Sussex Local Nature Partnership

Natural Capital Investment Strategy for Sussex

Evidence Base - Summary

January 2020

Table of Contents

1. INTRODUCTION 1

2. NATURAL CAPITAL ASSETS 1

2.1 LIST OF ASSETS 2
2.2 TERRESTRIAL ASSETS: MAPS AND SUMMARY OF STATUS 3
FRESHWATER ASSETS 3
HEATHLAND ASSETS 5
HEATHLAND AND SANDSTONE OUTCROPS: SUMMARY OF ASSET REGISTER 5
SEMI-NATURAL GRASSLAND ASSETS 6
GRASSLAND: SUMMARY OF ASSET REGISTER 6
AGRICULTURAL LAND ASSETS 7
FARMLAND, SOIL AND HEDGEROWS: SUMMARY OF ASSET REGISTER 7
WOODLAND ASSETS 8
A. LOCATION OF WOODLAND ASSETS 8
B. WOODLAND 'HEAT MAP' (WOODLAND PERCENTAGE COVER BY 500M SQUARE) 8
2.3 COASTAL ASSETS: MAPS AND SUMMARY OF STATUS 9
2.3 MARINE ASSETS: MAPS AND SUMMARY OF STATUS 11
SEABED HABITATS 11
WATER BODIES 14

3. BENEFITS AND SERVICES PROVIDED BY NATURAL CAPITAL 18

3.1 TERRESTRIAL 18
3.2 COASTAL 24
3.3 MARINE 26

4. NATURAL CAPITAL AT RISK 27

4.1 NCC NATIONAL RISK ASSESSMENT – AS APPLIED TO ASSETS FOUND IN SUSSEX 27
4.2 SUSSEX LNP ASSESSMENT OF RISK 28

1. Introduction

The starting point for the Natural Capital Investment Strategy is the evidence base. This sets out the current understanding of:

- The natural capital assets (terrestrial, coastal and marine) found within Sussex
- The range of economic and social benefits provided by these assets and their associated ecosystem services
- The extent, condition (where known) and distribution (or 'spatial configuration') of the natural assets and how this relates to the benefits derived from them.

This information is compiled for each asset type and is presented as an 'Asset Register' for Sussex. Assets are grouped as terrestrial, coastal or marine. With this information in place, the evidence base then provides an assessment of the level of risk to the assets and the flow of benefits from them. This is presented as a 'Risk Register'.

The full **'Asset and Risk Register'** is a work in progress and will be published later in 2020. A summary of the key information is provided below.

2. Natural capital assets

The main natural capital asset types in Sussex have been identified and mapped and for each asset type, an 'asset profile' has been prepared that summarises:

- Quantity (area) of each asset sub-type found in Sussex
- Description of its condition (quality) where known and spatial configuration)
- Significance (local, national, international)
- Main threats

The maps and extracts from the asset profiles below provide a very brief overview of the status of natural capital assets in Sussex within terrestrial, coastal and marine environments.

2.1 List of Assets

Terrestrial

Natural capital asset types	Natural capital assets: sub-types
Freshwater	River
	Chalk stream
	Lake
	Reservoir
	Pond
	Grazing marsh
	Reedbed
	Fen
	Bog
	Spring
	Aquifer
Heathland	Heathland
	Sandstone Outcrops
Grassland	Lowland calcareous grassland
	Unimproved grassland
Agricultural land	Arable and Horticultural
	Improved grassland
	Hedgerows
Woodland	Ancient woodland
	Plantation on ancient woodland
	Deciduous non ancient woodland
	Coniferous non ancient woodland

Coastal

Natural capital asset types	Natural capital assets: sub-types
Coastal	Sand dune
	Saltmarsh
	Vegetated Shingle
	Seacliffs
	Coastal lagoons
	Mudflats

Marine

Natural capital asset types	Natural capital assets: sub-types
Marine	Seabed habitats
	Marine Protected Areas
	Designated bathing waters
	Coastal and Estuarine water bodies (as identified and monitored under the Water Framework Directive)
	Designated shellfish waters

2.2 Terrestrial Assets: maps and summary of status

Freshwater Assets

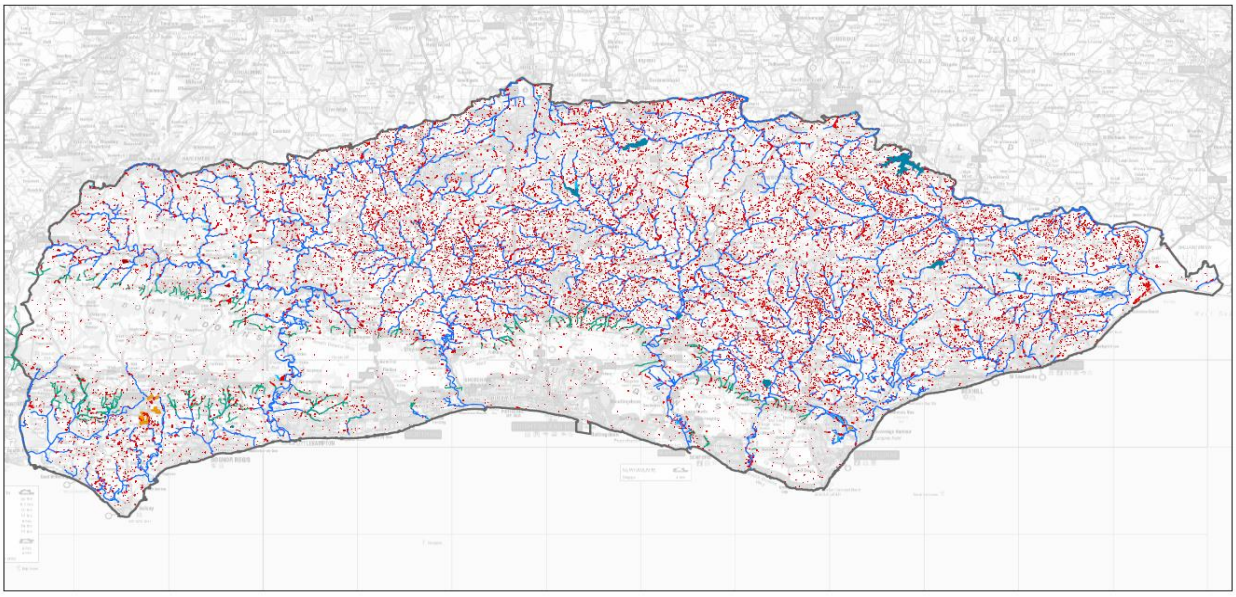


Figure 1: Open Water Assets

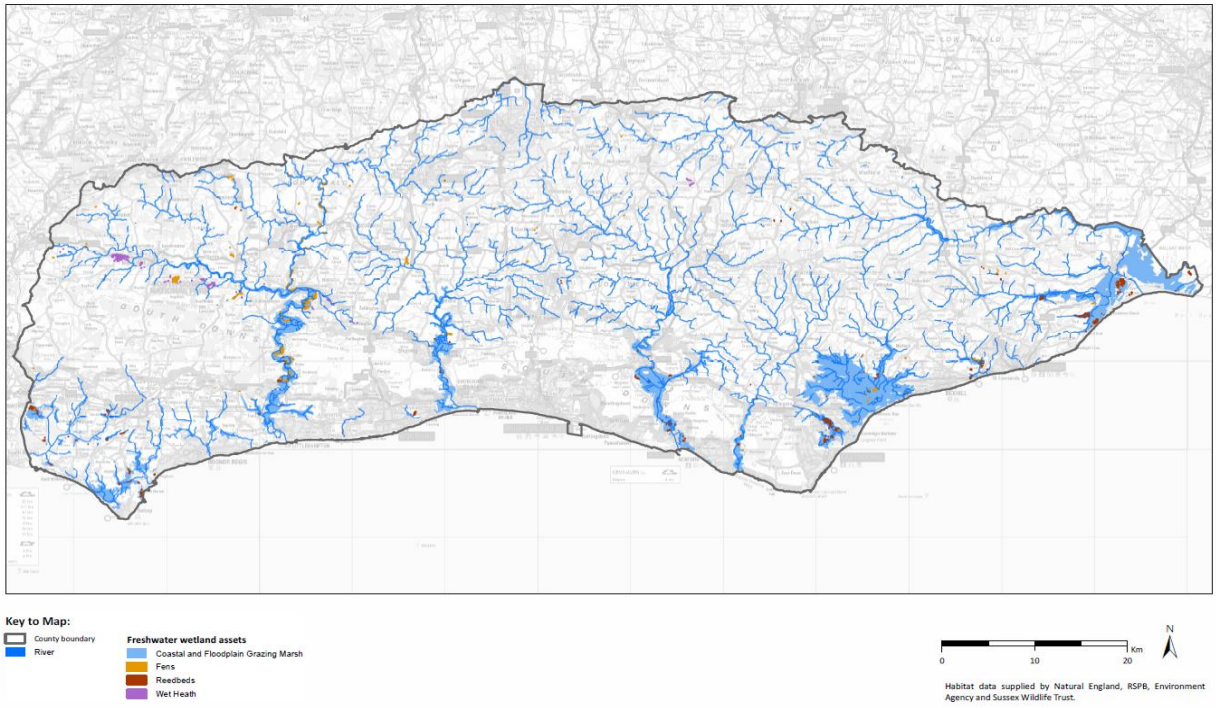
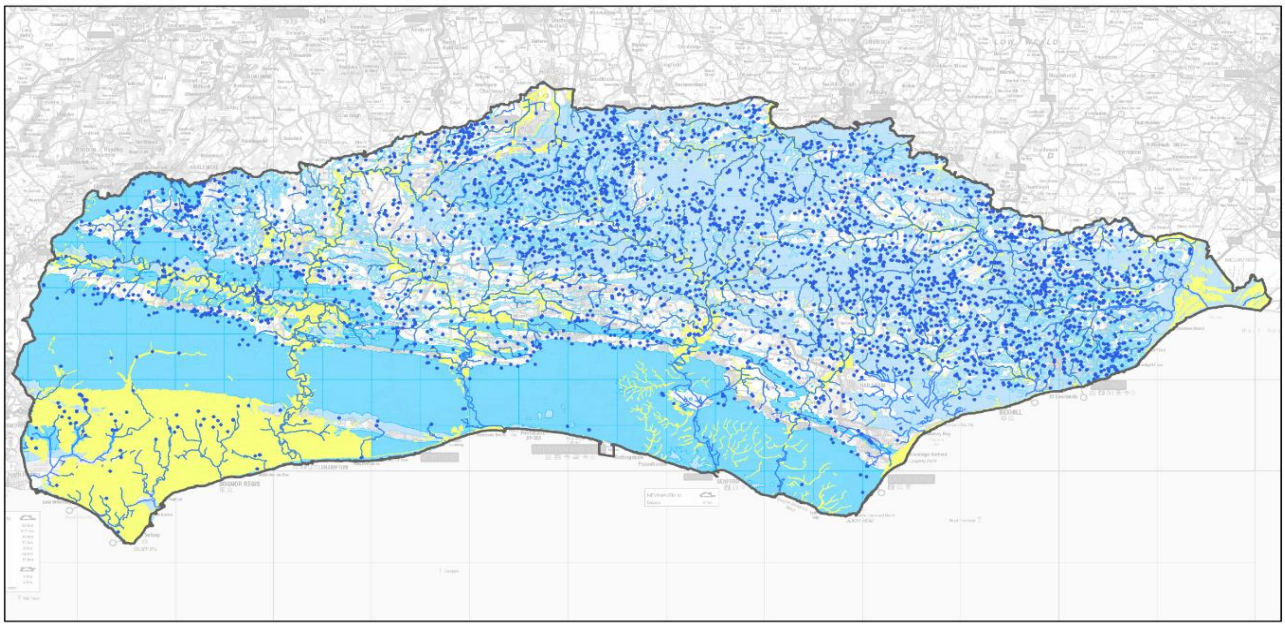


Figure 2: Freshwater Wetland Assets



Key to Map:
County boundary
River

Aquifers and Springs
Springs and Issues
Bedrock Aquifer - Principle
Bedrock Aquifer - Secondary A
Superficial Aquifer - Secondary A

Figure 3: Aquifers and Springs

0 10 20 Km
N

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Freshwater: Summary of Asset register

Sussex has over 9,655km of **rivers and streams.**
At least 80% of the rivers and streams in the south east are failing the 'Water Framework Directive' definition of Good Ecological Status.
Major floodplain systems in Sussex are found on the Arun, Adur, Ouse, Cuckmere, Brede and Easter Rother. These are almost all isolated from the rivers which support them and so do not functional naturally.
During the last 100 years there has been substantial loss of good quality river channel and riparian habitat.

There are 135.6 km, of confirmed **chalk stream** in Sussex. Less than 20% of this is deemed 'near natural'. Around 1/3 have been recommended for legal designation and protection. Many chalk streams are heavily impacted by surface water runoff from surrounding land-use, sedimentation, land use, obstructions, invasive species, water abstraction and climate change.

There are approximately 18 000 **ponds** in Sussex (excluding garden and urban ponds) and 16 lakes. Many historical ponds have been lost through ecological succession and/or because agricultural no longer needs ponds. Existing ponds are under threat from a range of threats including pollution, drainage, urban expansion etc and are highly influenced by surrounding land use. Nationally around 80% of ponds are in poor/ very poor condition. This is mirrored in Sussex (of 103 ponds in the West Weald surveyed in 2014, >80% suffered from poor water quality). 60 Priority ponds have been identified in Sussex. There are 6 identifiable 'networks' of ponds (known as 'Important Areas for Ponds'.

The extent of **grazing marsh (flood plain wetland mosaic)** in Sussex hasn't been accurately measured but is estimated at +/- 14 000 ha. Only 20% of this is likely to be of high quality for wildlife but many of these sites are of national significance with several of international importance for habitats and bird species. This is a historic-man-mad landscape type that is largely dependent on the management of water levels and traditional low intensity agricultural practices. It is inherently vulnerable to changing farming practices and water levels.

There are only 230 ha of **reedbed** remaining is Sussex, in a small number of sites. Only 2 of these sites are >20ha in size (Filsham and Pannel Valley). Other small areas remain at Rye Harbour, Eames Farm (Thorney Island) and

Pagham Harbour. Very small unsurveyed sites are also likely to be found along ditch edges. This is therefore a very fragmented habitat type and is one of the rarest lowland wetland types in the UK. Yet it is one of the most important habitats for birds in the UK and delivers a wide range of benefits and services. It is under threat from drainage, development, pollution and construction of hard flood defences.

There are <100ha of fen remaining in Sussex. 2/3 of this area is found at two sites (Combe Haven and Pette Level) with the rest found in small pockets. This is thus also a very fragmented habitat type, which is vulnerable to drainage for agriculture for drainage and development, cessation of management, changes to water levels and pollution

Chalk aquifers and springs have also been mapped. The chalk aquifer runs along the length of the South Downs and is one of the most heavily utilized and strictly managed ground water resource in the UK. Ground water quality is generally of good quality. Threats to water quality come from various pollution sources. Drought and abstraction levels impact on the level of groundwater within the aquifer.

Heathland Assets

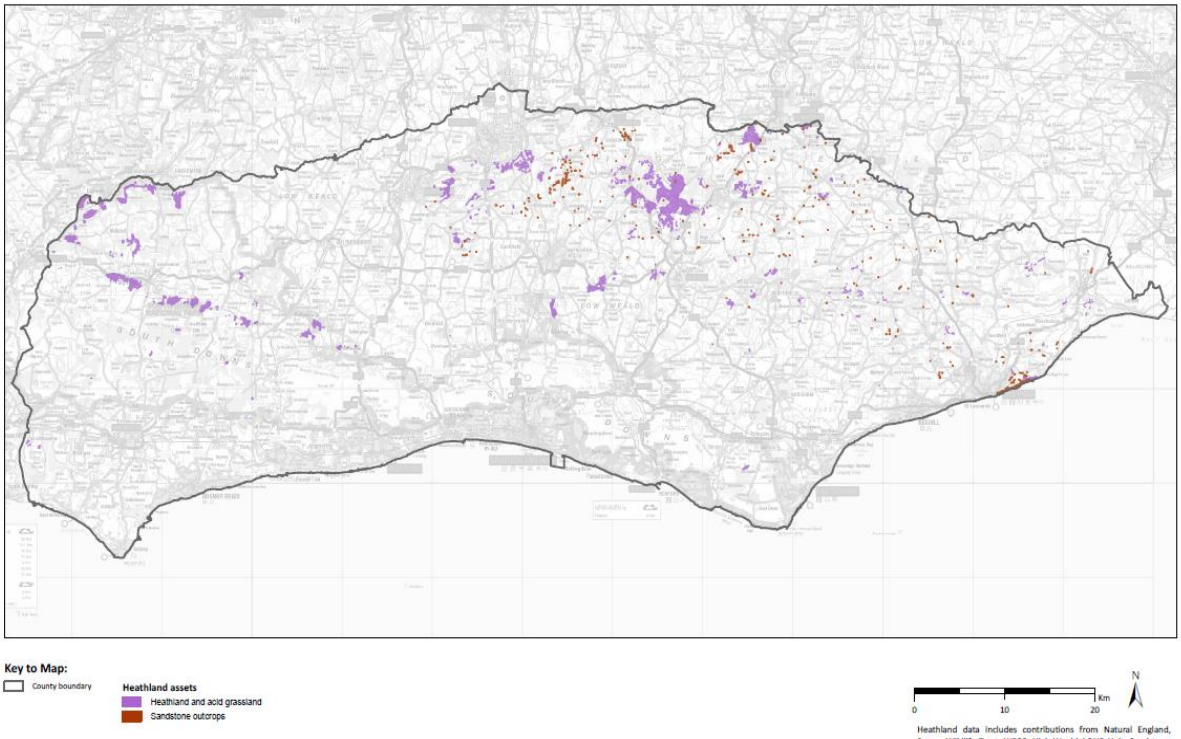


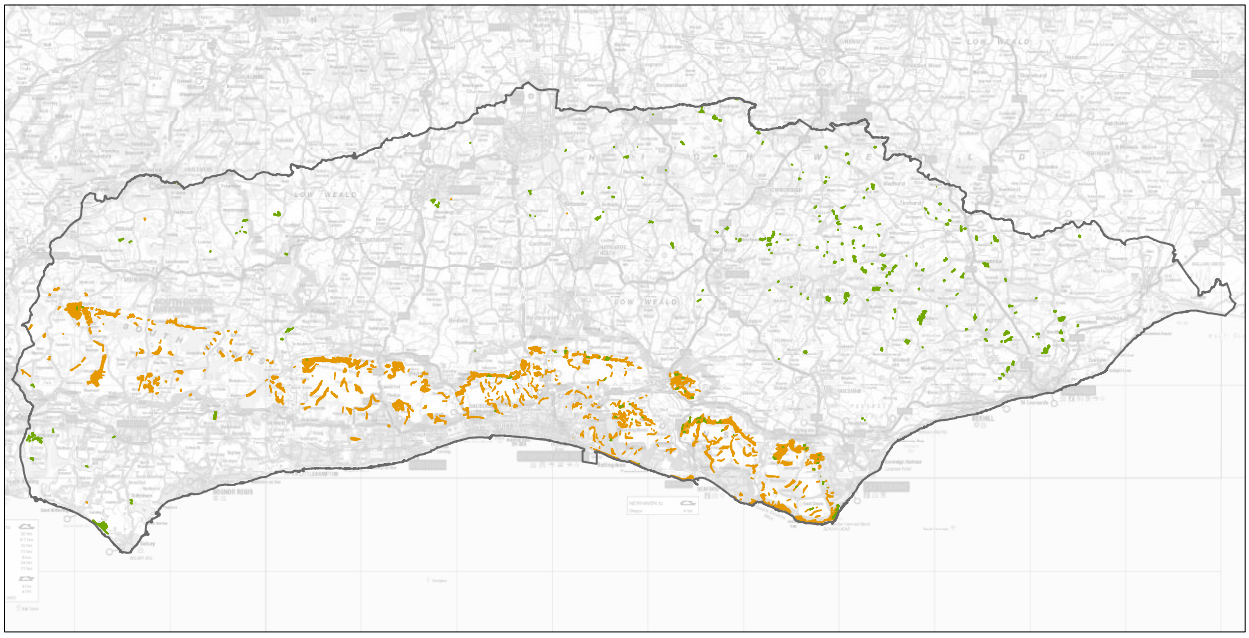
Figure 4: Heathland and Sandstone Outcrops

Heathland and Sandstone Outcrops: Summary of Asset Register
There are 3000ha of **lowland heath** in Sussex (approx. 1% by area). This represents <5% of the national area of this habitat type.This occurs on the Wealden Greensand in West Sussex and in the High Weald of East Sussex, where the Ashdown Forest contains the largest area of heathland remaining in the South East of England (1,264 ha). The South Downs retain areas of chalk heath, a rare habitat that develops on acidic deposits overlying chalk. Lullington heath is the largest example of this habitat. The total extent of heathland in Sussex has decreased approximately 70% in the last 100 years. The heathland ecological network is effectively becoming more fragmented and less ecologically coherent. Individual heathland sites are at risk from under-management,

changes to water levels, damage and destruction from development, recreational pressure and nitrogen enrichment.

Sandstone outcrops are scattered across Sussex, in particular. In the High Weald. Many support unique microhabitats and lower plant assemblages. They have ecological, geological and cultural significance. Most sites are managed to minimize visitor pressures on the rocks and associated habitats.

Semi-natural Grassland Assets



Key to Map:
County boundary
Semi-natural Grassland assets
Lowland chalk grassland
Lowland meadow

Figure 5: Semi-natural Grassland Assets

1:330,000
0 10 20 Km
N

Habitat data supplied by Natural England, High Weald AONB Unit,

Grassland: Summary of Asset Register

Around 2600 ha of **lowland calcareous grassland** remains in Sussex, with the South Downs representing one of the major areas in the UK. It is estimated that chalk grassland now covers only around 3% of the South Downs, where it is predominantly confined to steeper slopes. It supports a rich diversity of animals and plants including many rare species. 90% of this habitat type across Southern England and northern Europe has now been lost and what remains is highly fragmented. Most fragments in Sussex are found on less accessible northern slopes. At a national level, only 29% of this habitat type is in favourable condition. Although the poor condition is worrying, most sites in Sussex are under management which aims to promote return to favourable condition. Under-grazing and abandonment are the main causes of poor condition. Overgrazing and nutrient enrichment may also be a problem on some sites.

Lowland meadow:

Agricultural land assets

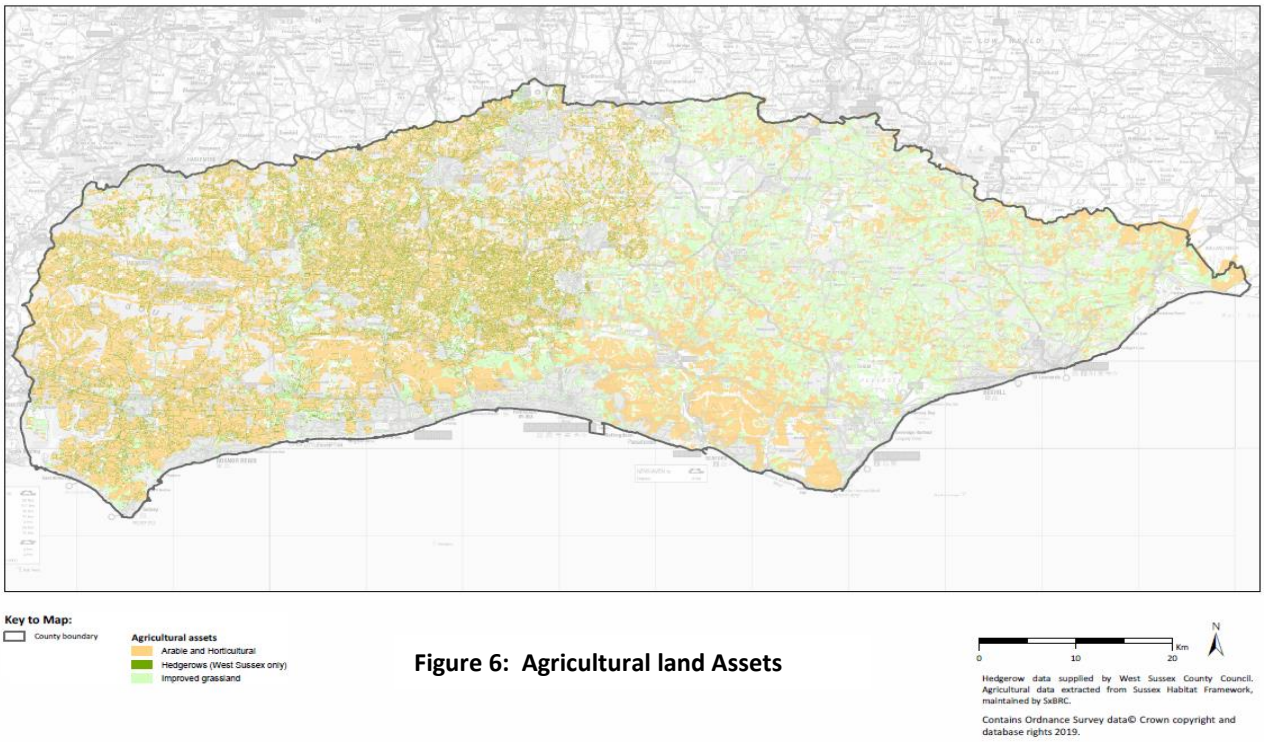
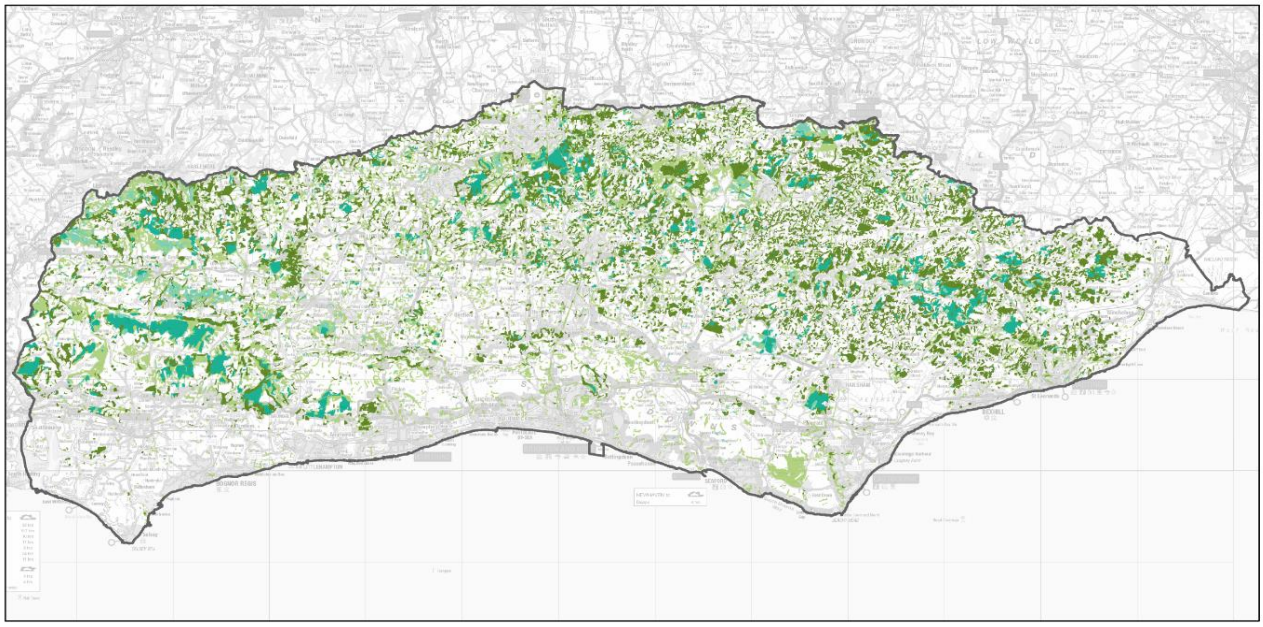


Figure 6: Agricultural land Assets

Farmland, soil and hedgerows: Summary of asset register
60% of the land area of Sussex is farmland and approximately 85% of the South Downs National Park is farmed. Farming systems in Sussex are clustered in areas where the type of crops, livestock, pasture and rotations are influenced by underlying soil type, land quality etc. Mixed farming tends to be found on the clay soils, in the Weald and outside the chalk downs. On the chalk, there is more arable farming whilst livestock farming is prevalent on the Downs. The richer soils of the coastal plain support large scale arable and horticulture systems. Farmland is a significant type of land use in Sussex upon which many other natural capital assets are found. Management of farmland thus has huge significance in determining condition of the assets it hosts (including the aquifer beneath), as well as the condition of freshwater and coastal assets on its boundaries and downstream. Southern England has seen an increased trend in **soil** moisture deficit. Inability for soils to hold water is exacerbated by poor soil condition, which is prevalent, especially on chalk. Recurrence of dry spring conditions may result in a decline in yields or loss of some crops due to drought conditions. Economic impact of soil degradation in England is already thought to be between £250-£350million per annum). There is an estimated 11,744KM of **hedgerows** across Sussex. A high percentage of these are ancient/species-rich hedgerows from earlier assarted scrub or woodland. As a result, these are rich in ancient woodland species. Smaller fields in the Sussex Weald lead to a greater intensity of hedges in this area. An estimated 42% of all hedges in Sussex are unmanaged and as result many are becoming 'gappy' and reverting to tree-line, thus providing a different habitat (which is therefore not protected under the Hedgerows Regulations). As already noted, the main threat to hedgerows in Sussex is lack of management and reversion to tree-line although over-management (severe annual trimming) is also an issue.

Woodland Assets

a. Location of woodland assets



Key to Map:

County boundary

Woodland assets

- Ancient and semi-natural woodland
- Plantation on ancient woodland
- Deciduous non-ancient woodland
- Coniferous non-ancient woodland

Figure 7: Woodland Assets

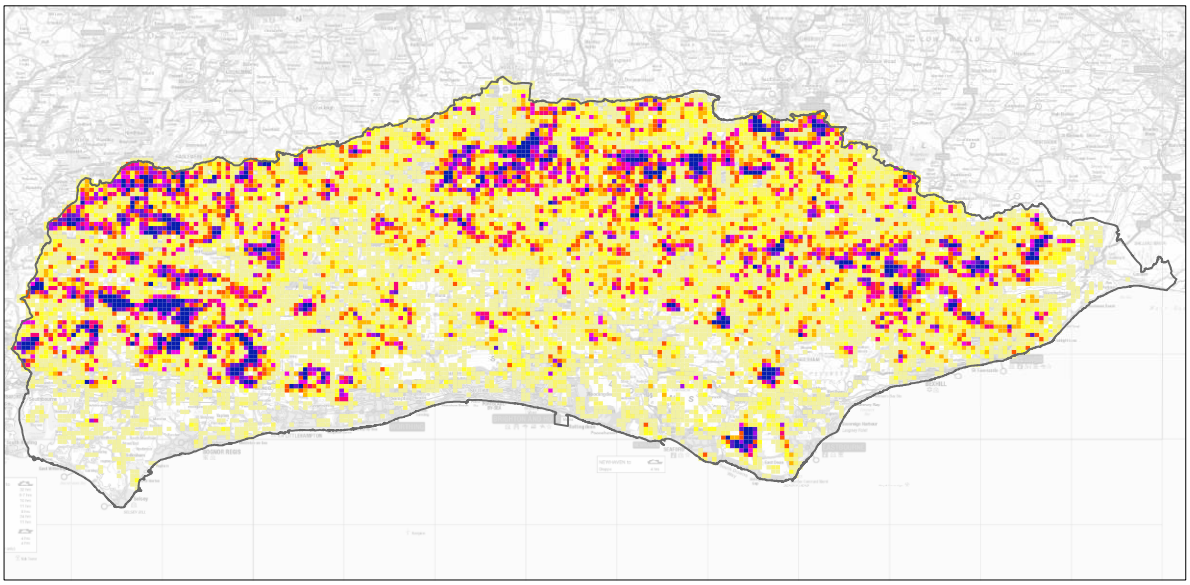
0 10 20 Km

N

Ancient and non-ancient woodland data supplied by Natural England. Contains public sector information licenced under the Open Government Licence v.3.0.

Contains Ordnance Survey data© Crown copyright and database rights 2019.

b. Woodland 'heat map' (woodland percentage cover by 500m square)



Key to Map:

Sussex county boundary

Woodland cover (%)

- under 10%
- 10% - 20%
- 20% - 30%
- 30% - 40%
- 40% - 50%
- 50% - 60%
- 60% - 70%
- 70% - 80%
- 80% - 90%
- 90% - 100%

Figure 8: Woodland Concentration

0 10 20 Km

N

rived from Ancient woodland data supplied by Natural England and National a supplied by Forestry Commission. Contains public sector information licensed ernment Licence v3.0.

urvey data© Crown copyright and database rights 2019.

Woodland: Summary of asset register
Sussex is one of the most wooded areas of England with 17% woodland cover (the average for English counties is 9%). The woodland coverage across Sussex varies considerably, with the coastal plain and eastern South Downs being the least wooded and the High Weald and western Low Weald the most heavily wooded. The South Downs National Park has over 38% of woodland which covers approximately a quarter of the park. National trends in woodland which are being seen in Sussex include: an increasing area of lowland mixed deciduous woodland; fluctuating area of lowland beech and yew woodland. At a national level there is a risk of **net deforestation** occurring (with low afforestation rates and continued loss of areas of woodland for development). Recent initiatives for increased tree planting for carbon storage purposes may influence this. Despite protections, a loss of ancient woodland is also an ongoing trend. In terms of quality, the condition of woodland across Sussex is thought to be in decline. This is being caused by fragmentation, a trend towards over-shading and a change in understorey flora and fauna due to over-grazing. Other significant threats include pests and diseases, invasive species, air pollution and climate change.

2.3 Coastal Assets: maps and summary of status

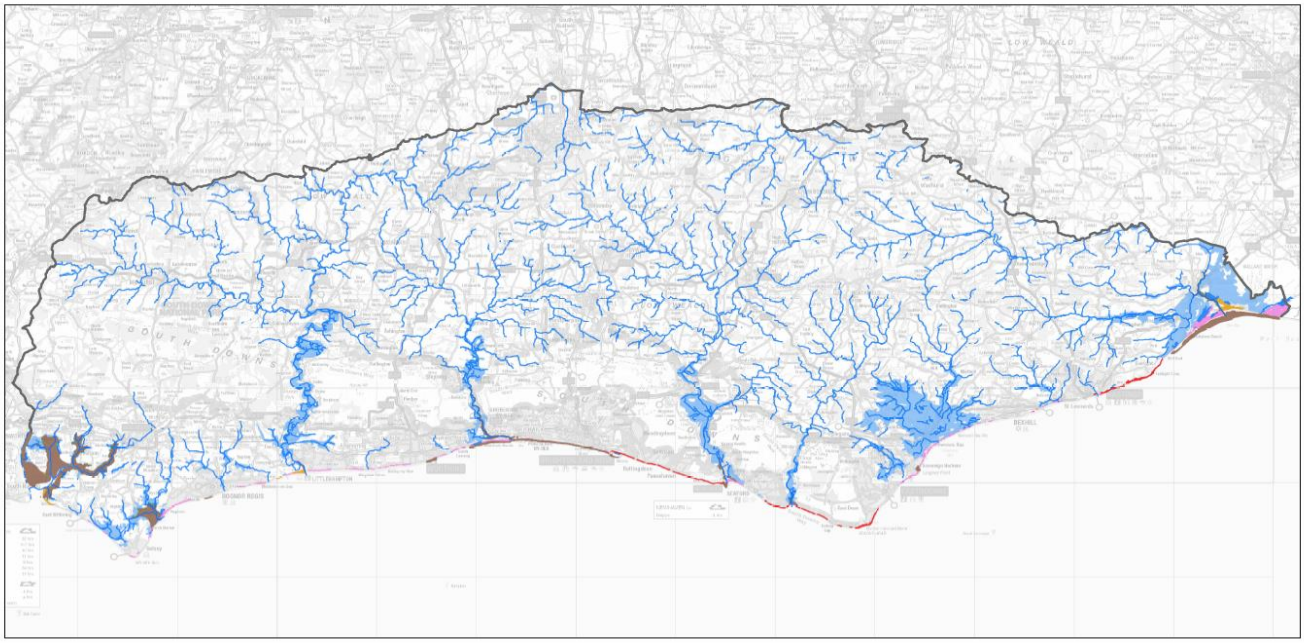
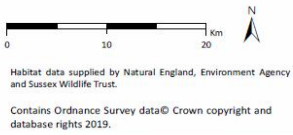


Figure 9: Coastal assets



All coastal habitats: summary of asset register
Sand dunes
Major dune systems are widely distributed within the UK but are scarce on the English Channel coast. Sand dune in Sussex is limited to a small number of scattered sites: Chichester Harbour (East Head), the River Arun (Climping Beach) and the River Rother (Camber Sands). In addition, there is a relict dune system at Bognor Regis and a small area at Shoreham Harbour. Camber is the most notable of these and is wedge-shaped (1km wide in the west, tapering to 10. metres wide in the east). It is an accreting dune system and 7500 cubic metres of sand are deposited every year. The system is now restricted by urban development. It supports locally and nationally important plant

and animal communities. The main threats to sand dunes in Sussex come from stabilization and destruction of the systems (agriculture and development), coastal defence works, erosion from visitor pressure and invasive species and scrub encroachment.
Saltmarsh
Saltmarsh is a rare habitat which is found in only a few places in Sussex: mainly in the harbours of Rye, Chichester and Pagham and along the tidal reaches of the Rivers Rother, Cuckmere and Adur. There are some small areas in East Sussex at Newhaven and Pevensey. There are only 405 ha of saltmarsh in Sussex (of a total 32500ha in England). Approximately 92% of this is found in West Sussex, and the majority of this is in Chichester Harbour. This is the largest saltmarsh site in the South-east of England and the 7th largest in the UK. Outside this site, the remaining areas of saltmarsh are small, fragmented sites. Saltmarsh is exceptionally rich in biodiversity and most of the sites in Sussex are included in local, national or international designations. Where it is present, it plays a significant role in coastal flood-defences (acting as a functional, natural; and sustainable wave-break). Threats to saltmarsh are numerous but include coastal squeeze, destruction due to land reclamation (agriculture, housing and industry), disruption of natural coastal processes (from coastal protection work/ dredging), grazing, commercial foraging and poor water quality from upstream pollution.
Vegetated shingle
Vegetated shingle is an internationally rare habitat, found only in northern Europe, Japan and New Zealand. There are approximately 5800ha of vegetated shingle in the UK and a large proportion of this is found in Sussex. The most extensive area is found in the Rye and Dungeness area (>2000ha) which is thought to be the biggest area of this habitat type in the UK. There are smaller strips at Pevensey and small pockets at Sovereign Harbour, Cuckmere, Newhaven (tide mills), Pagham, Brighton and Hove (3 areas at Shoreham). All areas of good quality are found within SSSIs or Natura 2000 sites. Despite designation, threats to vegetated shingle are numerous and include coastal squeeze (which prevents its migration inland and it thus washes away), coastal defence work and offshore aggregate extraction (which disturbs natural sediment movement and shingle re-charge rate), sea level rise, coastal development and enrichment of shingle from increased nutrient levels in seawater.
Sea cliffs
Sussex has just over 50km of cliff and slope, including more than 14% of the European coastal chalk exposure at Seven Sisters. The majority of this asset is found in East Sussex, where both 'hard' chalk cliffs and 'soft' sandstone cliffs can be found. Chalk cliffs erode to a vertical profile and can be found predominantly between Brighton and Eastbourne. Sandstone cliffs usually form less steep slopes and are prone to frequent slumps and landslips. These cliffs are found between Bexhill and Hastings. A range of scarce and threatened invertebrates and bryophytes can be found on cliffs in Sussex. Key sites include Fairlight Cove, Fairlight Glen, Beachy Head and Birling Gap. All chalk cliffs are designated as SSSI for their geological and biological interest. Threats to cliffs include coastal squeeze, disruption of natural coastal processes caused by coastal defence work and offshore dredging, increased runoff from arable land and urban areas which can increase erosions and introduce pollution into the cliff and marine environment, development close to cliff edges, recreational pressures and changes in cliff-top land management.
Coastal Lagoons
There are thought to be only 13 saline lagoons in Sussex, covering an area of just under 65ha. Only three of these are considered to be natural lagoons. Examples can be found at Newhaven, Cuckmere and Rye (where these have been created through extraction). All known lagoons in Sussex are designated in some form because of the species they support (particularly birds). Threat to lagoons include infilling by the movement of sediments, pollution, artificial control of water, coastal defence works and sea level rise. Many lagoons are also naturally transient (the salinity regime changes as succession leads to freshwater conditions and eventually to vegetation such as fen carr).
Mudflats
The largest area of mudflat in Sussex is found in Chichester Harbour (1200 ha) with other areas found in Pagham Harbour, Rye Harbour, Adur Estuary (Shoreham) and Shoreham Harbour. This habitat type is commonly found alongside saltmarsh and is important for biodiversity. While only a few species live in the mud, they are found in large quantities e.g. spire shells, Mud Shrimp, cockles, ragworms and lugworms. Mudflats provide important year-round feeding areas for birds when exposed at low tieds. Many are found within designated sites (where the reason for protection is bird populations). Threats to mudflats include: land reclamation, sea level rise, dredging for navigation, pollution, bait digging, invasion by hybrid cord-grass.

2.3 Marine Assets: maps and summary of status

(marine area in this case refers to the area from the intertidal zone to six miles offshore)

Seabed habitats

Estimation of the extent and condition of seabed habitats is carried out using a different approach to that for terrestrial and coastal habitats (where knowledge is based primarily on survey data). For the marine environment, the data relies on a combination of survey and modelled information. Significant work has been done for the Sussex marine environment (to six nautical miles) as part of the SCHIP projects[1] and work by Sussex Inshore Fisheries Conservation Authority (IFCA).

The seabed habitats identified in Sussex – and estimated areas of each – are shown in Table 1 below. These are classified utilising the **European Nature Information System (EUNIS).** EUNIS is recommended as the foundation for natural capital assessments as it provides a consistent classification with a logical basis[2]. In terms of extent, A5.2 Sublittoral sand covers the largest area (26.1%), followed by A5.1 Sublittoral coarse sediment (18.2%) and x Mosaic habitats (17.8%) where more than one habitat was recorded at a single survey location.

The habitat map (see Figure 9 below) is currently the best understanding of the habitats in Sussex coastal waters. It is important to note that polygons have been drawn with their boundaries equidistant between neighbouring data points as a way of estimating the location of likely habitats and so do not necessarily represent actual boundaries between habitats.

EUNIS Level 2	EUNIS Level 3		% of total area	Area (km²)
A2 Littoral Sediment	A2.1	Littoral coarse sediment	0.1	1.28
	A2.2	Littoral sand	0.1	1.54
	A2.3	Littoral mud	0.02	0.32
	A2.4	Littoral mixed sediment	0.002	0.03
A3	A3	Infralittoral rock	0.3	4.8
	A3.1	High energy littoral rock	0.6	9.8
	A3.2	Moderate energy infralittoral rock	2.8	49.0
	A3.3	Low energy infralittoral rock	0.3	4.76
	A3.7	Features of infralittoral rock	0.3	4.61
A4 Circalittoral rock	A4		0.7	12.92
	A4.1	High energy circalittoral rock	2.4	42.48
	A4.2	Moderate energy circalittoral rock	5.4	94.64
	A4.3	Low energy circalittoral rock	0.2	3.4
	A4.7	Features of circalittoral rock	2.7	46.46
A5 Sublittoral sediment	A5	Sublittoral sediment	3.8	65.79
	A5.1	Sublittoral coarse sediments	18.2	317.20
	A5.2	Sublittoral sand	26.1	455.08
	A5.3	Sublittoral mud	0.9	14.87
	A5.4	Sublittoral mixed sediment	11.8	206.63
	A5.5	Sublittoral macrophyte-dominated sediment	3.7	65.27
	A5.6	Sublittoral biogenic reefs	1.9	33.60
Mosaic Habitats			17.8	311.56

Table 1: List of seabed habitats in Sussex marine environment

1 https://cris.brighton.ac.uk/ws/portalfiles/portal/497611/SCHIP+2+Full+Project+Report+May+2015.pdf
2 Hooper et al 2018, In IFCA 2019

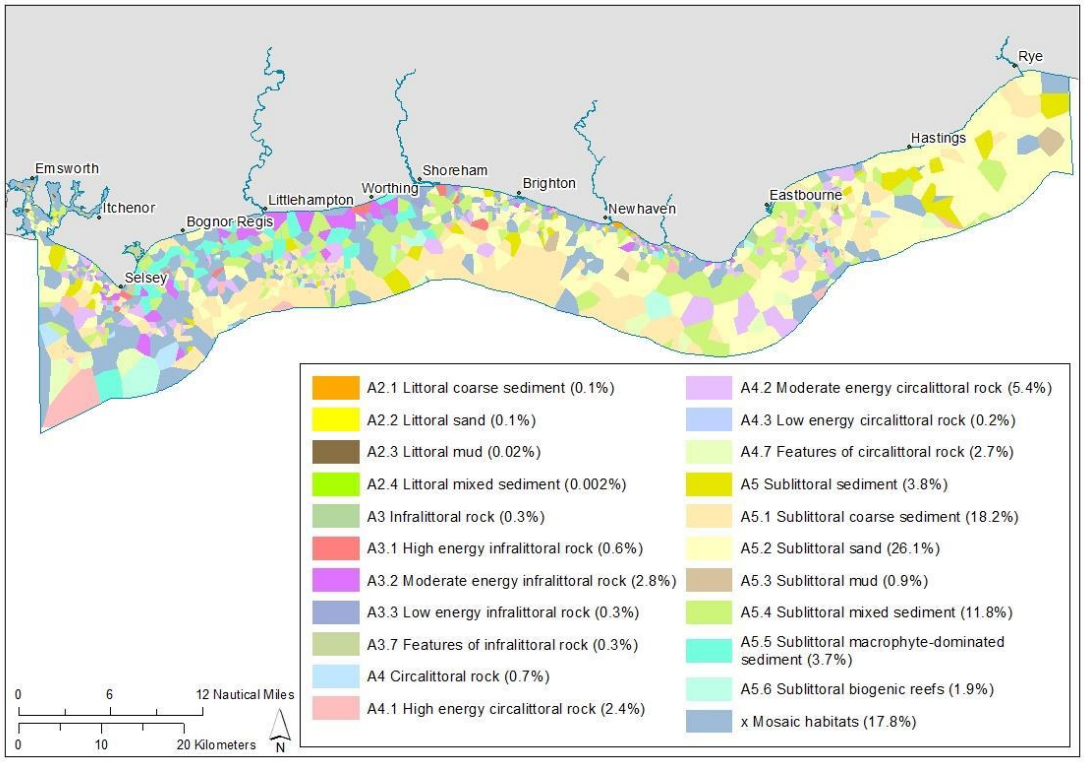


Figure 9: Seabed habitats at EUNIS level 2 and 3.

Voronoi polygons from point survey data from Marine Recorder and Sussex IFCA. Colours follow the EUNIS standard. Figures in brackets are the proportion of the study area covered by the habitat. Taken from Sussex IFCA 2019.

Assessment of the condition of marine natural capital assets is a particular problem, given the lack of survey data. Thus, the use of **proxy** indicators is an approach that is being proposed and tested as the methodology in this area continues to evolve.

Three indicators that are helpful proxies in assessing habitat condition include:

- Habitat diversity
- Habitat sensitivity
- Pressure on habitats from factors which cause damage

These indicators are mapped below with a short description of the conclusions.

Habitat diversity

In terms of spatial distribution, the **diversity** of habitats within the district is in itself a feature. Habitat diversity is important, as there is often more biodiversity when the habitat is more heterogeneous and structurally complex. Diversity also contributes to a robust, healthy ecosystem, better able to cope with changes[3].

There are areas of very high diversity throughout the Sussex marine area in particular south of Selsey, between Littlehampton and Shoreham, east of Eastbourne and near Rye (See Figure 10 below).

3 McLeod & Leslie, 2009; (Gray, 1997) in Nelson 2017

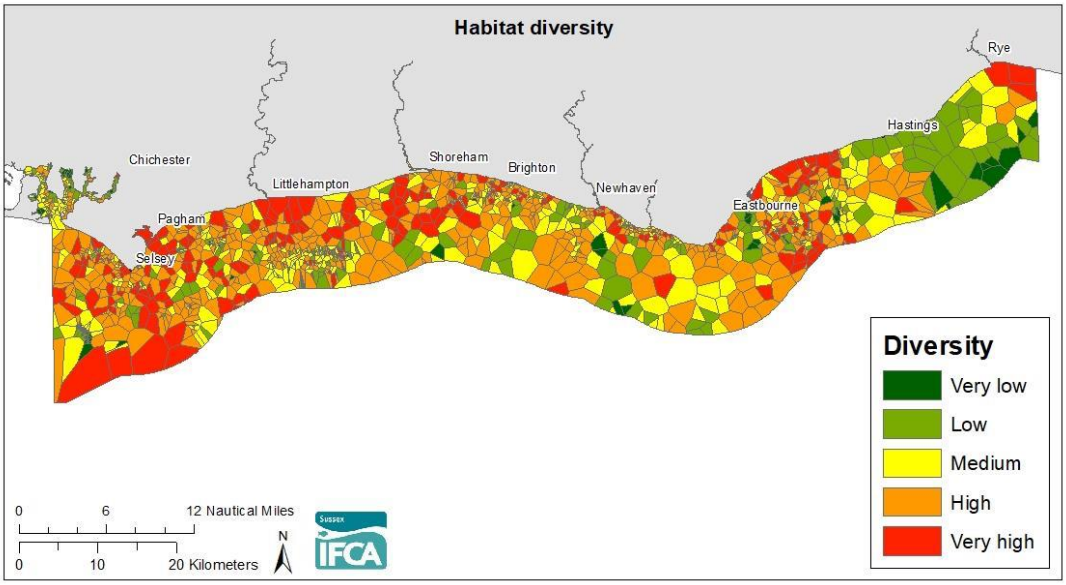


Figure 10. Habitat Diversity in Sussex marine environment (taken from Sussex IFCA 2019).

Habitat sensitivity

The sensitivity of each habitat has been assessed by researching the key species and their resistance to abrasion and how quickly they could recover from damage. The results of the analysis are shown in Figure 11 below. Generally, the habitats in the Sussex marine environment are vulnerable to damage but recover in 2-10 years. Where there is high sensitivity this means that physical damage will cause some decline in key species and it could take up to 10 years to recover. No habitat has very high sensitivity. Rock with attached animals or algae are the most sensitive habitats. In the west of the district there are larger areas of high sensitivity, around 4- 6 mile south of Chichester Harbour and Selsey Bill, as well as the inshore area stretching from Selsey to Shoreham. More isolated areas of high sensitivity habitats are found inside 3 miles from Brighton heading towards Eastbourne.

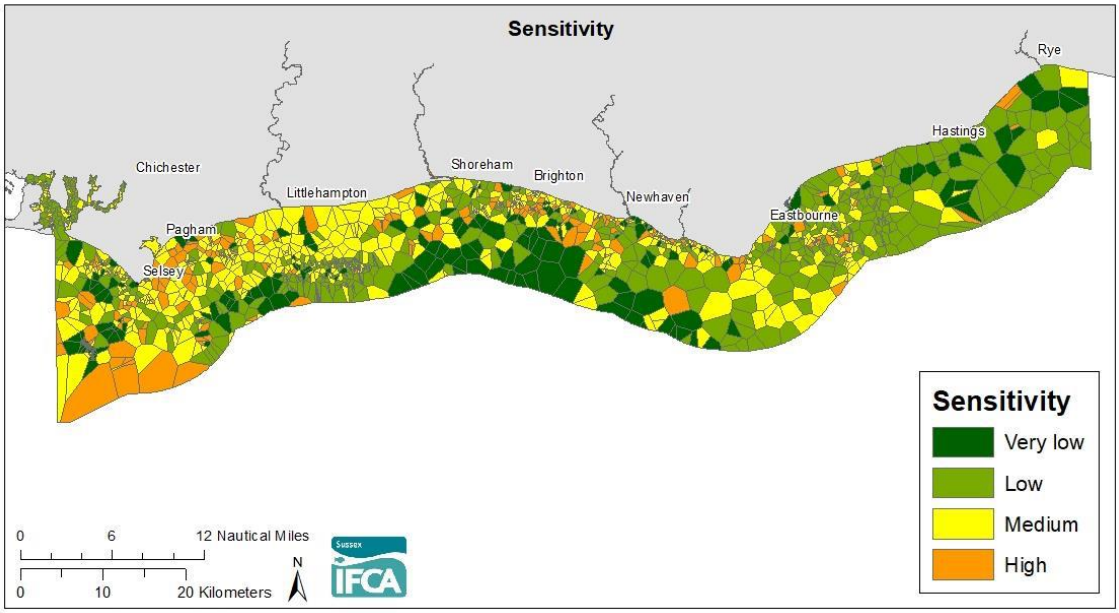


Figure 11. Habitat Sensitivity in the Sussex marine environment

Pressure on habitats

Research suggests that pressures arising from human activities have an impact on the condition of benthic habitats and species. This influences the ecological functions they carry out, which in turn affects their ability to deliver ecosystem services. Thus, researchers propose that **pressure information** may be used as a proxy indicator for seabed condition, especially where it can be used alongside evidence on the **sensitivity** of habitats to pressure[4,5].

The Sussex IFCA data set for fishing intensity includes various types of fishing activity but includes an assessment of **trawling.** A focus on trawling activity alone will be a useful indicator of abrasion pressure as fishing activity which interacts with the seabed, such as bottom towed gear, is the most widespread cause of disturbance to seabed habitats[6].

Figure 12 below shows sightings of towed gear, overlaid onto habitat type for the Sussex IFCA district. This information may be useful in estimating intensity of trawling activity in the area.

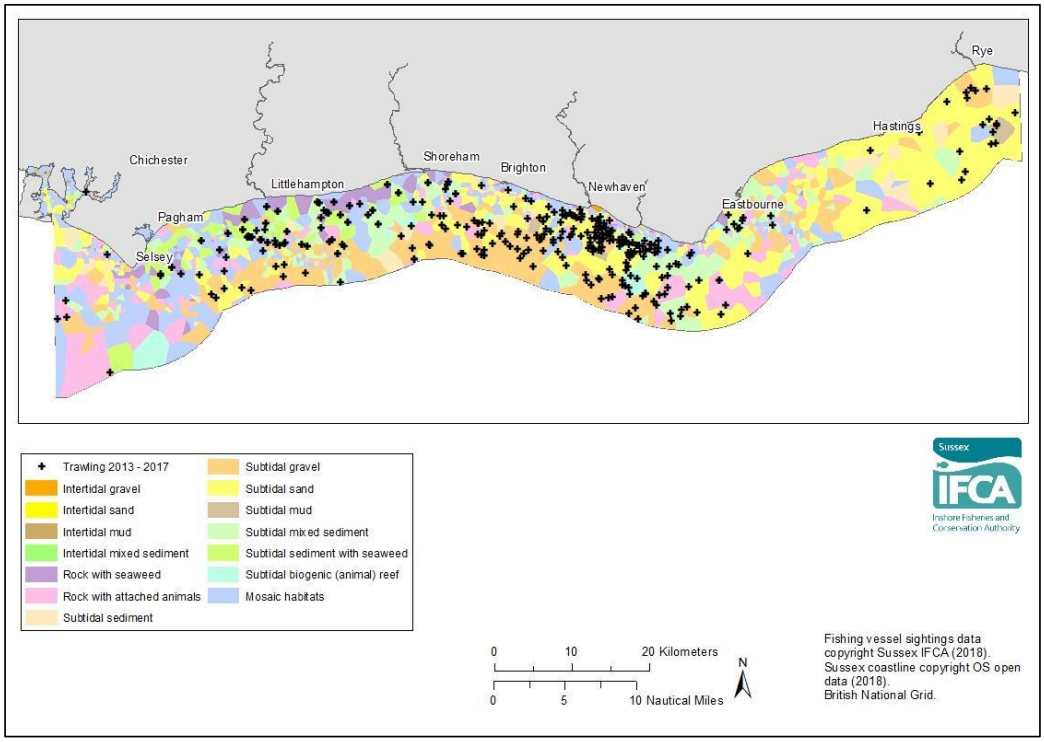


Figure 12. Sightings data for towed gear, overlaid on habitat type, within the Sussex IFCA district, data from 2013 to 2017 (not adjusted for patrol vessel bias).

Water Bodies

Bathing waters

There are 23 designated bathing waters in Sussex (10 in East Sussex and 13 in West Sussex). The name and quality (condition) of each of these is given in table 2 below. The classifications are:

- excellent – the highest cleanest seas
- good – generally good water quality

4 Tillin, H.M., Langmead, O, Hodgson, B., Luff, A., Rees, S., Hooper, T. and Frost, M. (2019). *Feasibility study for a Marine Natural Capital Asset Index for Scotland.* Scottish Natural Heritage Research Report No. 1071. See p24.

5 The use of proxies based on known pressures, such as abrasion by fishing, their impacts and habitat sensitivity is recommended by experts as a pragmatic approach to overcoming the lack of habitat condition information available (Hooper et al, 2018).

6 Hiddink et al, 2017 in Nelson 2017)

- sufficient – the water meets minimum standards
- poor – the water has not met the new minimum standards

East Sussex	Condition
Bexhill	Sufficient *
Camber	Excellent **
Hastings Pelham Beach	Sufficient *
Pevensey Bay	Good **
St Leonards	Excellent ***
Birling Gap	Excellent **
Eastbourne	Good **
Norman's Bay	Good **
Seaford	Excellent ***
Winchelsea	Excellent ***
West Sussex	
Bognor Regis (Aldwick)	Sufficient *
Bracklesham Bay, Chichester	Excellent ***
Lancing, Beach Green	Good **
Middleton-on-sea	Excellent ***
Selsey	Excellent ***
Bognor Regis (east)	Good **
Felpham	Good **
Littlehampton	Good **
Pagham	Good **
Shoreham Beach	Good **
Southwick	Excellent ***
West Wittering	Excellent ***
Worthing	Sufficient *
Brighton and Hove	
Saltdean	Excellent ***
Brighton Kemptown	Excellent ***
Brighton Central	Excellent ***
Hove	Excellent ***

Water Bodies identified under the Water Framework Directive (WFD)

Nine marine water bodies in Sussex are monitored under the WFD – and are either coastal or estuarine in nature. Names and condition are provided in the tables below.

Estuarine Water Bodies

Water Body	**Area (ha)**	**Overall status**	**Ecological Status**	**Chemical Status**	**Target status**	**Hydromorph status**	**Heavily modified** (HM) (Y/N)	**Use** (reason for designation as HM)
Chichester Harbour	3012.66	Moderate	Moderate	Good	Good	Supports Good	Y	Coastal Protection Navgiation, Ports & Harbours
Cuckmere	36.48	Moderate	Moderate	Good	Good	Supports Good	Y	Flood Protection
Ouse - estuarine	139.31	Moderate	Moderate	Good	Moderate	Supports Good	Y	Flood Protection

								Navigation, ports & harbours
Pagham Harbour	257.24	Moderate	Moderate	Good	Moderate	Supports Good	Y	Flood Protection
Pagham lagoon	9.52	Good	Good	Good	Good	Not assessed	N	
Rother	38.64	Moderate	Moderate	Good	Moderate	Supports Good	Y	Flood protection

Coastal Water Bodies (monitored under the WFD)

Water Body	**Area (ha)**	**Overall status**	**Ecological Status**	**Chemical Status**	**Target status**	**Hydromorph status**	**Heavily modified (y/n)**	**Use** (reason for designation as HM)
Sussex	19059.70	Moderate	Moderate	Good	Good	Not assessed	N	Coastal Protection
Sussex East	13059.21	Moderate	Moderate	Good	Good	Not assessed	N	Coastal Protection
Ternery Pool	5.18	Good	Good	Good	Good	Supports Good	N	

Table 2 Condition of water bodies (coastal and estuarine) as reported under WFD

Shellfish waters

The only classified shellfish water in Sussex is **Chichester Harbour** (Chichester Channel, Thornham Channel and Emsworth Channel). This is a small-scale but locally important fishery for native oysters in Chichester Harbour. Fishing by dredging takes place for a couple of weeks each November.

The boundaries of the fishery are shown in Figure 13 below.

The harbour has a wide variety of marine habitats including extensive areas of estuarine flats, intertidal areas supporting eelgrass (*Zostera spp.*), saltmarshes as well as drift line vegetation. In recognition of the variety and quality of habitats and species found in the harbour, the area has been designated: AONB, EU Natura 2000 (it is part of the Solent Maritime Special Area of Conservation (SAC) and Chichester and Longstone Harbour Special Protection Area (SPA)), SSSI, a Bass Nursery Area, Ramsar Site.

Key issues affecting the shellfish water include:

- **Decline in oyster fishery** (native oysters (*Ostrea edulis*)). Its productivity has been in decline for a number of years. This is thought to be due to a range of factors including loss of habitat, continued fishing when stocks are under pressure, disease, siltation and decline in water quality. Loss of the fishery productivity has had knock-on effects on other benefits/services such as water filtration
- **Poor water quality**. In 2009 the Chichester Channel designated Shellfish Water (SW) failed the Guideline (G) faecal coliform shellfish flesh standard. Thornham Channel SW only achieved the G standard for faecal coliforms in shellfish flesh in 2005 and 2008, although faecal coliform levels observed in the water column have been consistently low. Emsworth Channel SW achieved the G standard for faecal coliforms in shellfish flesh in 2004 and 2005. The level of treatment at Bosham STW and Chichester STW was upgraded to ultraviolet disinfection in March 2008 as part of a water company investment programme to improve water quality in the catchment and endeavour to ensure compliance with Shellfish Waters guideline standards.

The conclusion of a 2018 study[7] of the fishery concluded that if water quality in the fishery was improved, it would allow the Thorney area of the fishery to be re-opened which would lead to increased harvesting and knock on improvements in output of the fishery.

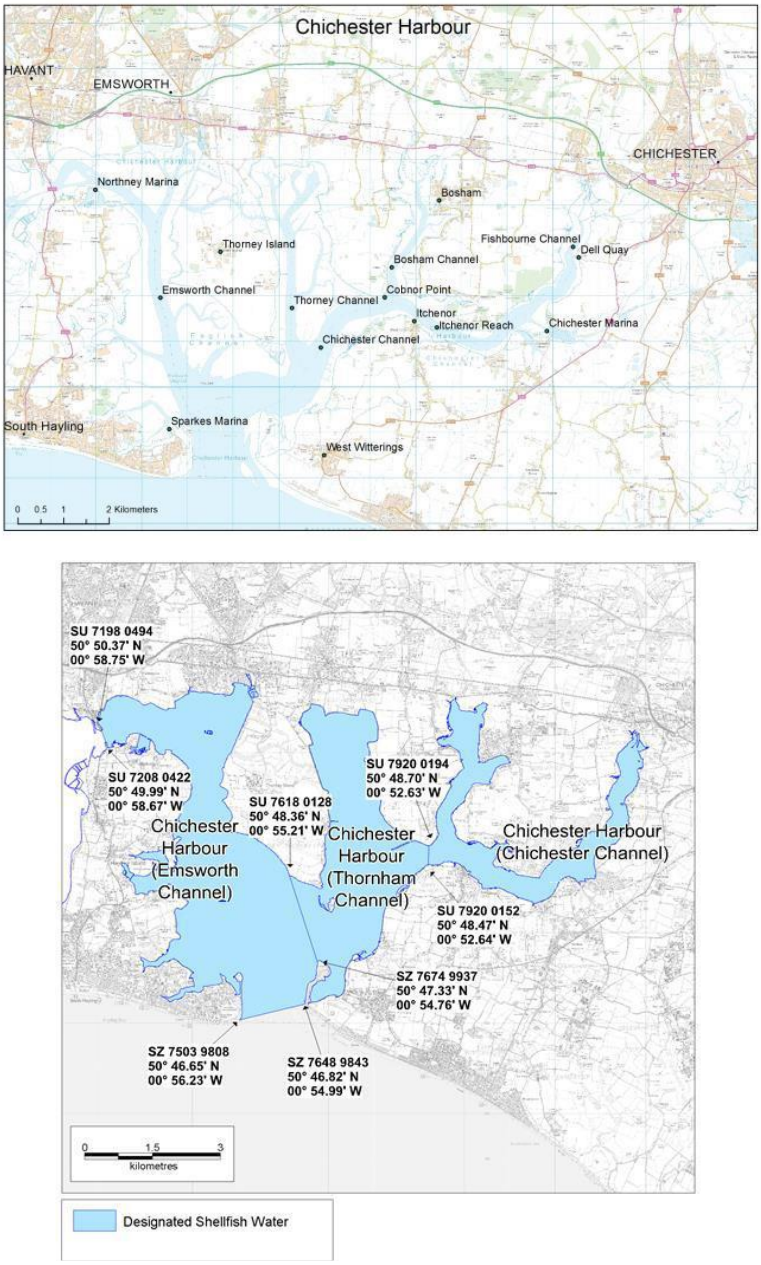


Figure 13: The five main channels which make up Chichester Harbour [Fishbourne, Chichester, Bosham, Thorney and Emsworth Channels and their relationship to the designated shellfish waters][8]

7 Williams, C., Davies, W. and Kuyer, J. (2018) *A valuation of the Chichester Harbour Provisioning Ecosystem Services provided by shellfish*. Sussex Inshore Fisheries and Conservation Authority.

8 From Williams, C., Davies, W. and Kuyer, J. (2018) *A valuation of the Chichester Harbour Provisioning Ecosystem Services provided by shellfish*. Sussex Inshore Fisheries and Conservation Authority.

3. Benefits and services provided by natural capital

The following tables provide an indication of the benefits and services provided by natural capital assets in Sussex. They indicate only the likely benefits/services that each asset provides and do not reflect the level of performance of the assets present (which depends on quantity, quality and spatial configuration of assets). However, they are a useful checklist upon which more detailed work on 'flows' of benefits and services can be calculated in the future.

A separate analysis for marine assets is provided, based on specific work carried out by Sussex IFCA.

3.1 Terrestrial

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
Freshwater								
Rivers and streams	✓	✓	✓	✓	✗	✓	✓	✓
	Fish and shellfish	Water quantity and flow regulation	Temperature regulation;	Detoxification and purification of water			Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place
Chalk Streams	✓	✓	✓	✓	✗	✓	✓	✓
	Watercress growing (historic)	Feed into rivers;	Water temperature regulation for climate buffering;	Detoxification and purification of water; high quality, cool water entering the river system		Support unique biodiversity; act as indicator for wider ecological health	Some surface and fluvial flood regulation	Accessible nature' aesthetic/ sense of place
Ponds and Lakes	✓	✗	✓	✓	✗	✓	✓	✓
	Fish – not commercial		Carbon storage and sequestration	Detoxification and purification of water		Support biodiversity; bird breeding, wintering	Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place; local fishing

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
						and feeding grounds; unique flora and fauna		activities supporting businesses and communities around stocked lakes and ponds.
Reservoirs	✗	✓	✓	✓	✗	✓	✓	✓
		Water quantity: main storage areas for water supply system	Carbon storage and sequestration	Detoxification and purification of water		Support biodiversity; bird breeding wintering and feeding grounds	Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place; fishing activities (supporting business and communities)
Grazing Marsh	✗	✓	✓	✓	✗	✓	✓	✓
		Flow regulation and recharge	Carbon storage and sequestration	Detoxification and purification of water		Support biodiversity; bird breeding, wintering and feeding grounds; rare plants and invertebrates	Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place
Reedbeds	✗	✓	✓	✓	✗	✓	✓	✓
		Flow regulation and recharge	Carbon storage and sequestration	Detoxification and purification of water		Support biodiversity; bird breeding, wintering and feeding grounds	Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place
Fens	✗	✓	✓	✓	✓	✓	✓	✓
		Flow regulation and recharge	Carbon storage and sequestration	Detoxification and purification of water	Support pollinator species;	Support biodiversity; bird breeding, wintering and feeding grounds	Surface and fluvial flood mitigation	Accessible nature; aesthetic/ sense of place
Springs	✗	✓	✗	✗	✗	✓	✗	✗

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
		Water quantity				Unique biodiversity associated with cool flowing water		
Aquifers	✗	✓	✗	✗	✗	✓	✗	✗
		Water quantity				Unique biodiversity associated with cool flowing water		
Heathland								
Lowland Heath	✓	✗	✓	✓	✓	✓	✓	✓
	Many heathland sites are periodically wooded		Carbon storage and sequestration	Detoxification and purification	Supports pollinator species	Wildlife habitat	Surface and fluvial flood mitigation (particularly headwaters)	Aesthetic/sense of place; accessible nature
Sandstone Outcrops	✗	✗	✗	✗	✗	✗	✗	✓
						Unique microhabitats; liverworts and mosses		Aesthetic / sense of place; accessible nature
Grassland								
Lowland calcareous grassland	✓	✓	✓	✓	✓	✓	✓	✓
	Meat (grazing)	Water quantity	Carbon storage and sequestration	Detoxification and purification	Supports pollinators	High value wildlife habitat	Surface and fluvial flood mitigation	Aesthetic/ sense of place; accessible nature
Unimproved grassland	✓	✓	✓	✓	✓	✓	✓	✓
	Meat (grazing); fodder	Water quantity (where the grassland is located over aquifer)	Carbon storage and sequestration	Detoxification and purification	Supports pollinators	High value wildlife habitat (especially when in good condition)	Surface and fluvial flood mitigation	Aesthetic/ sense of place; accessible nature

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
Farmland (including hedgerows)								
Farmland	✓	+/-	-	-	+/-	+/-	+/-	✓
	Food; biomass crops	Depending on management: +ve: can assist with Flow regulation (storage and recharge) Or -ve when poor soil management increases run off	**Overall tends to be net negative** due to emissions of GHG and depletion of soil carbon This can be improved through farming system and soil management	**Overall tends to be net -ve:** source of diffuse pollution; sedimentation This can be improved through farming system and soil management	Depending on management: **+ve** can contain habitats that support pollinators **or** **-ve** impact on pollinators via pesticides and farming practices	**+ve** Depending on management can contain Important farmland habitats; **or** **-ve** Poor quality habitats	Depending on management: **+ve** Surface and fluvial flood mitigation Or net -ve contributor to soil erosion and increase in potential for downstream flooding	Accessible nature (footpaths etc)
Hedgerows	✗	✓	✓	✓	✓	✓	✓	✓
	Non commercial forage only	Storage and recharge	Carbon storage and sequestration	Detoxification and purification	Pollinator habitat	Valuable wildlife habitat	Surface and fluvial flood mitigation	Aesthetic/ sense of place; accessible nature
Woodland								
Woodland	✓	✓	✓	✓	✓	✓	✓	✓
	Timber	Water quantity and flow regulation – esp from floodplain woodland	Carbon storage and sequestration	Detoxification and purification	Supports pollinators	High value habitat (value varies with woodland type and condition)	Surface and fluvial flood mitigation (esp floodplain woodland)	Aesthetic/ sense of place; accessible nature

Mapping benefits and services from terrestrial habitats

Work by Natural England in 2014[9] assessed the potential to map the services provided by a range of habitats and developed a scoring system to assist with this. This approach and the scoring system used by NE, has been adopted to develop a series of maps, each of which shows the relative delivery of specific benefits/services by natural capital assets in Sussex. These are very broad brush and should be interpreted with care, but do show where the assets are located which provide specific services on a scale of high, medium and low levels.

Climate regulation (carbon storage, sequestration and cooling effects)

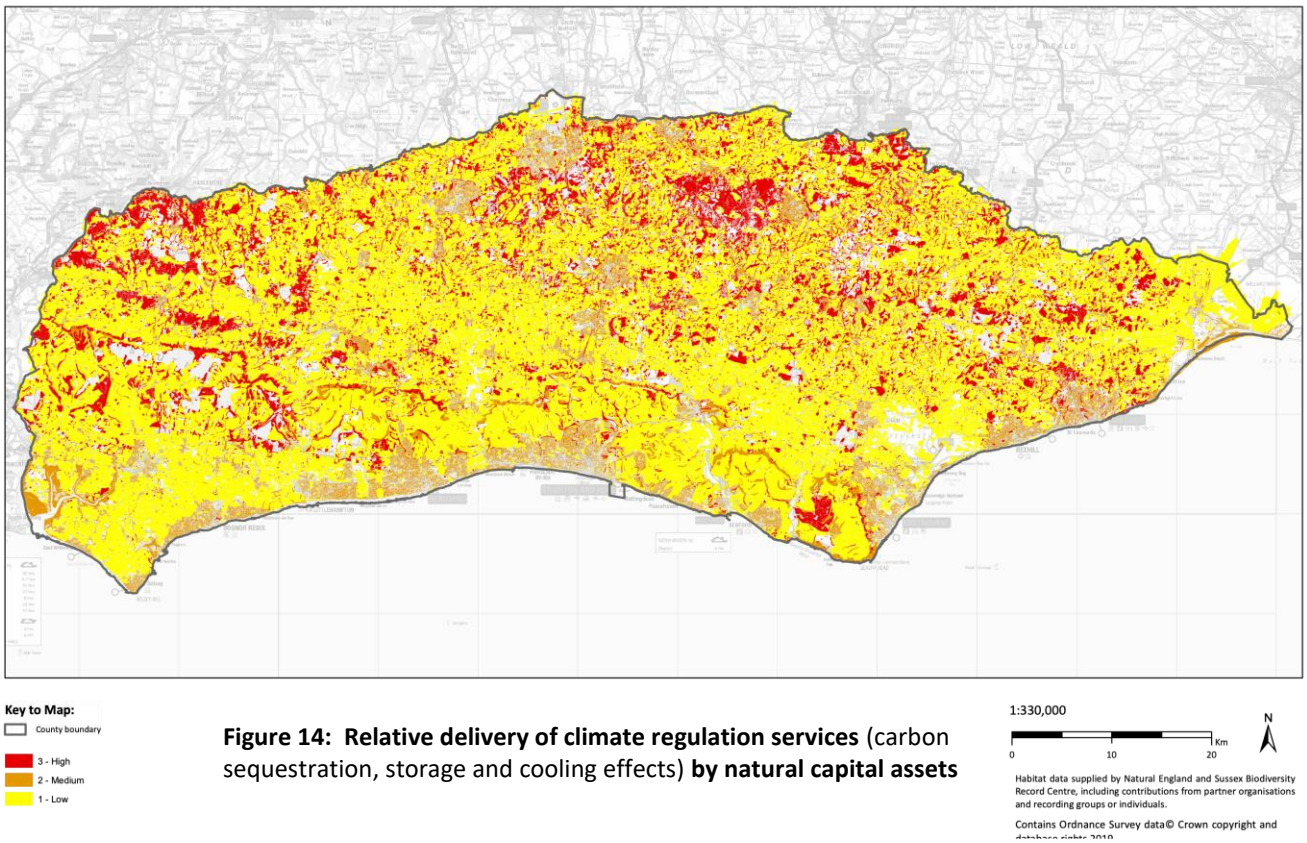
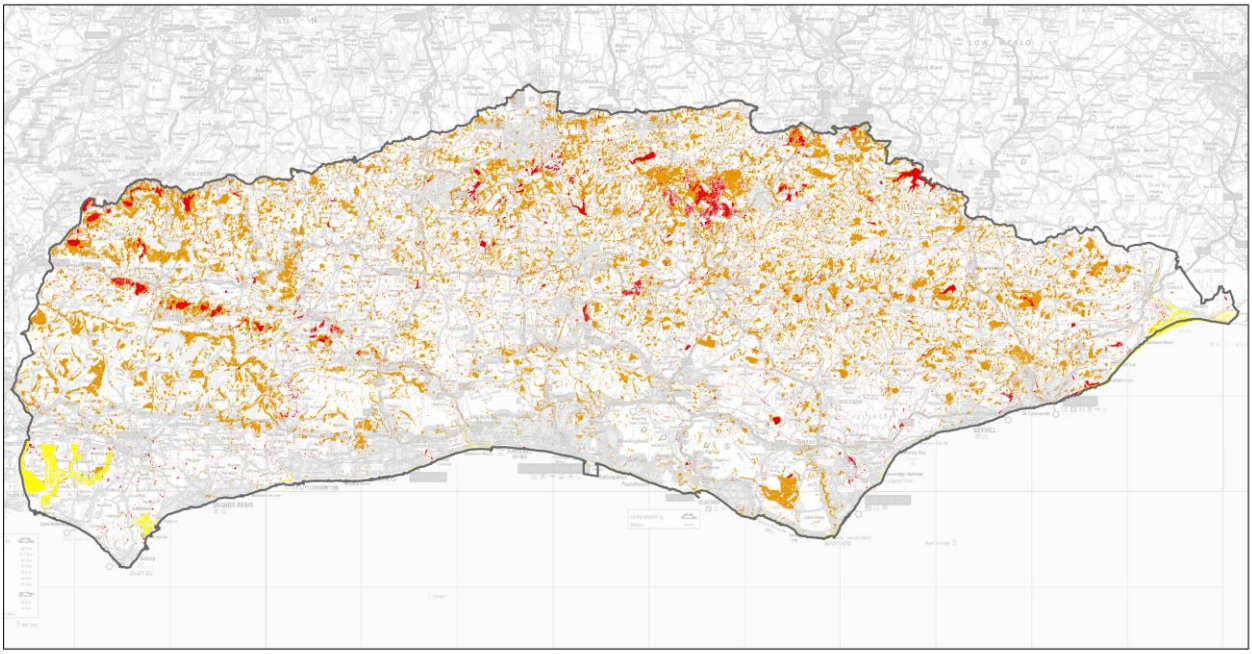


Figure 14: Relative delivery of climate regulation services (carbon sequestration, storage and cooling effects) **by natural capital assets**

Note: this does not reflect the role of soil in climate regulation services - and is limited to terrestrial habitat types only).

[9] Dales, N., Brown, N., and Lusardi, J. (2014). Assessing the potential for mapping ecosystem services in England based on existing habitats. Natural England Research Report NERR056. http://publications.naturalengland.org.uk/publication/5280919459987456

Contribution to water quantity/supply



Key to Map:

County boundary

3 - High

2 - Medium

1 - Low

1:330,000

0 10 20 Km

N

Habitat data supplied by Natural England and Sussex Biodiversity Record Centre, including contributions from partner organisations and recording groups or individuals.

Figure 15: Relative contribution of water quantity/supply benefits by natural capital assets

3.2 Coastal

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
Sand Dunes	✗	✗	✓	✗	✓	✓	✓	✓
			Carbon storage and sequestration		Pollinator habitat		Coastal flood and erosion mitigation	Aesthetic/ sense of place; accessible nature
Saltmarsh	✓	✗	✓	✓	✓	✓	✓	✓
	Meat (grazing); samphire gathering		Carbon storage and sequestration	Detoxification and purification	Supports pollinators	Wildlife habitat; nursery ground for fish; breeding, over wintering, feeding grounds for birds	Coastal flood and erosion mitigation	Aesthetic/ sense of place;
Vegetated Shingle	✗	✗	✗	✗	✗	✓	✓	✓
						Wildlife habitat; breeding, over wintering, feeding grounds for birds	Coastal flood and erosion mitigation	Aesthetic/ sense of place; Accessible nature
Sea cliffs	✗	✗	✓	✗	✗	✓	✓	✓
			Some carbon sequestration			Wildlife habitat; breeding, over wintering, feeding grounds for birds	Coastal flood and erosion mitigation	Aesthetic/ sense of place; Accessible nature

	Food/ Fibre (crops, livestock, fish), timber	Water Supply	Climate regulation	Clean Water	Pollination	Wild Species Diversity	Hazard Regulation (Flooding and erosion)	Cultural Services
Coastal Lagoons	✘	✘	✓	✘	✘	✓	✓	✓
			Some carbon sequestration	Detoxification and purification		Wildlife habitat; breeding, over wintering, feeding grounds for birds; nursery grounds for fish	Coastal flood and erosion mitigation	Aesthetic/ sense of place; Accessible nature
Mudflats	✘	✘	✓	✘	✘	✓	✓	✓
			Carbon storage and sequestration	Detoxification and purification		Wildlife habitat; breeding, over wintering, feeding grounds for birds; nursery grounds for fish	Coastal flood and erosion mitigation	Aesthetic/ sense of place; bait digging for recreational fishing

3.3 Marine

A study commissioned by Sussex IFCA[10] carried out an analysis of ecosystem services provided by marine natural capital assets in Sussex. A scoring system was then used to assign a value to each habitat for each ecosystem service type using a scale from 1 (negligible provision) to 5 (high level of provision). These scores are shown in the table below.

Habitat name	EUNIS code	Food	Raw material	Air quality & climate regulation	Disturbance & natural hazard prevention	Photosynthesis and primary production	Nutrient cycling	Reproduction/ nursery	Biodiversity maintenance	Water quality	Cognitive value	Leisure, recreation, cultural	Feel good/ warm glow	AVERAGE score
Intertidal sediment	A2	5.0	2.5	4.0	5.0	4.0	4.0	5.0	4.5	2.5	4.5	5.0	4.5	4.2
Infralittoral rock (rock with seaweed)	A3	4.5	4.0	4.0	3.0	4.5	4.0	4.5	4.3	4.8	5.0	4.5	3.5	4.2
Circalittoral rock (rock with attached animals)	A4	3.5	3.0	3.0	2.0	1.5	4.0	4.5	5.0	4.0	5.0	4.0	3.0	3.5
Subtidal sediment	A5	4.9	2.8	1.7	2.0	1.8	3.7	4.0	3.5	2.8	1.7	2.3	2.3	2.8

Table 3: Summary table of the ecosystem services provided by the seabed habitats at EUNIS level 2 on a scale from 1 pale green (negligible provision) to 5 dark green (high level of provision).
Assessed using information from Galparsoro et al (2014), Salomidi et al (2012) and Fletcher et al (2012). Taken from Nelson 2017.

The **average** score shown in the table was then mapped to illustrate an overall level of ecosystem service provision, as shown in Figure 16 below.

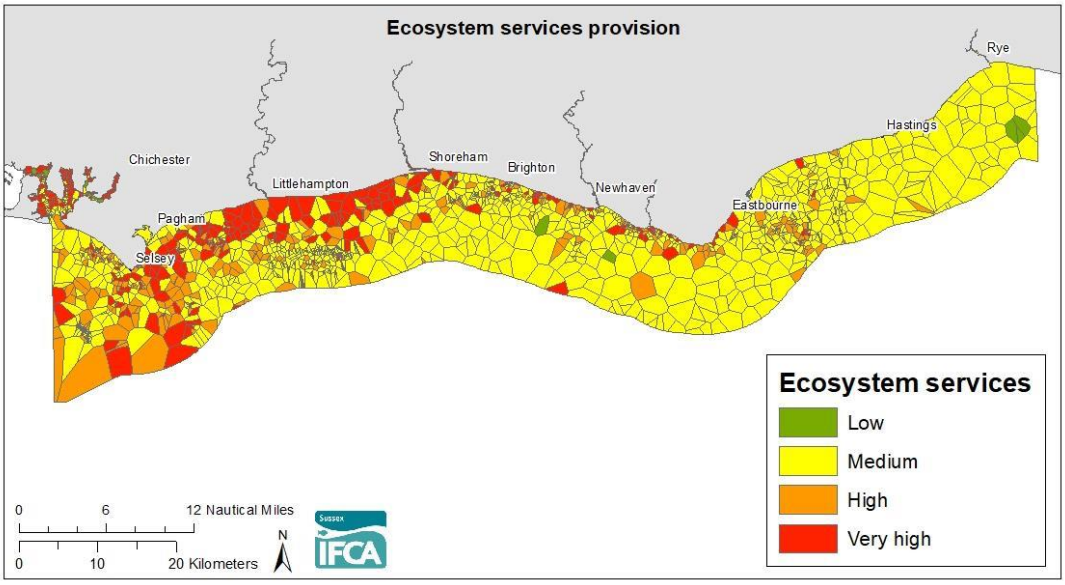


Figure 17. Ecosystem service provision across the Sussex marine area[11].

10 Nelson, K (2017)
11 Sussex IFCA (2019)

Further work is required to identify the flow of benefits and services from water bodies (bathing waters, Coastal and Estuarine water bodies and shellfish water), but it is likely that these contribute a range of important environmental, cultural and economic benefits.

4. Natural Capital at risk

Risk has been assessed only for terrestrial and coastal assets (i.e. not for marine assets as this information is not available).

4.1 NCC national risk assessment – as applied to assets found in Sussex

The Natural Capital Commission (NCC) carried out an analysis of how the quantity, quality (condition) and spatial configuration of natural capital assets related to the benefits produced at a national level. Over 240 relationships were assessed. From these, 73 were identified as significant i.e. this factor for a particular asset had a substantial effect on the benefits produced. For example, the quality of heathland has a substantial effect on water quality.

These priority relationships were then assessed (using available information on status and trends of natural assets and benefits) – and were allocated to a risk category.
The results are shown in the matrix below (Figure 17).

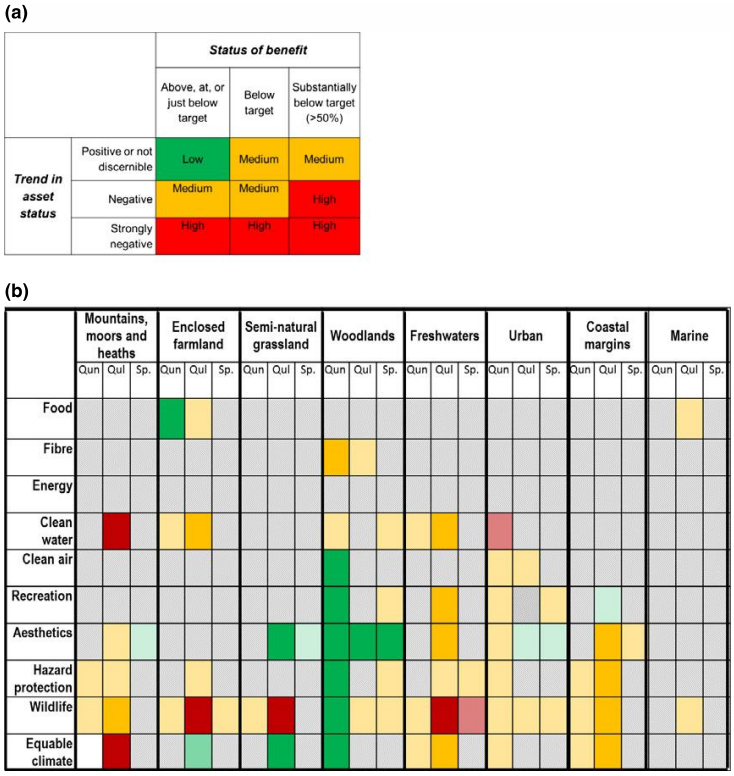


Figure 18. (a) Risk register scoring matrix and (b) Risk Register Results. Taken from Mace et al 2015.

As shown by the boxes coloured red, there were 7 relationships nationally that were flagged as **'high risk'.** These are cases where there is reasonable confidence that the current status of natural capital assets in these broad groups is poor and/or the trends are strongly negative in the relevant factor (quality, quantity and spatial configuration).

The categories of goods and, therefore, benefits most at risk include the following:

• **clean water from mountains, moors and heaths**, due to the **quality** of those habitats;
• **clean water** from the current extent and projected **growth of urban habitats** leading to a deterioration in freshwater, soils and natural water purification processes in these areas;
• **wildlife** is at risk in many habitats (but particularly in **semi-natural grasslands, enclosed farmland and freshwaters**. This is due to **poor-quality habitats and unfavourable spatial configurations** (i.e. fragmentation of habitats/ poor connectivity between them); and
• **equable climate**, essentially carbon storage, is at risk from the **degraded condition of mountains, moors and heaths** which have the potential for much greater carbon storage[12].

How the national assessment can be applied to Sussex:

- Sussex contains relatively little **heathland habitat,** but the classification of this asset-benefit relationship as 'high risk' nationally should be noted and taken forward for action in the strategy
- Sussex has a large extent of **freshwater habitats,** which are also included in the high-risk category. Action to improve the quality of these assets could deliver great increases in associated benefits across the area.
- Benefits received from **coastal margin** habitats are at medium risk nationally. Given the pressure on the coastal margins in Sussex, this will be at least the case in Sussex and particular focus should be given to these areas to identify local level of risk and to prioritise this in the strategy.
- Given the local importance of natural capital in **urban areas** (and the precautionary approach advised due to lack of information) – developing a greater understanding of the contribution of natural capital to urban environments will be important going forward. A precautionary approach to protection of these assets in urban environments should be taken.
- Sussex has a large extent of **woodland**, thus a focus on improvement of the quality of existing woodland would be beneficial to the delivery of benefits, whilst ensuring any new woodland also includes a focus on management for its long-term quality, will be important.

4.2 Sussex LNP assessment of risk

To supplement the broad national picture, a simple risk assessment approach was carried out a Sussex scale. Using expert knowledge within the LNP, a matrix was used which scored the level of risk to each asset-benefit relationship from four main 'drivers of change':

- Agriculture
- Development
- Climate Change
- Visitor Pressure

These drivers were selected as those which are perceived by the LNP to provide the greatest threat to the quality, quantity and condition of natural capital assets in Sussex currently, and into the near future. The risk levels included below were as a result of the judgement of LNP members

The headlines from this risk assessment are shown below. The full detail of the risk assessment is provided in the detailed Asset and Risk register (in production).

12 *ibid*

Terrestrial Assets

Asset	Benefit at risk	Rationale
Freshwater Assets	The role of freshwater assets – and in particular **rivers, reservoirs, aquifers and springs,** in the provision of **water supply** in Sussex is at **high risk** from climate change. Agriculture and adjacent land use is having a significant impact on the **water quality** of rivers, lakes, grazing marshes and ponds in Sussex, placing their role in supporting wildlife, fish nursery habitat and providing clean water at **medium risk**	**In Sussex**, climate change is likely to result in reduced summer rainfall with larger seasonal variations in river flow and groundwater levels. This will affect available resources for abstraction by water companies and will place greater risk to the ecosystems of rivers if water levels drop below certain levels. This has to be understood within the context of a significant future projected increase in the Sussex population, which will result in increased demand on water supply. Diffuse pollution from agriculture and increased siltation due to land management practices are having detrimental impacts on the water quality in freshwater habitats. A high proportion of water bodies in Sussex are in poor condition as monitored under the Water Framework Directive. The quality of water abstracted for public supply is also at risk due to these factors. In terms of supporting wildlife, a very large proportion of ponds are in poor condition due to poor management and adjacent land use, with shallow ponds under additional levels of risk from climate change (they are more likely to dry up) and succession of surrounding vegetation due to lack of management. The functioning of many freshwater habitats within flood plains in Sussex (e.g. reed beds, grazing marsh) is already highly compromised by the small remaining areas, poor condition and highly fragmented nature of these habitat types. In many cases this is exacerbated by 'disconnection' of areas of flood plain by hard flood defences.
Heathland	The role of heathland in the provision of **clean water** in Sussex is probably limited to where the habitat is found in any significant amount, which is in the Ashdown Forest. In this area it is at **medium risk** due to impacts of agriculture. Both in the Ashdown Forest and in other fragments across Sussex, it continues to provide support for important wildlife communities although this function is at **medium risk** due to losses from development	Poor habitat condition in Sussex heathlands due to lack of management, under grazing (losing heathlands to woodland/scrub) and nitrogen enrichment from nearby agriculture and existing atmospheric nitrogen, is reducing its role in provision of clean water. The Ashdown Forest contains the largest area of heathland in Sussex and supplies the headwaters of several rivers. Its role in provision of clean water is thus critical. Outside the Ashdown Forest only small areas of heathland remain in Sussex and as such it is an already fragmented habitat. Further losses due to lack of management or nearby development will severely threaten its ability to support its specialist wildlife.

Asset	Benefit at risk	Rationale
Grassland	The role of chalk grassland in the provision of **clean water** is at **high risk** due to impacts of agriculture. Its role in the support of wildlife and pollinators is at **medium risk,** again due to impacts of agriculture, scrub encroachment and losses to development. The loss of areas of chalk grassland coupled with pressures on the habitat quality, is placing the role of chalk grassland in **water supply and carbon sequestration/storage** at **low risk.**	Chalk grassland is found on chalk soils and is distributed in Sussex on areas of downland aquifer. Chalk grassland in good condition is likely to have a positive impact on aquifer recharge (due to reduced run-off rates) and the filtration of impurities from water when soil compaction is low13. Agricultural practices are a major contributory factor in the degradation of these habitats and poor management results in scrub encroachment. Losses of areas of this habitat, for example, through destruction or lack of management, is also increasing its fragmentation. Rough/unimproved grassland is also important for a range of benefits and should not be overlooked in this analysis as it experiences similar risks to chalk grassland. Development pressure is higher on species rich grasslands off the chalk as sites are isolated and more prone to development and lack of management
Farmland	The production of **food** by farmland in Sussex may be under **risk (medium)** from loss of land to **development** in the future. As per the national assessment, wildlife on enclosed farmland is at **high risk** due to the degradation and fragmentation of wildlife habitat The many services provided by **hedgerows,** most of which are found on farmland, are at **low/medium risk** due to loss from agriculture and development. Of particular concern are their role in supporting **wildlife pollinators and clean water**	**Losses of** farmland (both arable and improved grassland) may increase in the future due to the increasing demand for space for housing and infrastructure); conversion of farmland from production of food to energy crops, solar arrays and viticulture may also increase risk to food production in future Loss of agricultural land to development also underpins the **medium/low** risk to their delivery of ecosystem services such as water supply, flood risk regulation, erosion regulation and carbon storage (although this does depend on how the land is being managed as farmland can have a net negative impact on other values if it results in soil loss, erosion, destruction of wildlife habitat and diffuse pollution). The greatest risk to hedgerows in Sussex comes from removal/ loss of hedges and degradation of their structure, connection and wildlife value due to poor/no management. Development also poses a threat to hedgerows, even when a hedgerow is retained its ability to fulfil its role as a wildlife corridor can be curtailed.

13 http://sussexlnp.org.uk/SouthDownsNCA.php

Asset	Benefit at risk	Rationale
	Risk to **soil** in Sussex (and to its various components such as soil biodiversity, soil structure, sol carbon and so on) from various sources is thought to be significant. **Work is ongoing to develop a reliable approach to understanding risk to this resource. Information will be included in this section once complete.**	
Woodland	The variety of benefits provided by woodland in Sussex (clean water, wild species diversity, hazard regulation, carbon storage) is at **medium risk** due to losses of areas of woodland to development (e.g. infrastructure development, housing) and poor condition of woodland areas.	Woodland is a very important natural capital asset in Sussex, given the large area of the county under woodland cover. Yet its distribution is important – as it is found more in certain areas and less so in others. Most of the ancient hedgerows and shaws are themselves remnants from assarted fields. In Sussex, the density of woodlands and hedgerows creates extensive networks of wildlife, so no one piece of woodland or hedgerow can be looked at in isolation. The impact of any losses of woodland cover may therefore be increased when it is in strategically important areas (which affect the spatial configuration of woodland areas – e.g. connectivity; loss of woodland in sensitive parts of river catchments; loss of valued areas for recreation). An additional risk factor for woodland in Sussex is **condition,** which is very important in the delivery of many of the benefits associated with woodland. Much of the woodland in Sussex is in poor condition due to lack of management and so is underperforming in terms of delivery of services.

Coastal assets

Asset	Benefit at Risk	Rationale
Mudflats and Saltmarsh	Mudflats and saltmarsh are under threat from climate change. Destruction of these habitats places their role in the support of **wildlife** at **very high/severe risk** These pressures also place their role in **coastal erosion**	These habitats are found in small pockets, often within the narrow coastal strip between the sea and inland development. They are already highly fragmented and are under severe pressure from sea level rise and storm events which are reducing their area further. The confinement of the habitats within a narrow coastal area means they do not have anywhere to migrate to (coastal squeeze).

Asset	Benefit at Risk	Rationale
	protection and cultural services at **high risk.**	These habitats have a significant value for biodiversity, reduce the impact of waves on the shoreline and help to prevent coastal flooding. They are also an important part of the coastal landscape. Their loss or degradation thus places many benefits at risk.
Saltmarsh	The role of saltmarsh in providing **clean water** in the estuarine environment is at **medium risk** from **development and agriculture.**	Saltmarsh plays an important role in pollution control, waste disposal and the maintenance of water quality. This value is based on its extent and quality and thus factors which influence this (e.g. loss of area due to development) and/or reduction in quality from pollution from new urban areas and agriculture undermine its ability to provide this function. This habitat is often found in areas of the Sussex coast which are under increasing pressure for urban development – and where upstream development and land use is contributing to pollution levels. Salt marsh in Sussex is at high risk from agriculture and increased nutrients from landuse/ pollution which leads to eutrophication. It is thus very vulnerable to these impacts and cumulative impact over time will increase risk.
Sand Dunes and Sea Cliffs	The role of Sand dunes and sea cliffs in **coastal erosion protection** is at **high risk** from climate change	Sand dunes also provide a role in protection from coastal erosion by protecting inland areas from coastal water intrusion and by absorbing the impact of high energy waves and storms. They are only present in a small areas at a number of places along the Sussex coast. Although nationally only classified as 'medium'14 climate sensitivity, the examples in Sussex are very vulnerable to the impacts of climate change (sea level rise and storm events) due to their small size and the extent of coastal squeeze.
Vegetated Shingle	The biodiversity and cultural services supported by vegetated shingle, and its role as a feature of beaches in Sussex, is at from **development and visitor pressure and coastal protection measures.** This risk is **localized/ low**.	This habitat is of **very high** significance in Sussex due to the proportion of the national and European extent found along the Sussex coast. It supports very specialised biodiversity. Pockets are being lost to development and trampling by visitors. Invasion of shingle by other species also threatens this habitat. Vegetated shingle is more stable and provides greater protection to the shoreline than non-vegetated shingle. Loss of this habitat will reduce its presence on Sussex beaches – and thus its contribution to

14 Natural England and RSPB (2014), Climate Change Adaptation Manual.

Asset	Benefit at Risk	Rationale
		this landscape, and the many cultural services it provides.
Coastal Lagoons	The various benefits provided by coastal lagoons (wildlife, clean water and coastal erosion protection) are at risk from development and agriculture. This risk is localized/ **low.**	This risk level is due to loss of areas of this habitat to development and degradation of quality by upstream agricultural pollution.