on ringing activities.
Stokenham Parish Council	• Liaise with Stokenham Parish Council to maintain 'duck feeding area' by Torcross outflow and footpath to Stokenham. • Attend annual Parish Council meetings. • Contribute to Parish/village/AONB websites and newsletters, inc. Slapton Lines.
Slapton Parish Council	• Attend annual Parish Council meetings – Slapton and Stokenham. • Contribute to Parish/village websites and newsletters, inc. Slapton Lines.
Slapton Line Partnership	Liaise as appropriate re study of shoreline management options and agree future strategy with Slapton Line Partnership

Other stakeholder liaison activities

NNR team to:

- Report to Land Management Sub-Committee twice a year.
- Report to landowners and FSC executive at Slapton Annual meeting.
- To liaise with **Slapton Line Partnership** regarding beach management options and future strategy.
- Hold Celebrate Start Bay annual open day.
- Produce one NNR newsletter per year.
- Ensure the Annual Research Seminar has a good focus on topics that highlight reserve issues, record proceedings and make available via the web site.
- Make NNR management plan freely available.
- Undertake annual boundary check to ensure integrity of reserve.

7.2. Education & volunteers

Vision: Visiting the NNR significantly enhances outdoor learning and is informed by new research and surveys. A broad range of engaging events are enjoyed by many participants. Safe access is well maintained for visitors. Volunteers are engaged in meaningful activities that add real value to the NNR. Research is promoted to inform management of the NNR.

OUTCOMES	ACTIONS	MONITORING
All access routes are safe and well maintained for visitors. Clear walking corridor at least 1 m wide and 2.5m high on agreed routes.	Annual access plan to maintain suitable access routes for student use. Cut vegetation and replace steps as needed. Annual review with education team of infrastructure needs and suitability	Monthly safety checks completed.
Education groups well informed of seasonal events, ecology and management.	Regular liaison between NNR and education teams by attending weekly meeting and reporting on access and support issues.	Feedback from Education Team.
Management Plan survey data presented annually.	Survey data to support Management Plan collated monthly. Individual ecological records logged on iRecord.	Data presented to autumn Education & Science Sub-Committee.
>3 research papers received annually to inform management of NNR and delivery of this plan	PhD Researcher & agreed external research projects facilitated. Promote NNR field sites, research and monitoring to potential researchers and highlight topics relevant to NNR management on website. Research Seminar hosted annually	Research update presented to spring Education & Science Sub-Committee. All reports received & electronic library up to date.
>75 volunteers contribute >1200 hours to the delivery of this plan.	Recruit & manage volunteers to roles needed to support and add value to this plan.	Volunteer numbers, hours & records.
25 education visits per year.	Events plan completed by end of January. Promote NNR events and volunteer opportunities. Newsletter published & distributed before Easter. Update website quarterly & Tweet weekly. Distribute leaflets to local schools before school holidays by volunteers.	Events spreadsheet updated monthly Education Visit Forms collated.

	Distribute & update posters before events by volunteers. Celebrate Start Bay event co-ordinated annually. Events delivered by staff & volunteers.	
>200 FSC fold out guides sales.	Fold-Out Guides used as part of event and promoted for sale. Fold-Out guides available for sale at shops in Slapton and Stokeley.	

7.3. Infrastructure

Vision: Well-presented and safe Infrastructure & Visitor Facilities handcrafted from NNR resources through regular maintenance, repair and replacement.

Outcomes	Actions	Monitoring
Visitor Hides maintained to a high standard: • Clean, tidy & repaired. • Leaflet holders full. • Upcoming events advertised.	Hides swept and maintained regularly. Leaflets stocked. Posters refreshed and updated.	Monthly checks.
Viewpoints maintained to a high standard.	Repair Slapton Bridge Viewpoint 2020. Maintain Ireland Bay Viewpoint annually. Complete feasibility study for new Stokeley Farm hide by 2025.	Monthly safety checks.
Signs & interpretation panels welcoming and current.	Update 1 interpretation panel per year. Replace signs as needed.	Monthly checks.
Boardwalks maintained to a high standard.	Southgrounds Boardwalk replaced by 2025. Annually inspect & maintain other boardwalks.	Monthly safety checks.
Seating Maintained to a high standard	Replace one seating area annually.	Monthly safety checks.
Replace all bridges in Slapton Wood.	Replace one bridge annually.	Monthly safety checks.

Stiles & Gates maintained to a high standard.	Replace one stile annually with rustic squeeze.	Monthly safety checks.

7.4. Health and safety and maintenance actions

Health and Safety Activities		
Outcomes	Requirements	Actions
Carry out all required safety checks and inspections	Emergency procedures: Liaison with emergency services Lone field work procedure	Emergency action plans
	Accident recording	Accident reports
	Visitor safety procedures Inspection procedure for safety of timber structures Inspection procedure for other possible hazards to visitors, especially Tree safety checks	Visitor safety planning Tree safety checks
	Safety notes for storage and working procedures Machinery safety inspection procedures	Machinery safety planning – external consultant Morepay
	Equipment inspections Electrical safety Annual inspections Annual inspections	Inspect equipment
	Risk assessments COSHH assessments and records PPE Relevant equipment for staff and volunteers Risk assessments for manual tasks Noise assessments	Assess risks for staff and volunteers
	Training Safety training for staff Safety training for volunteers	Train/inform staff and volunteers

Vehicle and Infrastructure Maintenance		
Outcomes	Requirements	Actions
Maintain all buildings and hides	Ensure maintenance of Office and Workshops	Maintain buildings
	Ensure maintenance of hides and viewpoints	Maintain hides and viewpoints
Maintain other reserve infra-structure	Ensure maintenance of: Ley nature trail Boardwalks, including pond dipping area Educational access areas	Maintain paths and boardwalks – safety assessed to agreed timetable and remedial works carried out within 1 week.
	Ensure maintenance of Fences and gates	Annual Boundary Check Maintain fences
	Ensure maintenance of Slapton bridge sluice	Miscellaneous estate fabric
Maintain reserve vehicle/machinery /equipment.	Service and maintain Land Rover Boats	Maintain vehicles, including rowing boats
	Service and maintain Power tools Outboard engines	Maintain machinery
	Service and maintain General tools	Maintain existing tools and service machinery
	Train staff in driving ATVs and Land Rover	Train staff in driving techniques

References

Alexander, K. (2004) Slapton Line Shingle Invertebrate Survey: A Report for the Slapton Line Partnership. *Unpublished.*

Beeley, S. (1991) Investigation into the effects of trampling on the vegetation at Slapton Shingle Ridge [1987-1991]. *Unpublished.*

Bennett, R. (2011) NVC Survey: Little Marsh Slapton Ley NNR. *Unpublished.*

Boyce, D. C. (2017) Invertebrate Survey of Slapton Shingle Ridge. *Unpublished.*

Brookes B.S. & Burns A. (1969) The Natural History of Slapton Ley Nature Reserve, III: The Flowering Plants and Ferns. *Field Studies,* 3, pp. 125-157. https://fsj.field-studies-council.org/media/348852/vol3.1_64.pdf

Burt T.P., Butcher D.P., Coles, N. and Thomas. A.D. (1983) The Natural History of Slapton Ley Nature Reserve, XV: Hydrological Processes in the Slapton Wood Catchment. *Field Studies,* 5, pp. 731-752
https://fsj.field-studies-council.org/media/1745374/vol5.5_154.pdf

Cannell, S. (1992) Slapton Higher Ley - Its History, Ecology and Conservation. *Unpublished FSC report.*

Chatfield J.E. (1972) The Natural History of Slapton Ley Nature Reserve, V: Non-marine Mollusca. *Field Studies,* 3, pp. 579-588
https://fsj.field-studies-council.org/media/348828/vol3.4_82.pdf

Clark, R. J. and Beccaloni, J. (2018) Invertebrates of Slapton Ley National Nature Reserve (FSC) and Prawle Point (National Trust). *Field Studies,* 14(5).

Dobson, M., Stone, P., Riddick, C. and Webb, H. (2015) A review of Recent Water Quality Data at Slapton Ley SSSI. Final Report. APEM Scientific Report 413452. *Natural England,* 37 pp.

Dobson F.S. and Hawksworth D.L. (1996) The Slapton fungal (including lichen) survey: inventorying and documenting the changes in the Mycobiota. *Field Studies,* 8, pp. 677-684
https://fsj.field-studies-council.org/media/348654/vol8.4_235.pdf

Edwards, B. (2009) Slapton Ley SSSI: Site Dossier for Lichen Interest Features. *Natural England.*

Fletcher, D., Hurst, D. & Jones, P. (1987) Slapton Ley Shingle Ridge. Exclosure Plot Survey 1-20 July 1987. *Unpublished.*

Guillem, R. M., Drijfhout, F. P. and Martin, S. J. (2012) Using chemo-taxonomy of host ants to help conserve the large blue butterfly, Biological Conservation. Elsevier, 148(1), pp. 39–43. doi: 10.1016/J.BIOCON.2012.01.066.

Hails, J.R. (1975) Submarine geology, sediment distribution and Quaternary history of Start Bay, Devon. *Journal of the Geological Society,* 131 pp. 1-5.

Hails J.R. (1975) Some aspects of the Quaternary history of Start Bay, Devon. *Field Studies* 4, 207-222.
https://fsj.field-studies-council.org/media/1745362/vol4.2_105.pdf

Hawksworth D.L. (1986) The Natural History of Slapton Ley Nature Reserve, XVII: Additions to and Changes in the Fungi (including lichens). *Field Studies,* 6, pp. 365-382
https://fsj.field-studies-council.org/media/348732/vol6.3_172.pdf

Johnes P.J. and Wilson H.M. (1996) The limnology of Slapton Ley. *Field Studies,* 8, pp. 585-612
https://fsj.field-studies-council.org/media/348624/vol8.4_240.pdf

Kennedy C.R. (1996) The fish of Slapton Ley *Field Studies,* 8, pp 685-697
https://fsj.field-studies-council.org/media/348660/vol8.4_234.pdf

Kitchin C. (1983) Nature conservation and the tree community in Slapton Wood and its environs, South Devon, *University of Bradford, Dept of Environmental Science.*

Lamont, F. (1985) A Study of the Invertebrate Fauna of Slapton Ley, Third Year Project, King's College.

Natural England and Environment Agency (2010) Slapton Ley diffuse water pollution plan. *Unpublished.*

Natural England & Environment Agency (2015) Slapton Ley diffuse water pollution plan. *Unpublished.*

Riley, C.J. (1996) Mammals and other animals *Field Studies,* 8, pp 665-676
https://fsj.field-studies-council.org/media/348648/vol8.4_236.pdf

Royal Haskoning (2007) Slapton Ley Study: a vision for the future. Haskoning UK Ltd.

Silvester, L. M. (2005) An investigation into the effects of trampling on shingle vegetation and the need for effective visitor management at Slapton Ley, Devon. *Unpublished*.

Smith J. (1990) A study of the invertebrate fauna of Slapton Ley. La Sainte Union College of Higher Education.

Sneddon, P. & Randall, R. E. (1993) Coastal vegetated shingle structures of Great Britain: Main Report. Peterborough, Joint Nature Conservation Committee

Stevens, P. J. (1998) Investigation into the habitat preferences of dragonfly (Odonata) nymphs at the Higher Ley Slapton NNR, *Fitzwilliam College.*

Streeter, D. (2011) Hedgeland, Loworthy Farm, Slapton. *Unpublished.*

Trudgill S.T. (1983) The Natural History of Slapton Ley Nature Reserve, XVI: The Soils of Slapton Wood. *Field Studies*. 5, pp.833-840
https://fsj.field-studies-council.org/media/348738/vol5.5_158.pdf

Van Vlymen, C. D. (1979) The natural history of Slapton Ley Nature Reserve XIII: The water balance of Slapton Ley, *Field Studies,* 5, pp. 59-84.

Wilson, P. J. (2002) Slapton Line Shingle Vegetation Survey: A Report for the Slapton Line Partnership. *Unpublished.*

Appendices

Appendix 1. Reportable features for SSSI designation (Natural England)

Feature
Aggregations of breeding birds - Cetti's warbler, *Cettia cetti*
Aggregations of non-breeding birds - Bittern, *Botaurus stellaris*
Aggregations of non-breeding birds - Reed warbler, *Acrocephalus scirpaceus*
Aggregations of non-breeding birds - Sand martin, *Riparia riparia*
Aggregations of non-breeding birds - Sedge warbler, *Acrocephalus schoenobaenus*
Aggregations of non-breeding birds - Swallow, *Hirundo rustica*
Assemblages of breeding birds - Lowland open waters and their margins
Coastal vegetated shingle (SD1-3)
Eutrophic lakes
FB - Coastal Geomorphology
Hard maritime cliff and slope
IA - Coastal Geomorphology
Lichen assemblage
Lowland wetland including basin fen, valley fen, floodplain fen, waterfringe fen, spring/flush fen and raised bog lagg
Population of RDB plant - *Hypericum linariifolium*, Toadflax-leaved St John's-wort
Population of Schedule 8 plant - *Corrigiola litoralis*, Strapwort
Sand dune; strandline, embryo and mobile dunes (SD1-6)
Scrub
Standing waters
Vascular plant assemblage
Wet woodland

Appendix 2. Species lists

Slapton Ley macrophytes

Key macrophyte species from three surveys showing a transition towards species tolerant of eutrophic verses mesotrophic conditions.

Survey	Species
Brookes and Burns, 1969	*Ranunculus circinatus*
	R. trichophyllus
	R. peltatus ssp. peltatus
	R. baudotii
	Ceratophyllum demersum
	C. submersum
	Elatine hexandra
	Myriophyllum spicatum
	Elodea Canadensis
	Potamogeton *pusillus*
	P. *crispus*
	P. pectinatus
	Zannichellia palustris
Cole, 1984	*Ranunculus peltatus*
	R. penicillatus ssp. penicillatus
	Potamogeton *pectinatus*
	P. berchtoldii
	P. trichoides
	Myriophyllum spicatum
	Ceratophyllum demersum
	Nymphaea alba
	Elodea Canadensis
	Polygonum amphibium
Wilson, 1991	*Ranunculus circinatus*
	Potamogeton *pectinatus*
	P. *crispus*
	Ceratophyllum demersum
	Myriophyllum spicatum
	Elodea Canadensis
	Zannichellia palustris
	Callitriche sp.
	Chara sp

Hedgelands grassland

Streeter (2011)

Grasses
Agrostis capillaris
Agrostis stolonifera
Anthoxanthum odoratum
Carex flacca
Cynosurus cristatus
Dactylis glomerata
Elytrigia repens
Festuca rubra
Holcus lanatus
Lolium perenne
Forbs
Acer pseudoplatanus (seedling)
Cerastium fontanum
Cerastium glomeratum
Cirsium arvense
Cirsium palustre
Cirsium vulgare
Ficaria verna
Galium aparine
Geranium dissectum
Hypochaeris radicata
Lotus corniculatus
Luzula campestris
Plantago lanceolata
Potentilla reptans
Potentilla sterilis
Pteridium aquilinum
Ranunculus bulbosus
Ranunculus repens
Rubus fruticosus agg.
Rumex acetosa
Rumex crispus
Senecio jacobaea
Sonchus (seedling)

Taraxacum 'Ruderalia'
Trifolium dubium
Trifolium micranthum
Trifolium repens
Urtica dioica
Veronica chamaedrys
Veronica serpyllifolia

Appendix 3. Additional maps

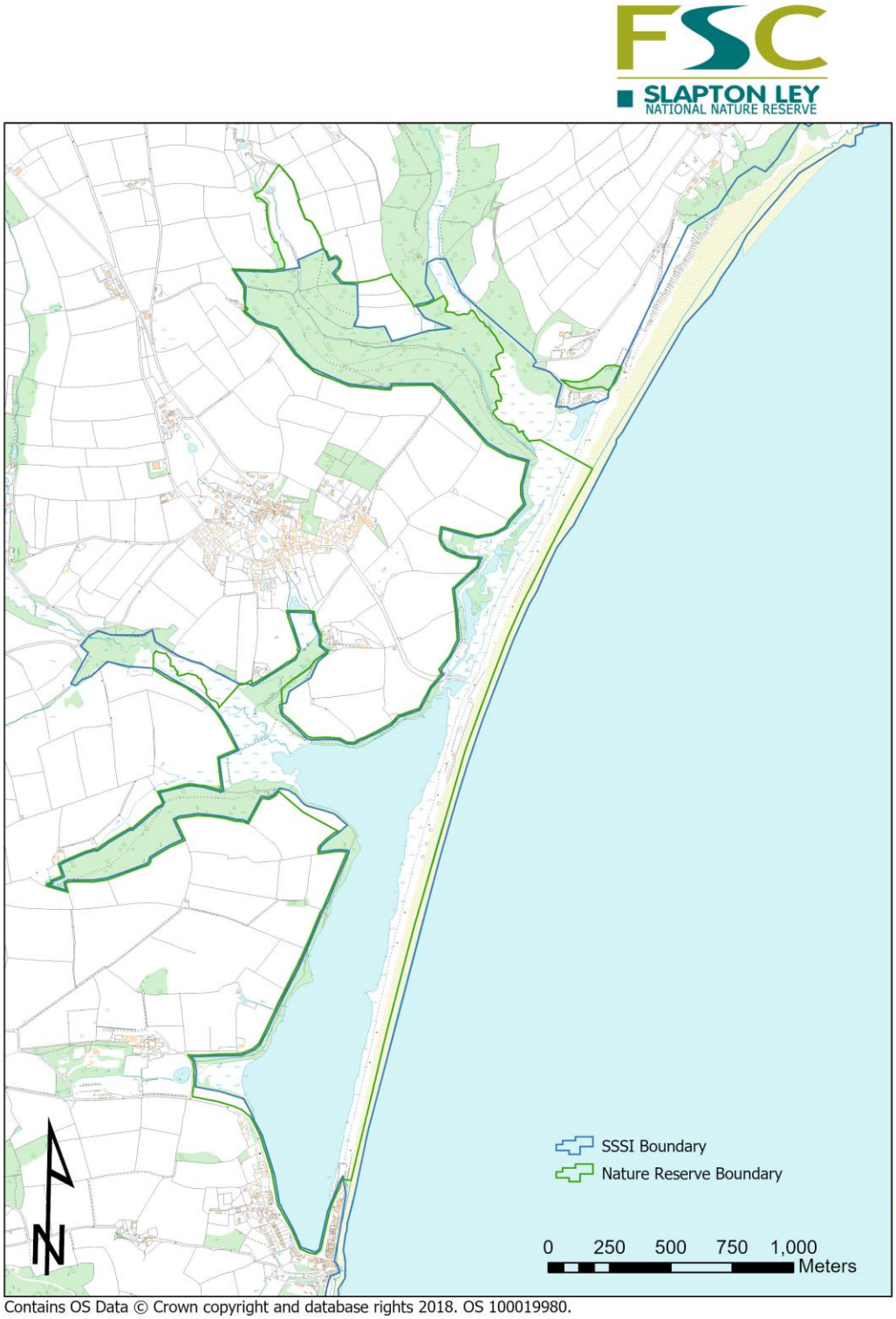
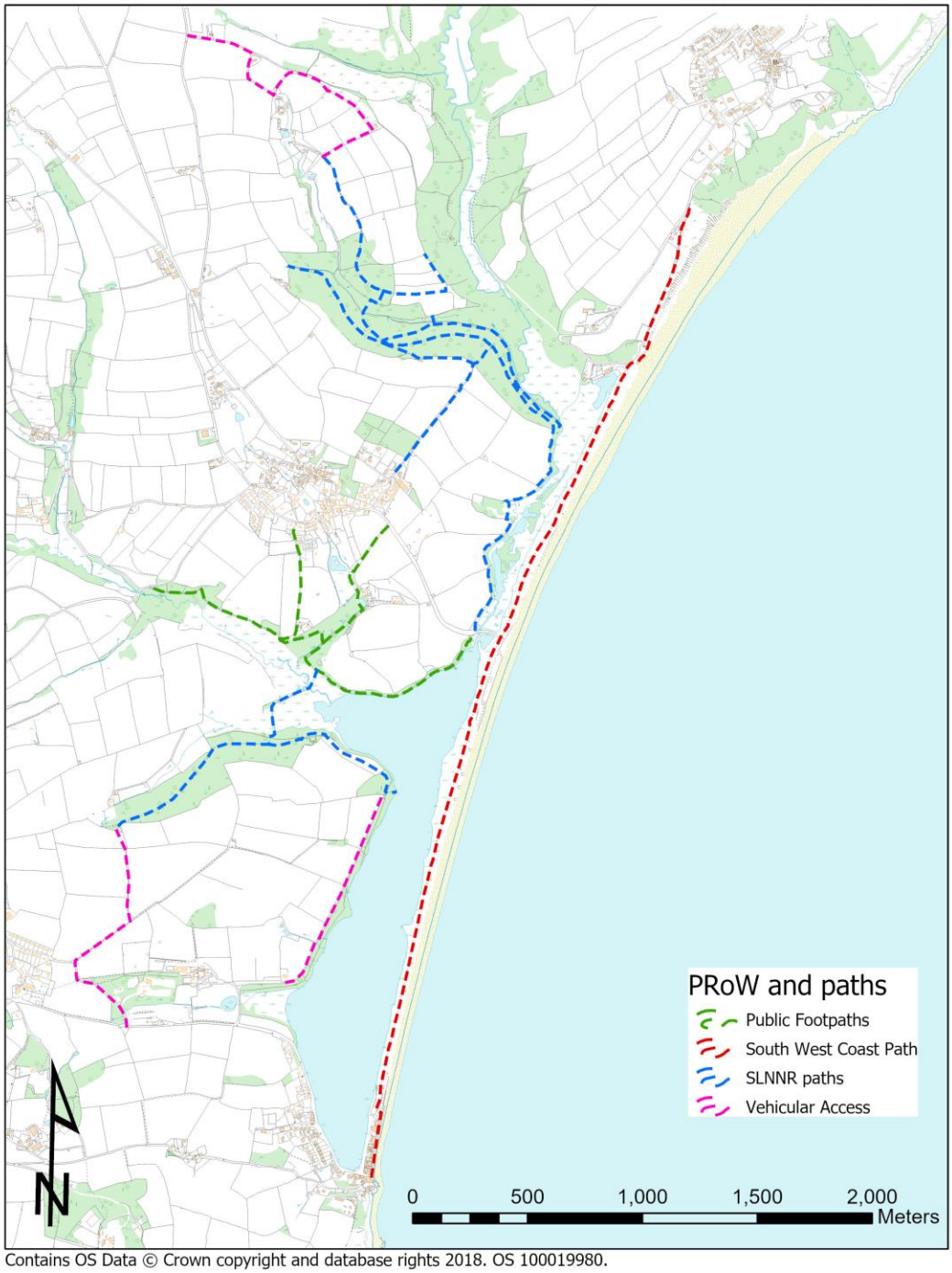


Figure 12. Boundaries



Contains OS Data © Crown copyright and database rights 2018. OS 100019980.

Figure 13. Public rights of way and access

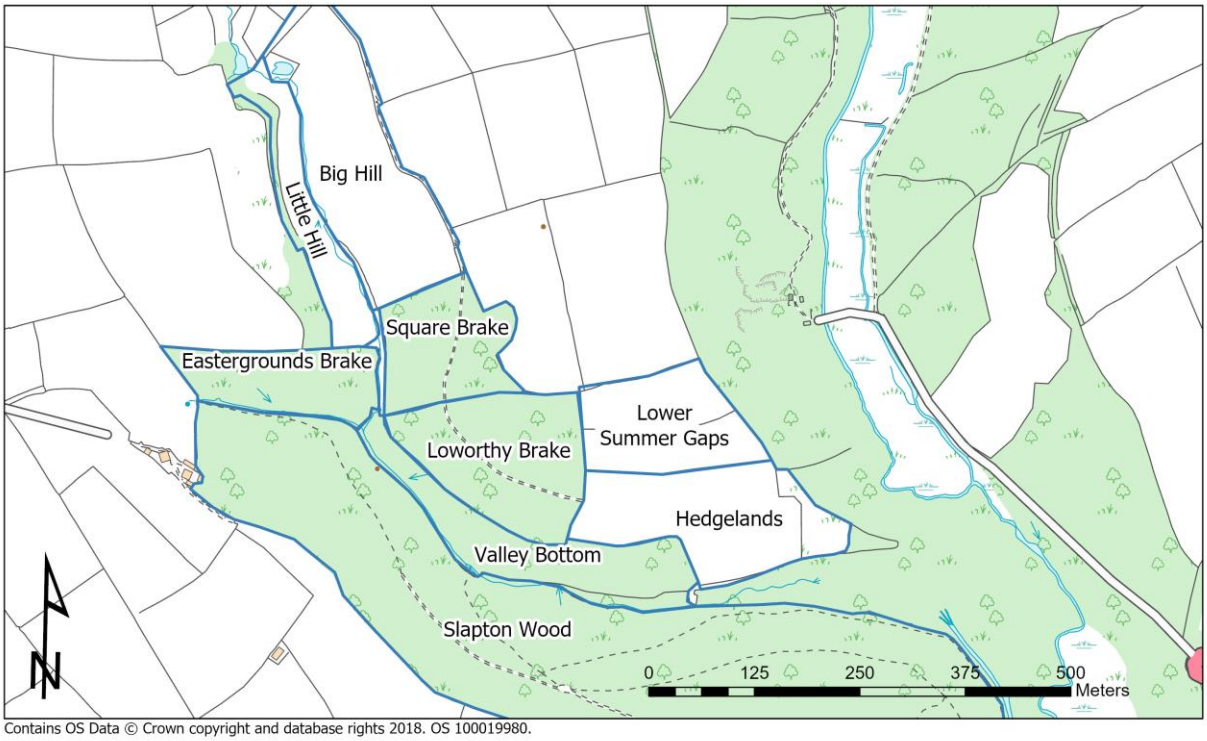


Figure 14. Place names mentioned in text (North).

Figure 15. Place names mentioned in text (South).