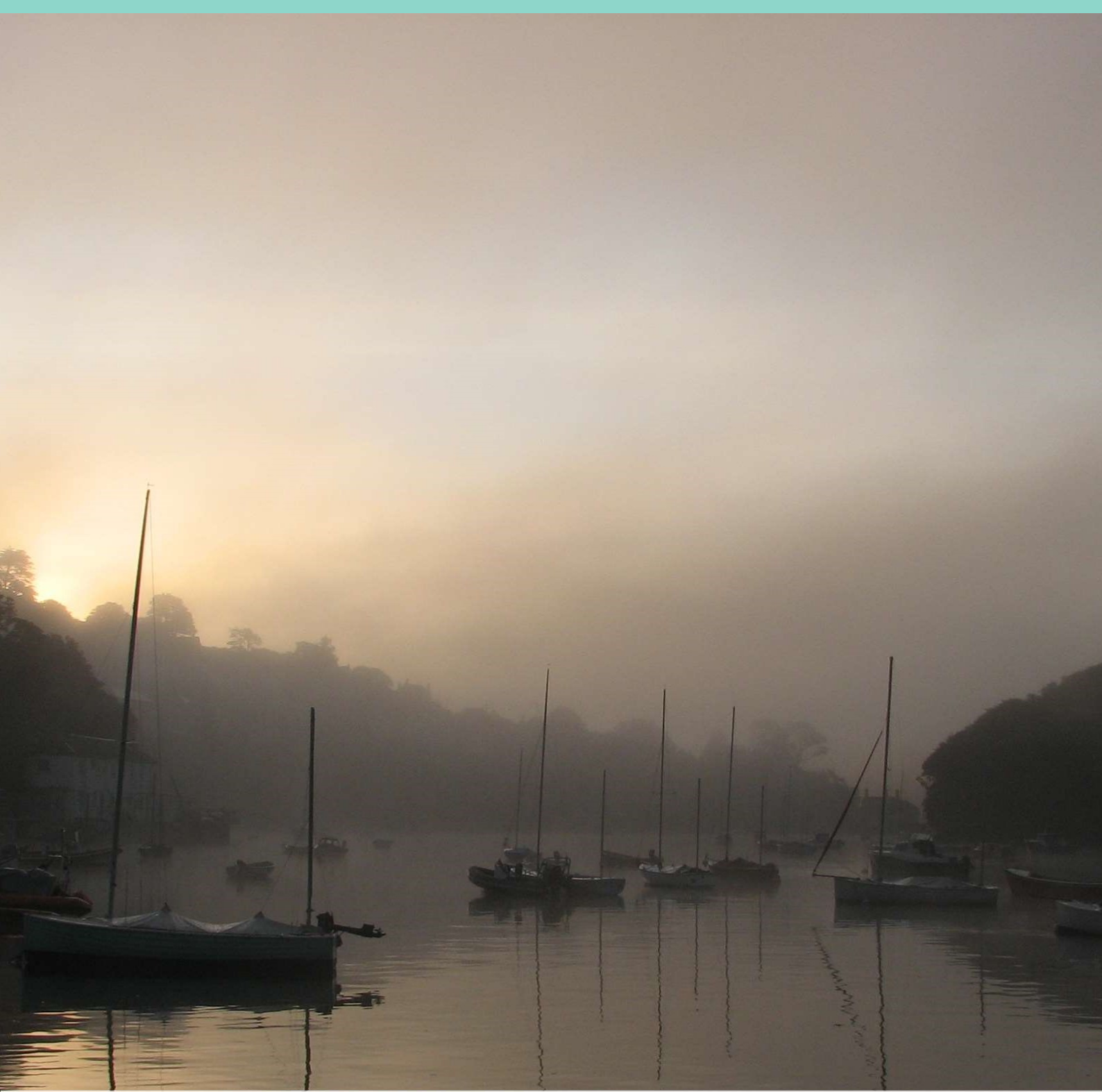




Yealm Estuary to Moor

Scoping study





This document was produced by the Westcountry Rivers Trust in partnership with Yealm Community Energy for the Yealm Estuary to Moor project.



Cover photo: [Flickr] GrahamAndDairne - River Yealm, Misty dawn (CC BY-NC 2.0)

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Report overview: scoping study

The purpose of this scoping study is to undertake a systematic review of available information relating to the River Yealm catchment, the two main elements undertaken while creating this report included a **desk study** and a **stakeholder engagement workshop**.

The **desk study** focused on gathering the most up to date evidence, and included:

- A stakeholder identification exercise to document key stakeholders in the Yealm catchment (page 39);
- A review of existing relevant environmental reports (pages 40-42);
- A review of relevant data and evidence for the Yealm catchment, including mapping of existing land use types, habitats & habitat condition, as well as water quality and biodiversity, flood risk, obstructions to fish passage (pages 7-24);
- Opportunity mapping and prioritisation of land along the Yealm riparian corridor for improvement of existing habitat and creation of new habitats (pages 25-34).

The information gathered during the desk study was presented to the stakeholders' during a **workshop**, and was an opportunity to:

- Gain insight from local environmental groups;
- Identify gaps/errors in the data,
- Gather local knowledge to incorporate in to scoping study;
- Support the creation of a baseline monitoring plan.

Information gathered during the desk study and the stakeholder workshop have been combined and presented in this report. The report starts by providing a short review of the relevance of the Yealm Estuary to Moor project, then it will outline the catchment features, habitats present currently, with condition information where this is available. The known issues which are impacting the habitats and water quality have also been mapped.

The final element of the scoping study is the opportunity mapping which is presented at the end of the report. This chapter includes any relevant or existing opportunity data that has been published by other organisations (Environment Agency and Natural England).

Further opportunity mapping has been undertaken, where data are processed using established methods, and are presented in four distinct categories i.e., flood risk, habitat restoration, habitat creation and habitat specific opportunities (wetland and woodland).

Maps showing the main waterbodies and a detailed Ordnance Survey map of the catchment are included on pages 37-38 for reference while reviewing this report.



Photo: Flickr – Natural England – River Yealm (CC BY-NC-ND 2.0)

Background: Yealm Estuary to Moor

The River Yealm catchment (as defined by the Environment Agency's 'Operational Area') is just over 100km² (page 37) and includes coastal areas in the south to moorland in the north. There is nearly a 500m difference in elevation (page 7, map 1) across the catchment, meaning that a wide variety of habitat types are found here, from the sheltered estuarine habitats where seagrasses can be found (see page 14) to the blanket bog of Dartmoor, with many other priority habitats providing connections in between (see page 13).

The loss of habitats and ecological networks across the country has led to the UK Government's 25 Year Environment Plan (25YEP) (DEFRA, 2018) being published, which sets out a series of goals and steps for achieving them. Recognising the value of the natural environment, protecting it and taking measures to enhance it are fundamental elements of the plan.

Diverse ecological communities are more resilient to changing and increasing external pressures (Peterson *et al.*, 1998), and can help to mitigate the challenges that are presented by climate change. By creating **more** natural spaces and making existing ones **bigger, better** and **joined** (Lawton *et al.*, 2010) we are protecting and enhancing landscape scale biodiversity, which is an excellent insurance policy for protecting our ecosystems and the services that they provide.

The aim of the **Yealm Estuary to Moor** project is to link fragmented habitats, such as wetlands, woodlands and species rich grassland, along the River Yealm from coastal estuary to moorland source, to create a continuous in-river and riparian wildlife corridor.

The project will do this through **restoring** existing habitats currently in poor ecological condition, **creating** new habitats where possible, improving connectivity in-river by the easement of barriers to migratory species of fish and to increase biodiversity along the course of the River Yealm.

Creating new habitats ('more')

More available habitat means more space for biodiversity.

Increase the area of existing natural spaces ('bigger')

Bigger areas generally support higher diversity.

Restoring existing habitat in poor ecological condition ('better')

This will help to ensure that existing habitats are functioning at maximum carrying capacity; more available resources can support greater diversity.

Planning habitat restoration and creation effectively ('joined')

Using data and local knowledge to plan restoration and creation in the optimum locations will help to reduce fragmentation and promote biodiversity at a landscape scale.

Overview

Before illustrating the habitats that are found within the catchment and their condition, it is important to understand the physical characteristics of the land and how these can influence landuse in the area. These characteristics may influence the potential habitat restoration and creation opportunities that maybe possible (e.g., soil type). This chapter will provide an overview of these characteristics including, landform, landuse and designated areas.



Photo: Flickr – Reading Tom – The River Yealm (CC BY 2.0)

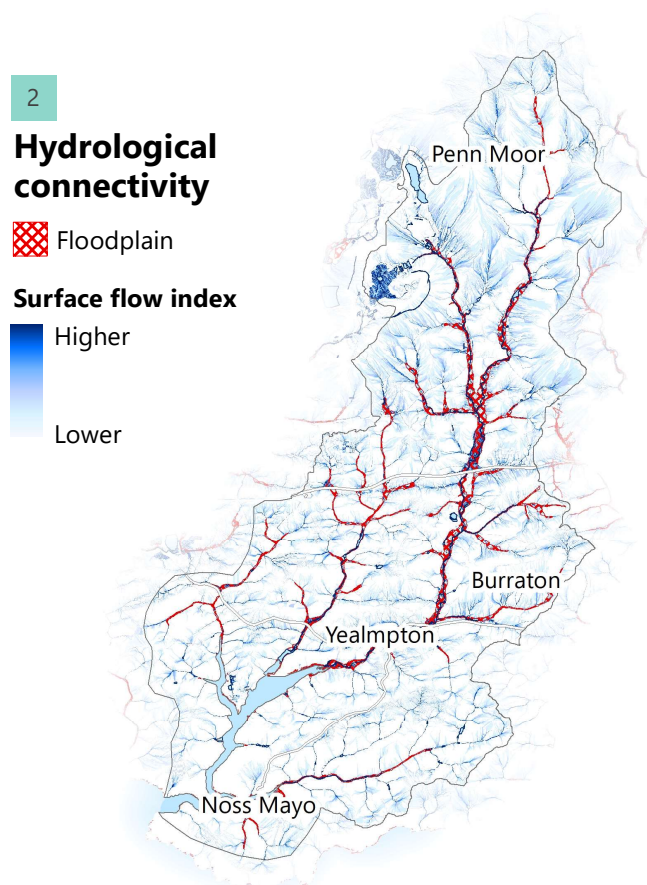
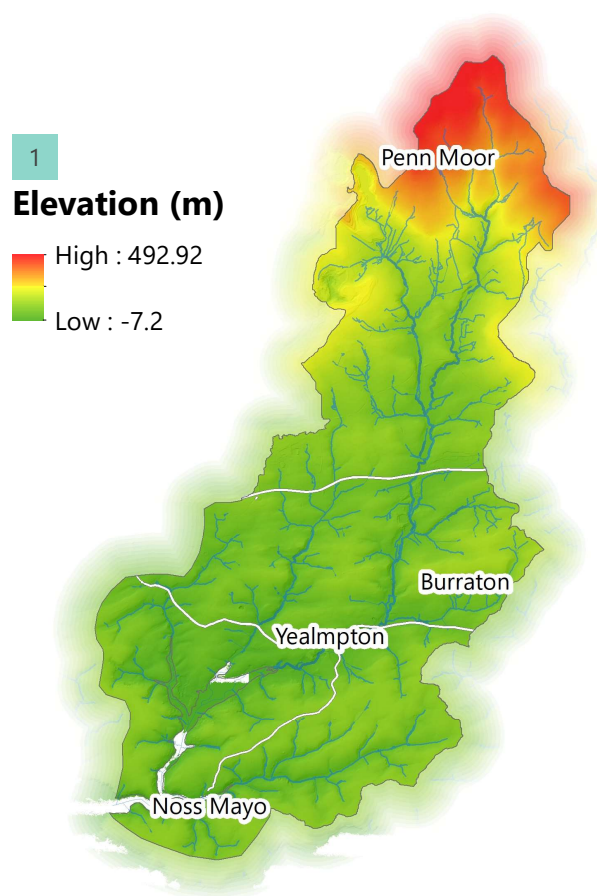
Overview: landform

Elevation

Digital terrain data is very useful for visualisation of the shape of the land, while detailed accurate data representing rivers, streams and other watercourses is also a vital component of any catchment mapping process. These terrain data are an essential element in modelling hydrological connectivity (see below) and necessary for some opportunity mapping processes.

Hydrological connectivity

In some areas water has a greater propensity to run over the surface and collect due to the shape of the land and the size of the upstream catchment area. These areas are of critical importance to the regulation of water quality as moving water has the greatest chance of becoming contaminated and/or they are where contaminated water may be moving along a pathway. This map shows the flow pathways in the catchment and can highlight areas where the water is likely to collect. In addition to other data, these data are used to weight a location's suitability for wetland habitat creation (page 32).



Dataset presented:

1. Detailed River Network (2016), LiDAR based Digital Terrain Model (DTM) data for South West England (2014).

2. Detailed River Network (2016), Flood Zone 2 and 3 (2018), LiDAR based Digital Terrain Model (DTM) data for South West England (2014).

Overview: geology

Bedrock Geology

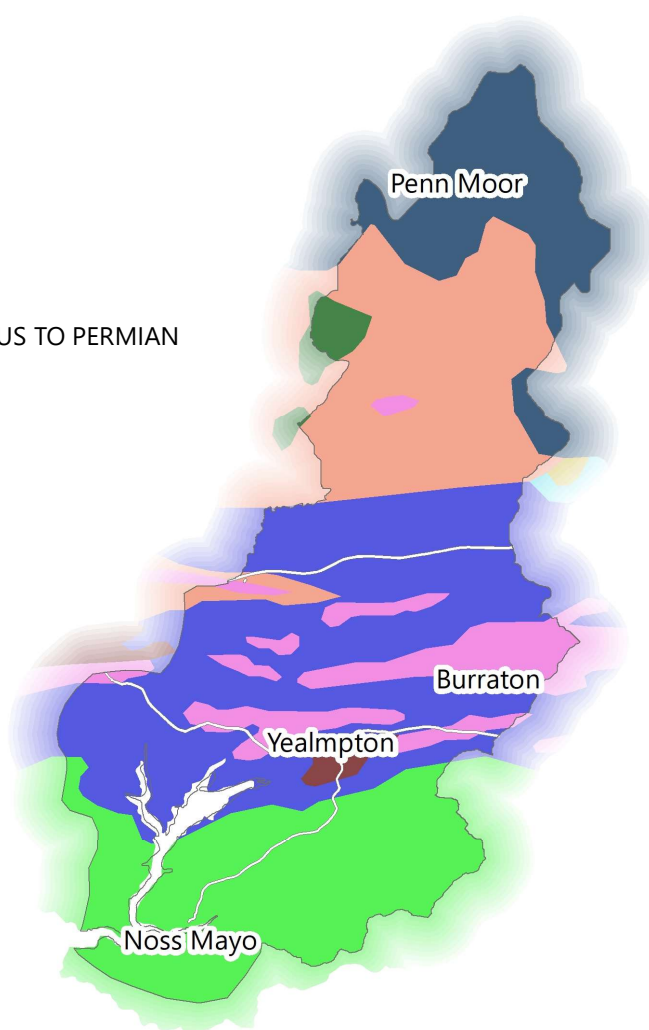
Geological maps are of potential use to a wide range of people with both interests in planning and development, oil and gas (including shale gas) reserves, water and mineral resources (especially groundwater), waste disposal sites, utilities, transport, geo-hazards and property insurance; as well as academic interests such as the Earth's geological history, its fossils, and its landscape development.

The underlying geology of an area can influence the habitats and species that are found in a location and therefore the geology is linked to biodiversity. While the bedrock geology was not used in the opportunity mapping presented in this report, it is useful to illustrate the variety of geology in the catchment.

3

Geology

- DEVONIAN ROCKS (UNDIFFERENTIATED)
- LOWER DEVONIAN ROCKS (UNDIFFERENTIATED)
- MIDDLE DEVONIAN (UNDIFFERENTIATED)
- TEIGN VALLEY GROUP
- UNNAMED EXTRUSIVE ROCKS, CARBONIFEROUS
- UNNAMED EXTRUSIVE ROCKS, DEVONIAN
- UNNAMED IGNEOUS INTRUSION, CARBONIFEROUS TO PERMIAN
- UNNAMED IGNEOUS INTRUSION, DEVONIAN
- UPPER DEVONIAN ROCKS (UNDIFFERENTIATED)



Dataset presented in this page (map number):

3. BGS Geology 625K (2007).

Overview: soils

Soil typology

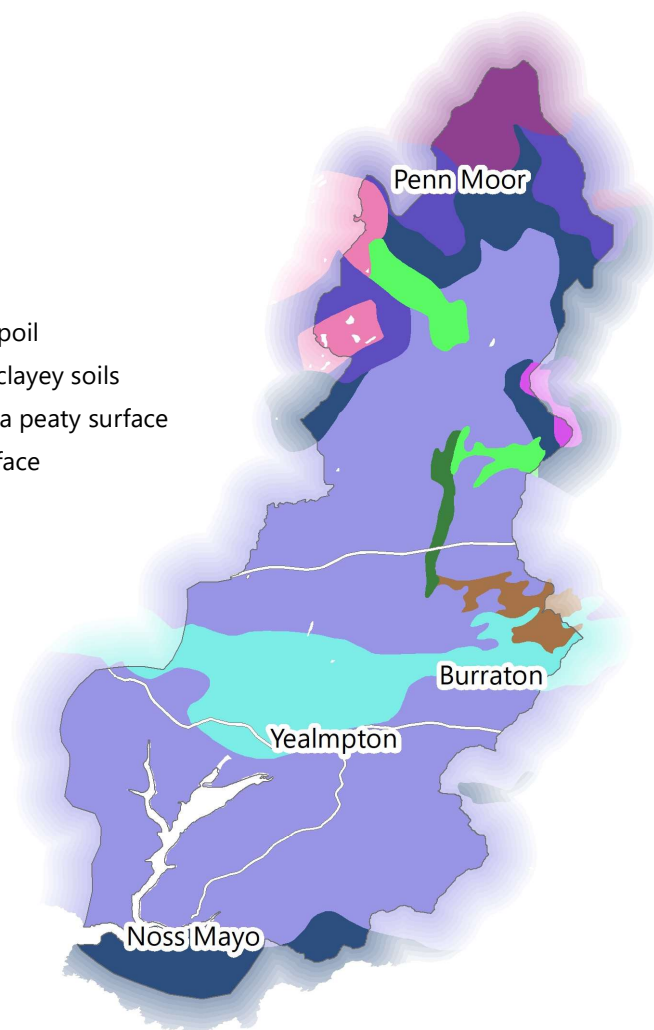
Soil is the medium in which plants grow and is a vital habitat that supports a huge diversity of animal species and micro-organisms. Fertile soil is critical for the production of food, timber and fibre, and it is therefore essential for our survival and economic prosperity.

Soils also influence the character of our local landscapes and play a key role in the regulation of environmental services such as nutrient cycling, water quality, water flow regulation and carbon storage.

4

Soils

- Blanket bog peat soils
- Freely draining acid loamy soils over rock
- Freely draining floodplain soils
- Freely draining slightly acid but base-rich soils
- Freely draining slightly acid loamy soils
- Loamy soils with naturally high groundwater
- Restored soils mostly from quarry and opencast spoil
- Slowly permeable seasonally wet acid loamy and clayey soils
- Slowly permeable wet very acid upland soils with a peaty surface
- Very acid loamy upland soils with a wet peaty surface



Dataset presented on this page (map number):

4. Natmap Soils (2019).

Overview: land use

Agricultural Land Class

Agricultural Land Classification (ALC) is a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system (as defined by the National Planning Policy Framework). The ALC system classifies land into five grades: the best and most versatile land is defined as Grades 1, 2 and 3, while Grades 4 and 5 are of poorer quality and maybe more suitable locations for habitat restoration/creation.

Landcover

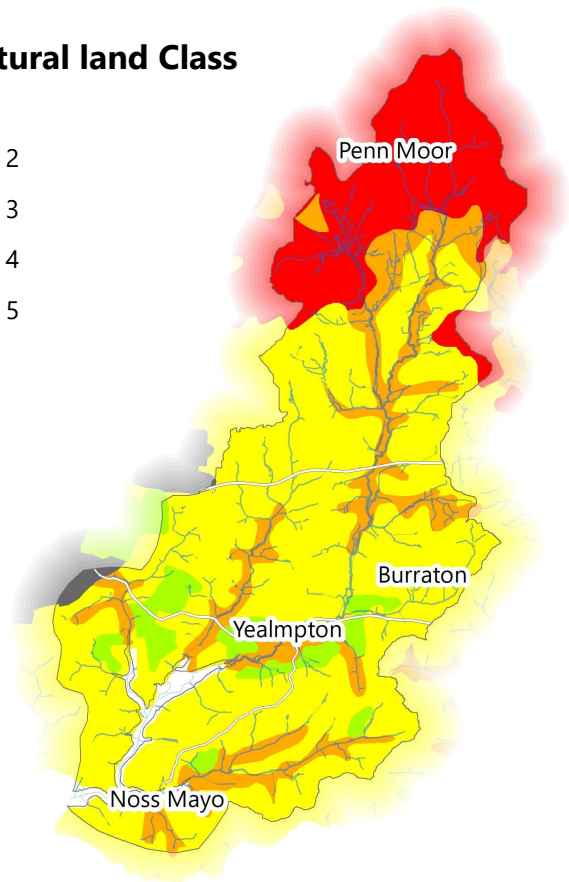
Land cover is the physical material on the surface of the Earth, including artificial materials, such as roads and buildings in urban areas, but also natural and managed vegetated surfaces and inland water.

Land cover information has multiple uses, such as the management of natural resources, urban planning, carbon accounting and flood risk modelling.

5

Agricultural land Class

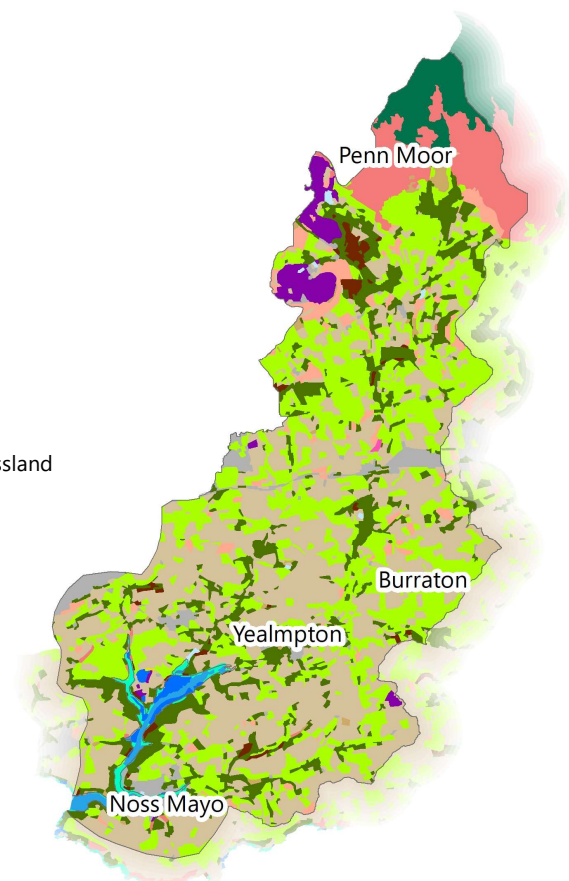
- Grade
- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Urban
- River



6

Landcover

- | | |
|--------------------------------------|----------------------------------|
| Acid grassland | Improved grassland |
| Arable and horticulture | Inland rock |
| Bog | Littoral rock |
| Broad leaved, mixed and yew woodland | Littoral sediment |
| Built up areas and gardens | Neutral grassland |
| Coniferous woodland | Rough low-productivity grassland |
| Dwarf shrub heath | Salt water |
| Freshwater | Supra-littoral sediment |



Datasets presented on this page (map number):

5. Agricultural Land Class (2020), Detailed River Network (2016).

6. CEH Landcover 2015 (2015), Detailed River Network (2016).

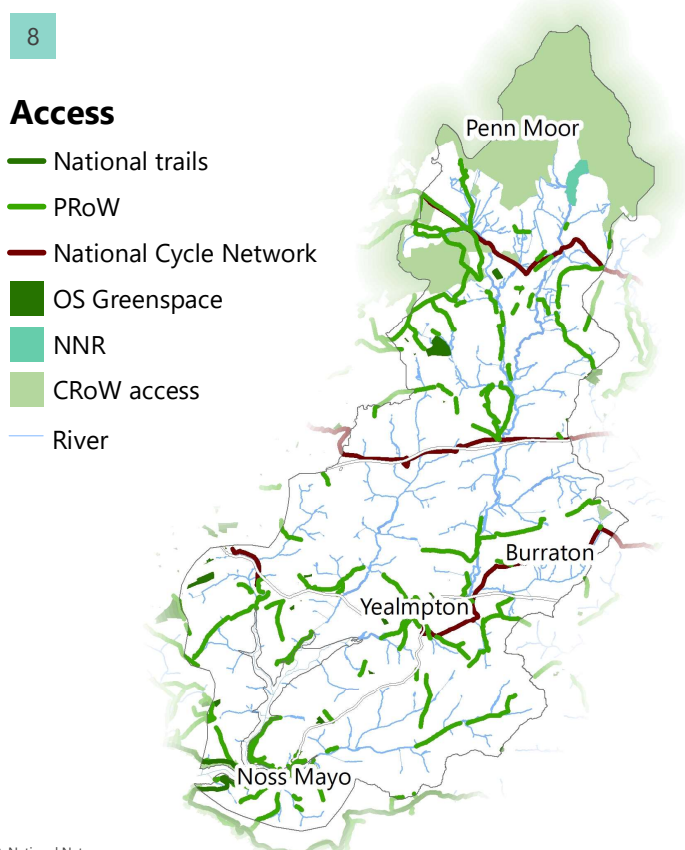
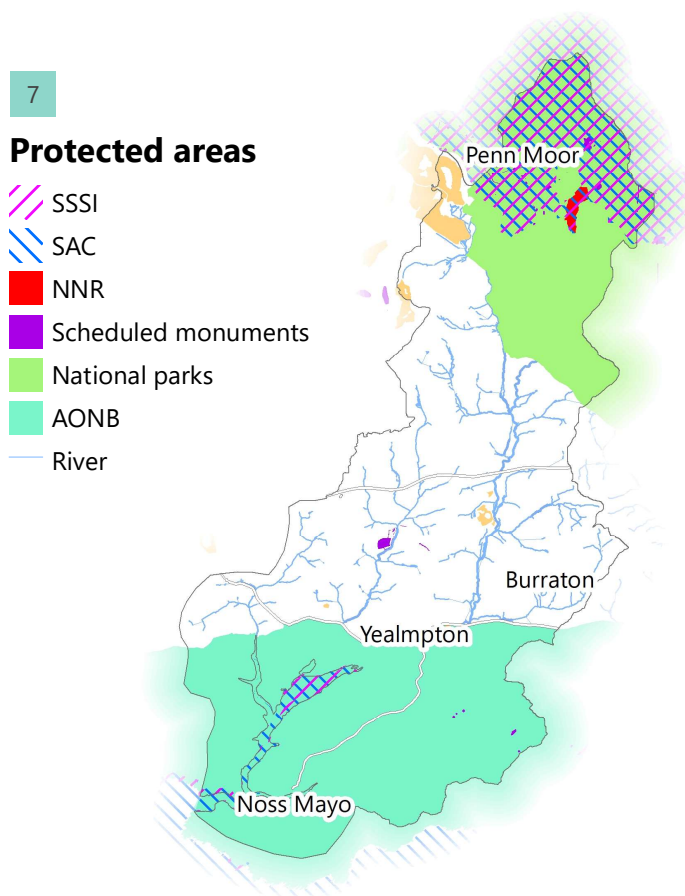
Overview: designated areas

Protected areas

There are designations protecting England's terrestrial and aquatic natural environments under local (Local Nature Reserves - LNRs), national (Sites of Special Scientific Interest - SSSIs, Ancient Woodlands, National Parks, AONBs, National Nature Reserves - NNR) and international law (Ramsar Wetlands, Special Protected Areas - SPAs, Special Areas of Conservation - SACs). These designated sites represent critical infrastructure in the conservation of biodiversity in the UK and should be prioritised for protection. It is possible for a site to have multiple designations.

Access

There are some areas of land within the catchment which are open and can be accessed without the need to gain landowners permission (see map 8). This will be useful for planning monitoring activities. While permission is not necessarily required, where possible landowners should be informed when undertaking survey and monitoring activities.



Datasets presented on this page (map number):

7. Areas of Outstanding Natural Beauty (2020), Detailed River Network (2016), National Parks Data (2020), National Nature Reserve (2021), SAC (2020), Scheduled Monuments (2021), SSSI Units (2021).

8. CRoW Act 2000 - Access Layer (2020), Detailed River Network (2016), National Cycle Network (Public) (2021), National Trails England (2020), National Nature Reserve (2021), OS Green Space (2021), Public Rights of Way (2021).

Habitats for wildlife

Before carrying out any opportunity mapping it is important to understand the extent and distribution of habitats already present across the catchment and what condition they are in. This information highlights which areas need to be protected or restored. The initial maps will illustrate the habitats (terrestrial and estuarine), while the condition maps are divided into water quality and habitats.



Photo: Flickr - antenne - Dartmoor (CC BY-NC 2.0)

Current habitats: terrestrial

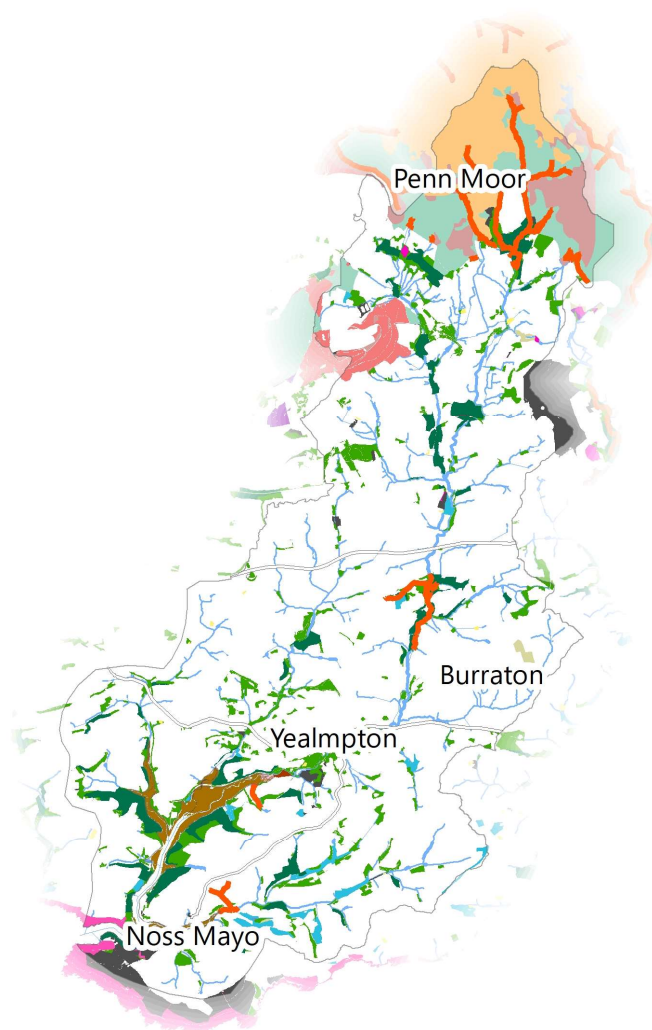
The species and biodiversity that occur in a catchment landscape are supported by the network of natural habitats and greenspaces that currently exist in the catchment landscape. Before any work is carried out it is vital that the habitat components of the landscape are mapped, and where possible the condition of the habitats assessed. Any work undertaken in the catchment should not degrade the existing priority habitats and where possible work should be undertaken to protect and enhance them (See page 19 map 20) for the locations and condition of the SSSI's in the catchment).

9

Priority habitats

Main Habitat

-  Blanket bog
-  Coastal and floodplain grazing
-  Coastal saltmarsh
-  Deciduous woodland
-  Good quality semi-improved g
-  Grass moorland
-  Lowland dry acid grassland
-  Lowland fens
-  Lowland heathland
-  Lowland meadows
-  Maritime cliff and slope
-  Mudflats
-  No main habitat but additional
-  Traditional orchard
-  Upland heathland
-  Ancient woodland
-  Priority river habitat
-  River

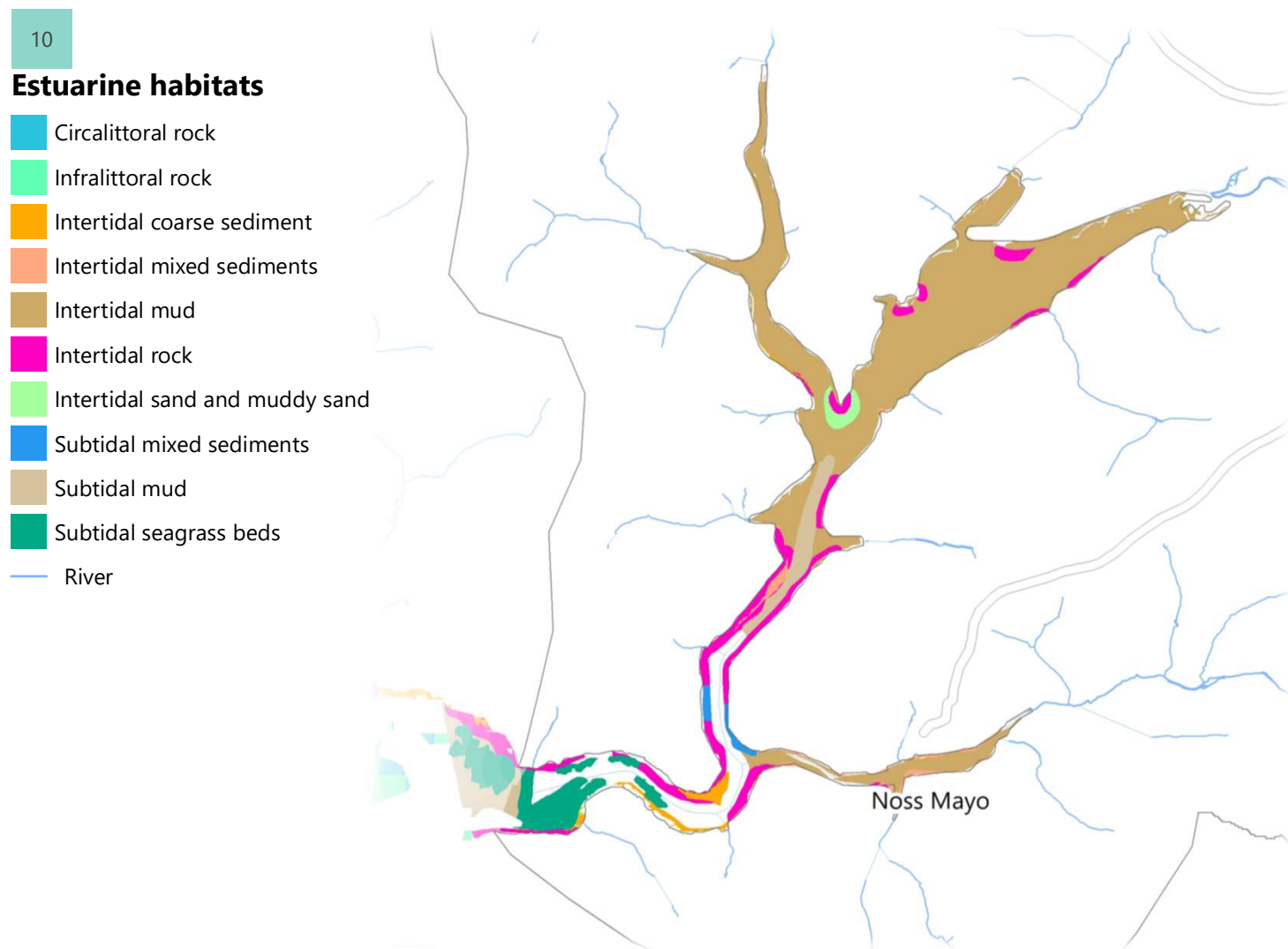


Datasets presented on this page (map number):

9. Ancient Woodland (England) (2021), Detailed River Network (2016), Priority Habitat Inventory (2020), Priority River Habitats (2021).

Current habitats: estuarine

The Yealm Estuary forms part of the Plymouth Sounds and Estuaries Special Area of Conservation (SAC) and makes up three Sites of Special Scientific Interest (SSSI). Currently the SSSI's are all in unfavourable declining condition due to the encroachment of pacific oysters. The subtidal seagrass beds within the estuary are a declining habitat nationally and internationally and are monitored as part of the SAC condition assessments.



Datasets presented on this page (map number):

10. Detailed River Network (2016), Marine Habitats and Species Open Data (2021).

Condition: water quality

Water Framework Directive Monitoring

Overall Class

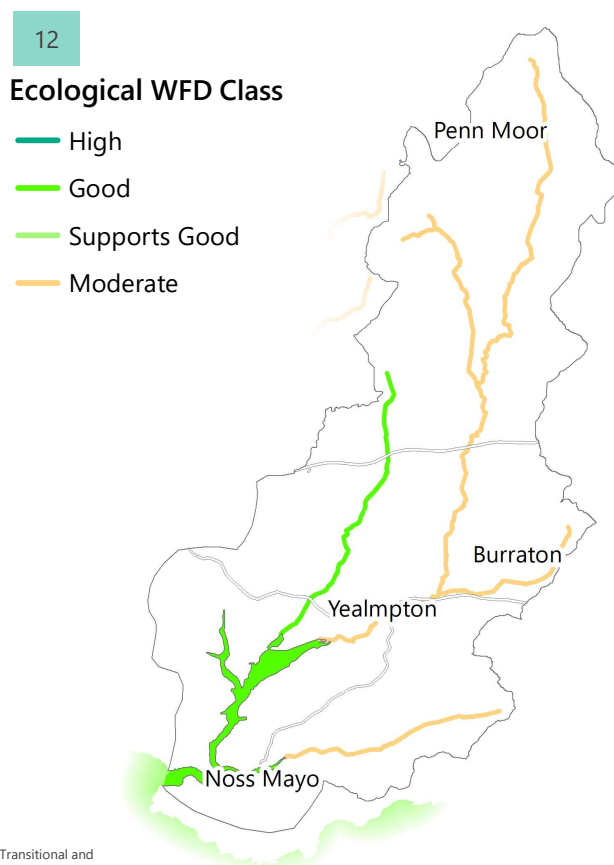
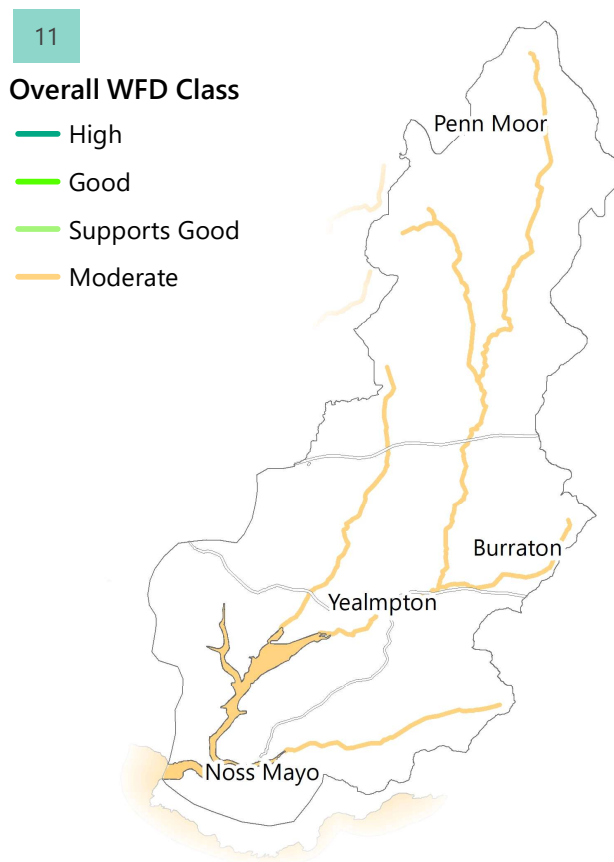
The principal set of evidence that is available to use to assess the water quality in a catchment is the WFD classification of the waterbodies. For surface waters, such as rivers and lakes, the 'overall status' of a waterbody is comprised of an ecological and a chemical component.

Ecological Class

The ecological status can be classed as Bad, Poor, Moderate, Good or High and is arrived at through assessment of a number of elements including aquatic invertebrates, fish populations, nutrients, oxygen levels, aquatic plants and specific pollutants.

Chemical Class

Chemical status can be Fail or Good and requires assessment of a range of Priority and Priority Hazardous substances. After the introduction of more stringent tests for the 2019 WFD assessment, every water body in England failed the tests for Polybrominated diphenyl ethers (PBDE) and mercury. This meant that no waterbody could achieve an Overall Status of Good, even if they are classified as Good for ecological status.



Datasets presented on this page (map number):

11 & 12 2019 WFD information for EA cycle 2 river, canal and surface transfer waterbodies (lines) (2019), WFD Transitional and Coastal Water Bodies Cycle 2 Classification 2019 (2019).

Condition: water quality

Fish Class

Fish populations, especially of salmonid species, are widely accepted to be good biotic indicators of river ecosystem health. The WFD assessment method for fish uses a non-parametric geo-statistical model called the Fisheries Classification Scheme 2 (FCS2) to predict the abundance of different fish species that should be found in a particular river based on a number of recorded environmental variables and the geographic location of the site.

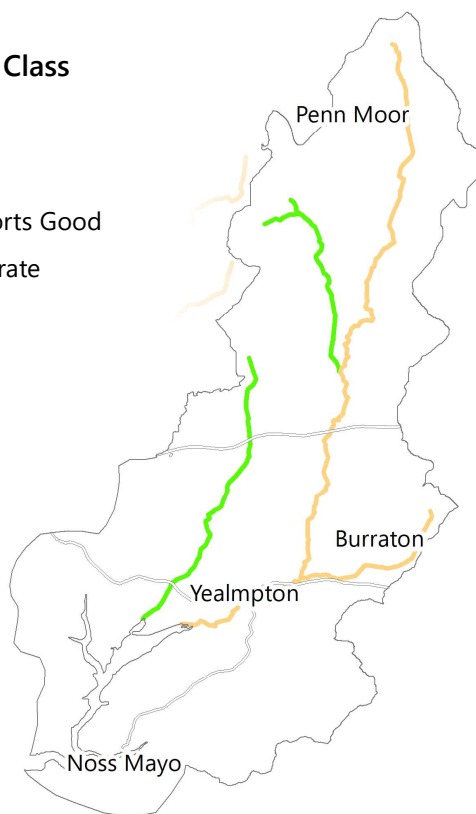
Invertebrate Class

The evaluation of invertebrate assemblages in a river is a good method for assessing the impacts of environmental stress. Invertebrate samples collected using standardised methods are identified to the level of taxonomic family or species and their approximate abundance in the sample recorded. These data are then used to calculate biotic indices which are used to draw conclusions about the condition of the river and to make comparisons between sites on the same or different rivers

13

Fish WFD Class

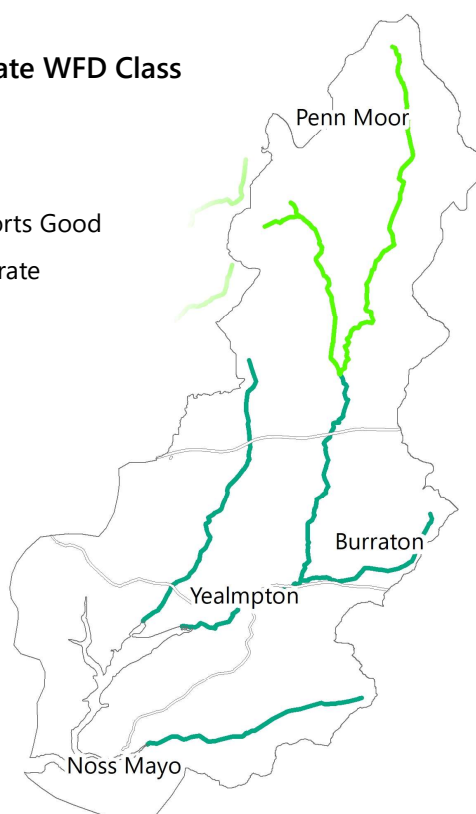
- High
- Good
- Supports Good
- Moderate



14

Invertebrate WFD Class

- High
- Good
- Supports Good
- Moderate



Datasets presented on this page (map number):

13 & 14. 2019 WFD information for EA cycle 2 river, canal and surface transfer waterbodies (lines) (2019).

Condition: water quality

WFD Nutrient Quality Assessment

Nitrogen and phosphorus containing compounds (often termed nutrients) contribute to the ecological status of the waterbody. They are natural and vital components of healthy aquatic ecosystems. They play a critical role in supporting the growth of aquatic plants and algae, which, in turn, produce oxygen and provide habitats that support the growth and reproduction of other aquatic organisms.

Unfortunately, when nutrients accumulate in aquatic ecosystems they can drive the uncontrolled and unbalanced growth of aquatic plants and algae in a process called eutrophication which can cause severe problems for other aquatic organisms, the ecological health of the waterbody and for the humans who also depend on the water.

Communities of phytobenthic algae (known as diatoms) that live in a river are very sensitive to nutrient enrichment and are therefore good indicators of degraded ecological health.

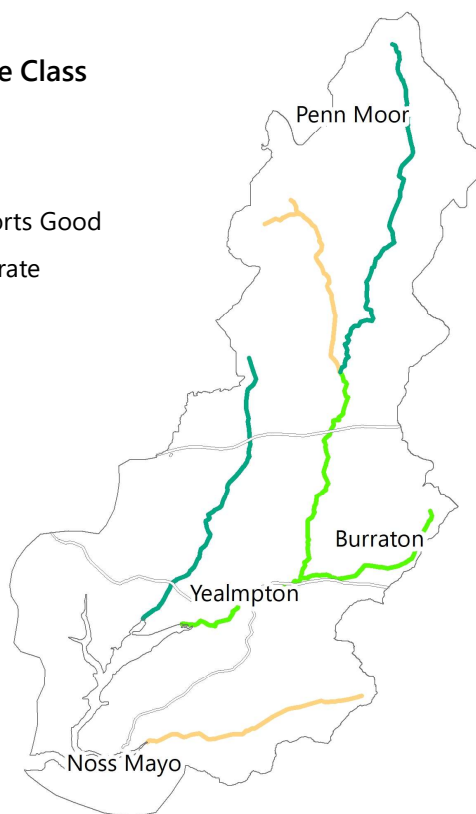
Macrophyte and Phytobenthos Status

Macrophyte and Phytobenthos Status is a well established method for assessing water quality (diatom indices). It is widely accepted that a detailed evaluation of the structure and function of phytobenthic communities in a river can provide robust evidence for assessing its ecological condition. Community composition is particularly affected by changes in the pH and nutrient levels in the water and can be used to identify rivers impacted by these types of pollution.

15

Phosphate Class

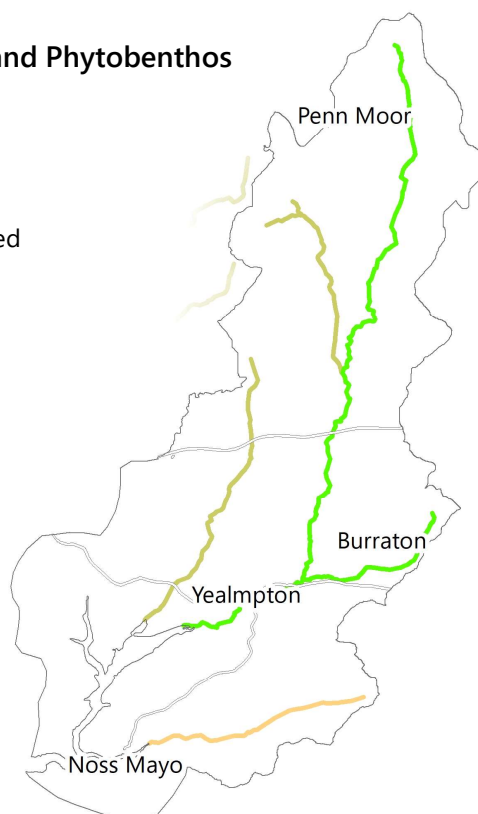
- High
- Good
- Supports Good
- Moderate



16

Macrophyte and Phytobenthos Status class

- Good
- Moderate
- Not assessed



Datasets presented on this page (map number):

15 & 16. 2019 WFD information for EA cycle 2 river, canal and surface transfer waterbodies (lines) (2019).

Condition: water quality (*E.coli*)

Food Standards Agency (FSA) shellfish monitoring

There are two shellfish classification zones in the Yealm estuary which are sampled for *E. coli* levels. These have been graded for two species (pacific oyster and mussels) that are destined for human consumption. The most recent classifications are presented in this map.

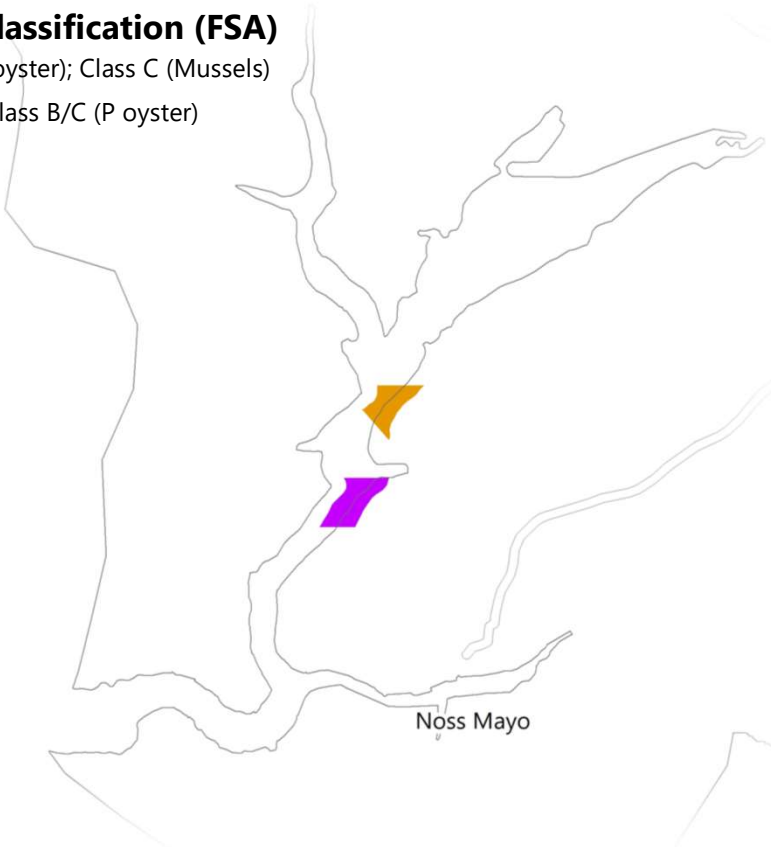
Class B (90% of samples must be ≤ 4600 *E. coli*/100g; all samples must be less than 46000 *E. coli*/100g). **Class C** (≤ 46000 *E. coli*/100g).

Both classes require some form of processes/treatment before shellfish can be sold for human consumption.

Shellfish classification (FSA)

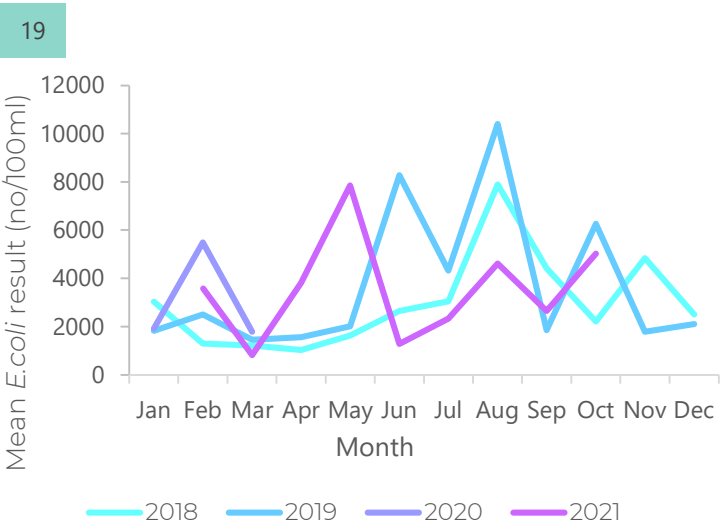
- Class B (P oyster); Class C (Mussels)
- Seasonal Class B/C (P oyster)

17



Environment Agency (EA) *E. coli* monitoring.

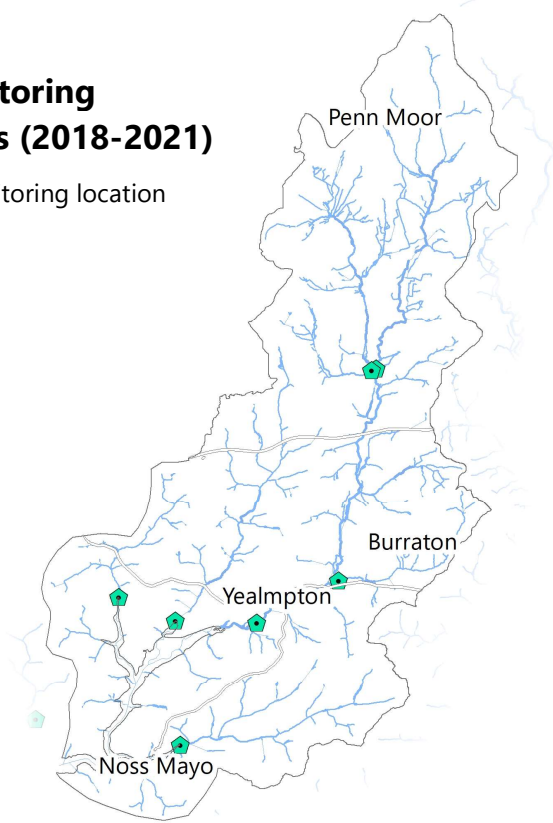
The EA have monitored the levels of *E. coli* throughout the catchment, the sampling locations from 2018 onwards are shown in map 18 (right). The average result (no/100ml) per month are presented in the graph below and there are appears to be seasonal differences in the results.



18

EA monitoring locations (2018-2021)

- EA monitoring location
- River



Datasets presented on this page (map/graph number):
17. Shellfish Classification Zones of England and Wales (2021). 18. Detailed River Network (2016), Open WIMS Water Quality Archive (Various dates). 19. Open WIMS Water Quality Archive (Various dates).

Condition: habitats

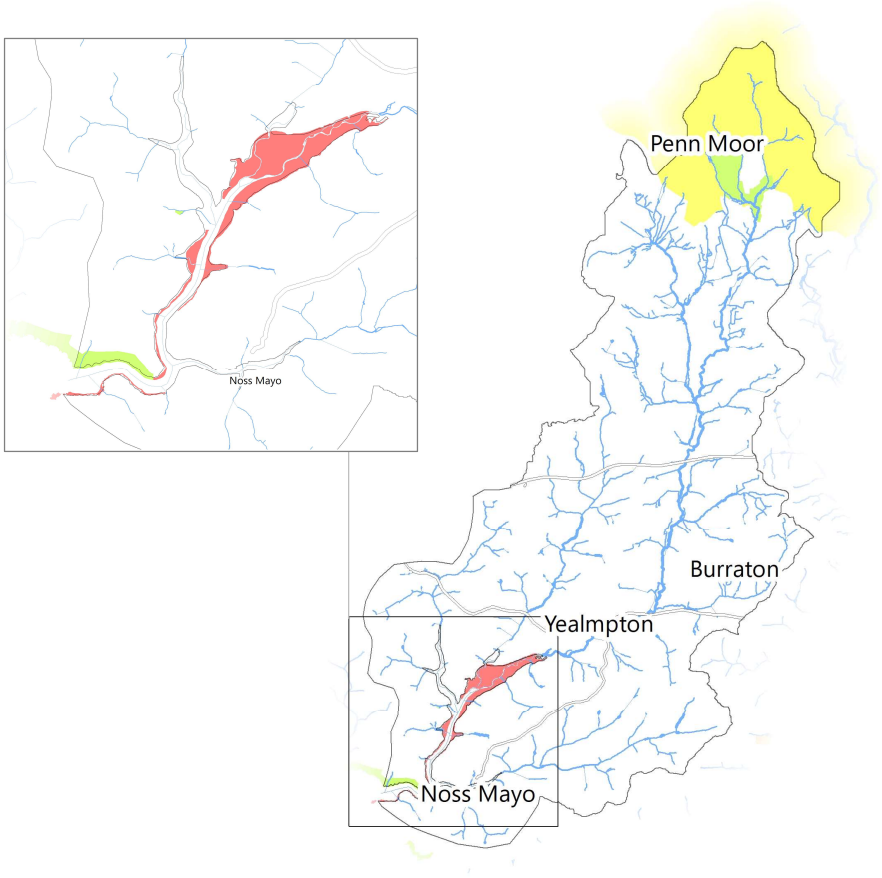
SSSI condition

Habitat quality condition of all SSSIs are assessed as part of a six year cycle. These condition assessments are carried out on all the SSSIs in England and will continue to be carried out on a regular basis to help them monitor the health of these sites over the long-term. This map provides an indication of the habitats that would benefit from restoration, and those that should be maintained as they are already in favourable condition.

20

SSSI condition

- FAVOURABLE
- UNFAVOURABLE RECOVERING
- UNFAVOURABLE NO CHANGE
- UNFAVOURABLE DECLINING
- River



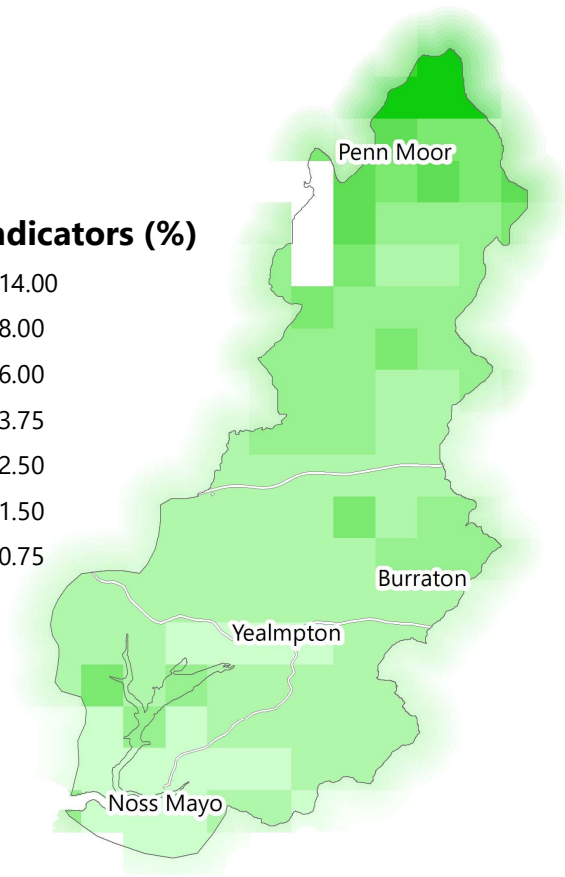
Plant indicators for habitats in good condition

The Centre of Ecology and Hydrology have produced an expected plant indicator species for habitats in good condition. These are taken from the Common Standards Monitoring guidance for Sites of Special Scientific Interest and are used to assess the expected plant indicator species in an area. This dataset provides a measure between observed and potential species and is represented as a percentage in the map.

21

Plant indicators (%)

- 8.01 - 14.00
- 6.01 - 8.00
- 3.76 - 6.00
- 2.51 - 3.75
- 1.51 - 2.50
- 0.76 - 1.50
- 0.11 - 0.75



Datasets presented on this page (map/graph number):
20. Detailed River Network (2016), SSSI Units (2021).
21. CEH Natural Capital Maps - Plant Indicators (2016).

Issues

It is important to identify the known issues within a catchment during the planning stages of a project as locations for restoration can be identified and effective management can be incorporated into the project from the start. The issues that affect the habitats and natural spaces within a catchment can come from numerous sources, but they mostly stem, directly or indirectly from some form of human source. The issues illustrated in this chapter impact water quality, flooding and habitats.



Issues: water quality

Point sources of pollution

Given that the contamination in a catchment can be caused by a wide array of pollutants in different locations, and that these pollutants can each be derived from multiple sources, it is vital to explore the contribution that these sources of contamination make to the pollution load in different sections of the catchment. There are a huge number of pollutants that can be derived from so-called point sources (outfalls, consented discharges into controlled waters, drains, mis-connections, etc..) and it is important to consider the location and contribution of these alongside examination of the different diffuse sources when making an assessment of the water quality problem in a catchment and designing a programme of interventions to correct it.

22

Point sources of pollution

- ▲ Consented discharges (Domestic)
- ▲ Consented discharges (Trade)
- ▲ Consented discharges (Combined Sewer Overflows)
- ▲ Consented discharges (Sewage Treatment Works)

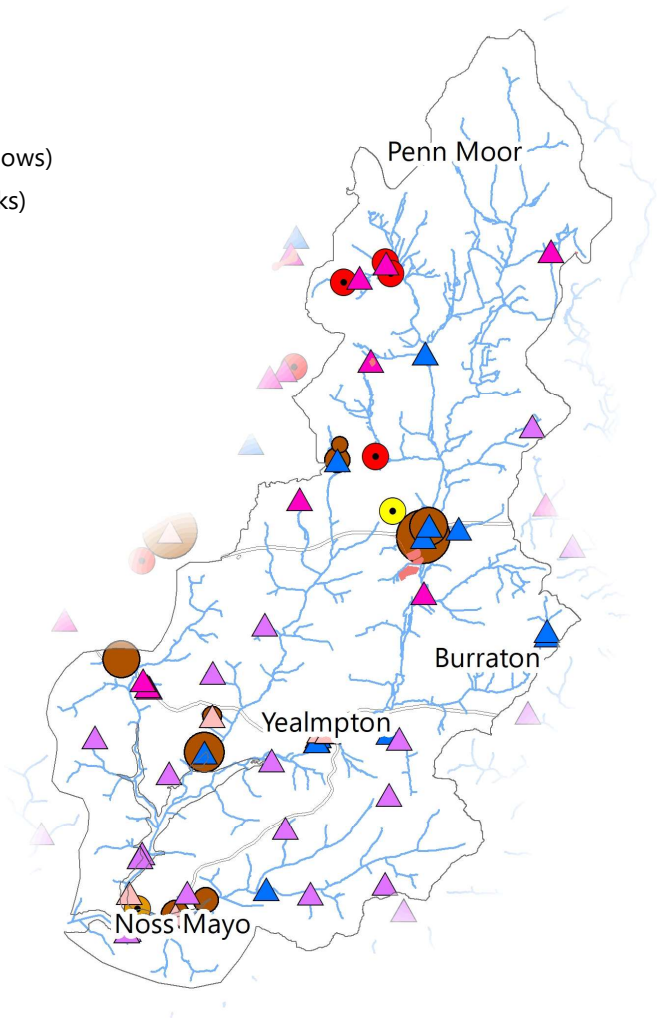
Pollution incident (since 2010)

- Category 2 (Significant)
- Category 3 (Minor)
- Category 4 (No Impact)

Count of storm overflows (2020)

- 1
- 5
- 10
- 50
- 100

- Historic landfill
- Rivers



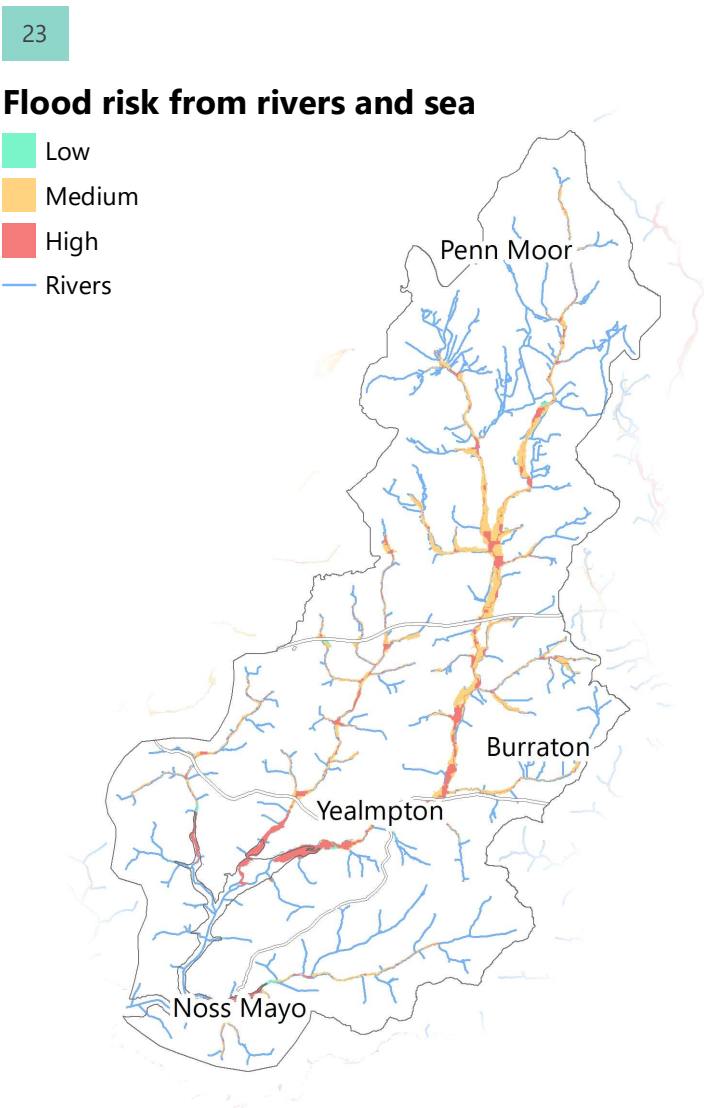
Datasets presented on this page (map/graph number):
22. Consented Discharges (2020), Event Duration Monitoring - Storm Overflows -2020 (2020), Environmental Pollution Incidents (Category 1 and 2) (2017), Historic Landfill Sites (2018).

Issues: flooding

Flood risk areas

The Environment Agency have produced a dataset that describes a locations likelihood flood. These data are illustrated in the map below and shows the risk of flooding from rivers and sea from very low to high.

The Environment Agency have also produced Catchment Flood Management Plans (CFMPs) (Environment Agency, 2012) which consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding. The Yealm operational area falls within the East Tamar sub-area and according to the CFMP the flood risk in this area is being managed effectively, but it does state that land management measures to minimise run-off should be targeted.



Datasets presented on this page (map/graph number):
23. Detailed River Network (2016), Risk of Flooding from rivers and sea (with risk categories) (2018).

Issues: habitats

Barriers to fish migration

Artificial barriers to fish migration have been assessed for salmonids and coarse fish by the EA. This map show the locations and combined priority ranking of the identified barriers. One of the barriers illustrated in this map has been classified as a super-critical due to its combined ranking.

While most of the barriers do not have a combined ranking, they still may be acting as barriers to migration for certain species, or different life stages of individual species.

Invasive non-native species (INNS)

Several INNS have been recorded in the catchment. The data illustrated in this map are derived from an EA dataset and from information gathered during a stakeholder workshop.

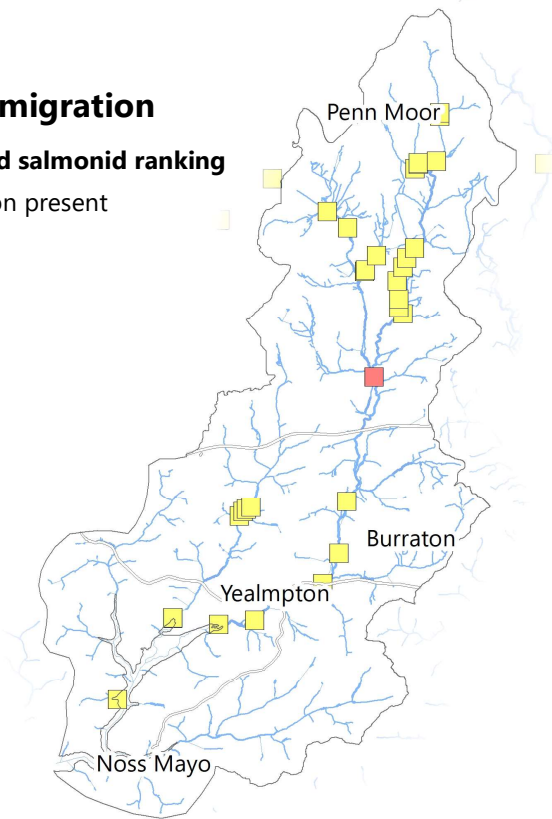
As previously mentioned (page 19), but was not included in the EA dataset is the pacific oyster. This species is found in the estuary and is affecting the habitat and causing the condition to decline.

24

Barriers to fish migration

Combined coarse and salmonid ranking

- Barrier to migration present
- Super-Critical
- River



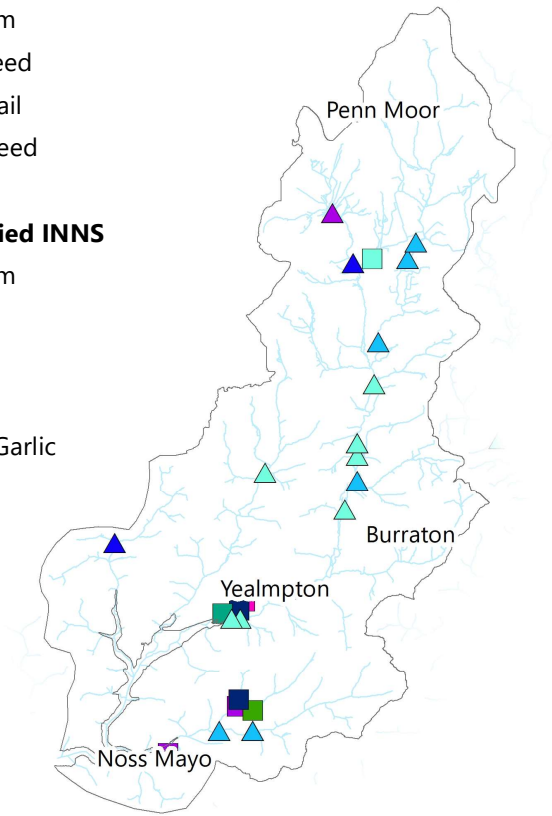
25

INNS

- Canadian Waterweed
- Himalayan Balsam
- Japanese Knotweed
- Jenkins' Spire Snail
- Nuttall's Waterweed
- Rhododendron

Stakeholder identified INNS

- Himalayan Balsam
- Laurel
- Rhododendron
- Spanish Bluebell
- Three Cornered Garlic



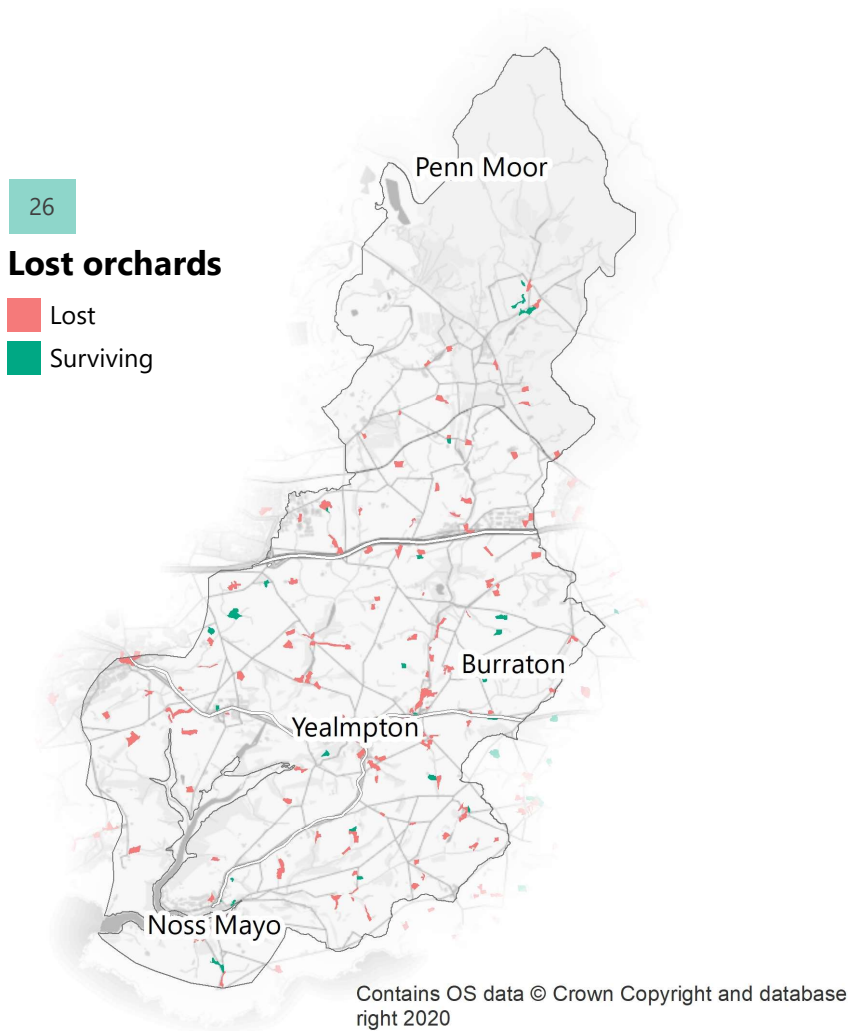
Datasets presented on this page (map/graph number):
24. Detailed River Network (2016), Prioritised River Obstructions (England) (2019).
25. Detailed River Network (2016), England Non-Native Species records 1965 to 2017 (2017).

Issues: habitats

Lost habitats

The loss of some key habitats such as orchards and ponds have been documented within the catchment and more widely at a national scale. The map below illustrates the extent of the loss of orchards in the target area. With more orchards being lost than have survived.

Ponds (permanent and semi-permanent) can be highly diverse and support a variety of protected and/or declining species, but these habitats have been in decline over the last 100 years and as much as 90% have been lost altogether in lowland areas (Hayhow *et al.*, 2019). No spatial data could be located to show the historic distribution of these habitats, but their loss is a concern among the local stakeholders and opportunities for restoration and/or creation could be investigated during the next stages of the project.



Datasets presented on this page (map/graph number):
26. Lost Orchards (2015).

Opportunity Mapping

This chapter of the report looks at opportunities to restore or create habitat along the corridor of the River Yealm and its tributaries. It presents a variety of datasets, some of which have already been combined and processed by other organisations to identify opportunities (i.e. pre-existing opportunity maps) and some of which have been mapped for the purpose of this report. By presenting different sources of evidence and understanding their intended purposes and limitations, it is possible to highlight potential opportunities from different angles. The combination of these maps can be used to identify priority areas for habitat restoration and creation that can then be investigated further in the feasibility study.

The opportunity mapping chapter is divided into the following sections:

- Existing opportunity mapping data
- Flood risk
- Habitat restoration
- Habitat creation (all habitats combined)
- Habitat creation (wetland)
- Habitat creation (woodland)



Photo: Flickr – Alan Stanton - Seaton Wetlands and River Axe (CC BY-SA 2.0) *representation of chapter title rather than location

Existing opportunity data: WWNP

Working With Natural Processes

Working With Natural Processes (WWNP) is a form of flood risk management that can be implemented on existing natural features (i.e., hill slopes, rivers, flood plains and in coastal areas) and is another term for Natural Flood Management (NFM). In 2017 an evidence directory was published by the Environment Agency, this brought together the available evidence on WWNP and a series of open-access opportunity data were produced to identify areas with the potential to support specific WWNP actions (described below). The map shows the areas where these actions could be implemented. This map was limited to the floodplain reconnection, floodplain woodland and riparian woodland.

Floodplain reconnection

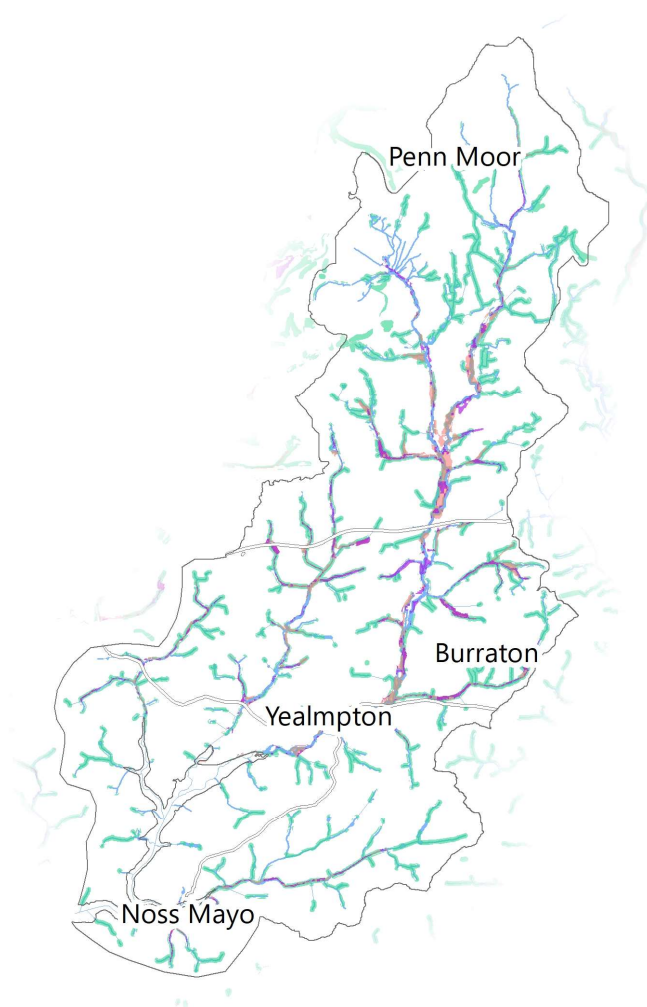
Locations where it may be possible to establish reconnection between a watercourse and its natural floodplain, especially during high flows.

Riparian woodland

These are locations where tree planting may be possible on smaller floodplains close to flow pathways, and effective to attenuate flooding.

Floodplain woodland

These locations are estimates of where tree planting on the floodplain may be possible, and effective to attenuate flooding.



27

Working with natural processes

- Floodplain reconnection potential
- Floodplain woodland potential
- Riparian woodland potential
- River

Datasets presented on this page (map/graph number):

27. Working With Natural Processes (2017).

Existing opportunity data: NEHN

Natural England Habitat Network Mapping

Natural England have produced a series of priority habitat network and expansion maps. These maps include different zones i.e., Network Enhancement Zones 1 and 2, Fragmentation Action Zone and Network Expansion Zone. The network maps were created to help land managers and stakeholders by identifying locations for actions to improve the ecological resilience of existing habitats in line with the Lawton principles (**more, bigger, better** and **joined**) which have shaped the Government's 25YEP.

Habitat restoration-creation

These are locations where habitat creation or restoration is known to occur, this is primarily sites under relevant agri-environment options.

Fragmentation action zone

Land immediately adjoining existing habitat patches that are small or have excessive edge to area ratio where habitat creation is likely to help reduce the effects of habitat fragmentation.

Network enhancement zone 1

Land connecting existing patches of primary and associated habitats which is likely to be suitable for creation of the primary habitat.

Network enhancement zone 2

Land within close proximity to the existing habitat components that are unlikely to be suitable for habitat re-creation but where other types of habitat may be created or land management may be enhanced including delivery of suitable Green Infrastructure.

Network expansion zone

Land within relatively close proximity to the Network Enhancement Zones 1 & 2 that are more likely to be suitable for habitat creation for the particular habitat and identifying possible locations for connecting and linking up networks across a landscape.

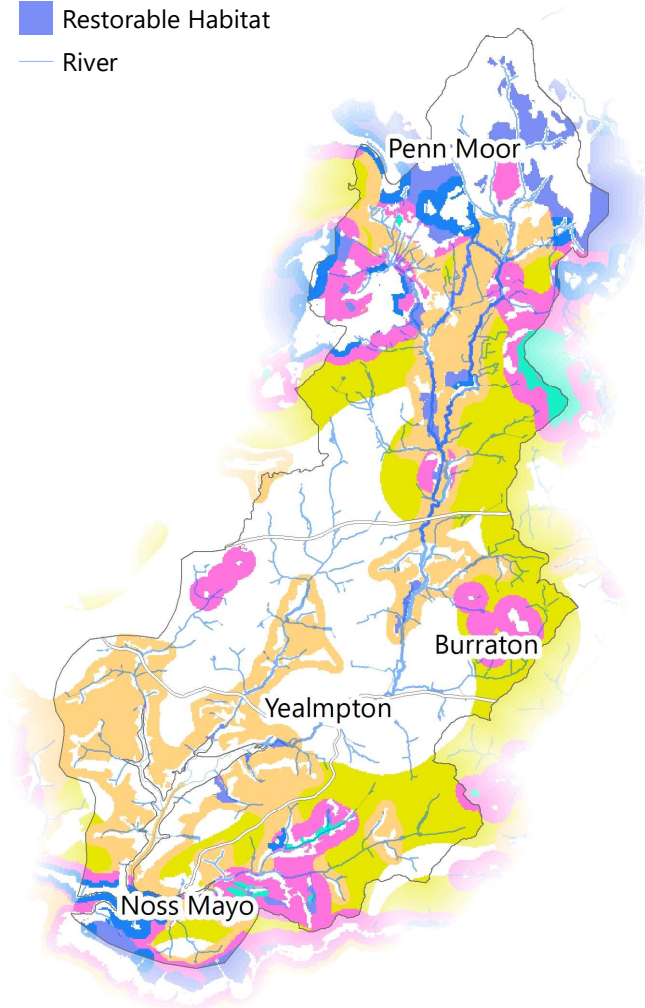
Restorable habitat

Sites where data indicates small fragments of the primary habitat or degraded habitat exists and where restoration may be possible.

28

Natural England's Habitat Networks

- Fragmentation Action Zone
- Habitat Restoration-Creation
- Network Enhancement Zone 1
- Network Enhancement Zone 2
- Network Expansion Zone
- Restorable Habitat
- River



Datasets presented on this page (map/graph number):

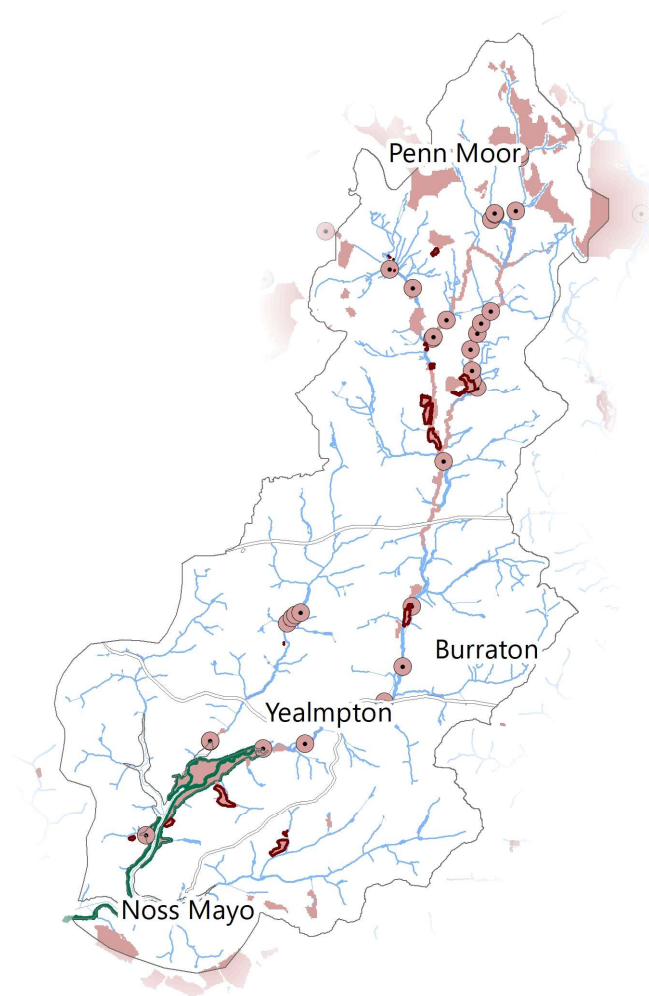
28. Detailed River Network (2016), Natural England Habitat Network Maps (2020).

Opportunity mapping: habitat restoration

This map shows locations of the highest habitat restoration opportunities within the catchment. These data have not been weighted or scored and are presented as they were when downloaded from the source (pages 43 & 44). It is important to note that there are likely to be areas outside what is mapped here that would also benefit from habitat restoration, however these data provide a good starting point for identifying tangible restoration opportunities during the feasibility study. It is possible that other data exists that would be useful to assess restoration opportunities within the catchment.

What opportunities this map shows:

1. **SSSI's in unfavourable condition.**
2. **Coniferous woodlands which overlap with ancient woodland;**
3. **River obstructions;**
4. **Restoration areas (NEHN).** *Sites where data indicates small fragments of the primary habitat or degraded habitat exists and where restoration may be possible.*



29

Habitat restoration opportunities

- Barriers to fish migration
- Coniferous plantation on ancient woodland
- SSSI Unfavourable condition
- Restorable habitat (NEHN)
- River

Datasets presented on this page (map/graph number):

29. Ancient Woodland (England) (2021), Detailed River Network (2016), National Forestry Inventory (2018), Natural England Habitat Network Maps (2020), Prioritised River Obstructions (England) (2019), SSSI Units (2021).

Habitat creation: All habitats combined

Habitat creation opportunities

This process will highlight areas where the opportunity for habitat creation is highest. Areas closest to existing priority habitats have been prioritised using Natural England's Habitat Network dataset. This dataset divides land areas into categories (described below) that can be used to prioritise areas for habitat creation at a broad scale:

High opportunity:

Fragmentation Action Zone

Land immediately **adjoining existing habitat patches** that are small or have excessive edge to area ratio where habitat creation is likely to help reduce the effects of habitat fragmentation.

Network Enhancement Zone 1

Land **connecting existing patches** of primary and associated habitats which is likely to be suitable for creation of the primary habitat.

Medium opportunity:

Network Enhancement Zone 2

Land **within close proximity to the existing habitat** components that are unlikely to be suitable for habitat re-creation but where other types of habitat may be created or land management may be enhanced including delivery of suitable Green Infrastructure.

Network Expansion Zone

Land within **relatively close proximity** to the Network Enhancement Zones 1 & 2 that are more likely to be suitable for habitat creation for the particular habitat and identifying possible locations for connecting and linking up networks across a landscape.

Habitat creation: All habitats combined

This map provides the best indication of where habitat creation may be possible which would provide more available habitat and the best level of habitat connectivity with existing habitats. As with the habitat restoration opportunity map (page 29), this map is not an exhaustive account of the habitat creation opportunities in the catchment, but it provides a starting point to focus efforts when planning habitat creation in the catchment. These data could be used in conjunction with the habitat restoration opportunity map to help build a bigger picture of habitat connectivity within the catchment.

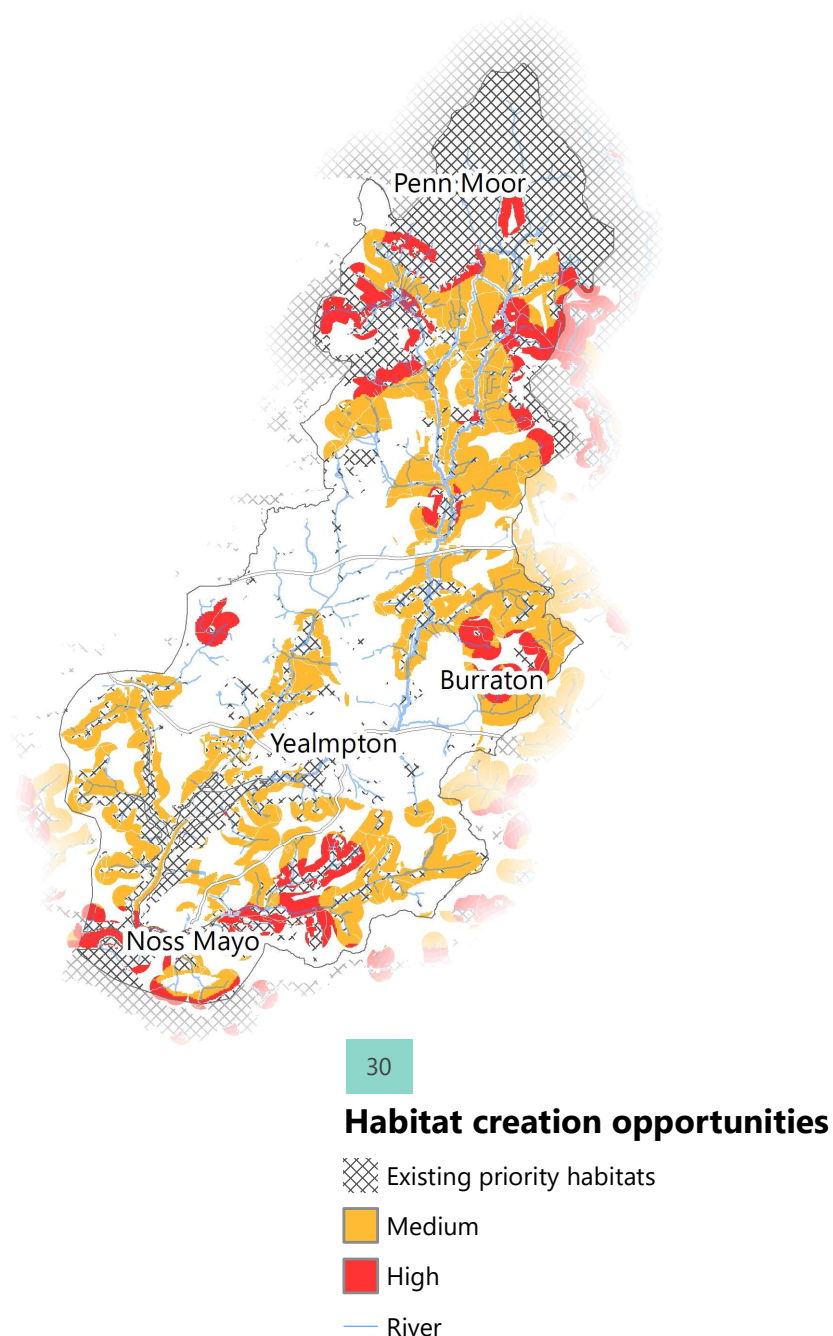
What opportunities this map shows:

1. Natural England's Habitat Network (description on previous page)

- **High** (Fragmentation Action Zone & Network Enhancement Zone 1)
- **Medium** (Network Enhancement Zone 2 & Network Expansion Zone)

Method:

These data were clipped to a 150m riparian corridor, but were not weighted or scored.



Datasets presented on this page (map/graph number):

30. Detailed River Network (2016), Natural England Habitat Network Maps (2020), Priority Habitat Inventory (2020).

Opportunity mapping: flood risk

Opportunities to reduce flood risk

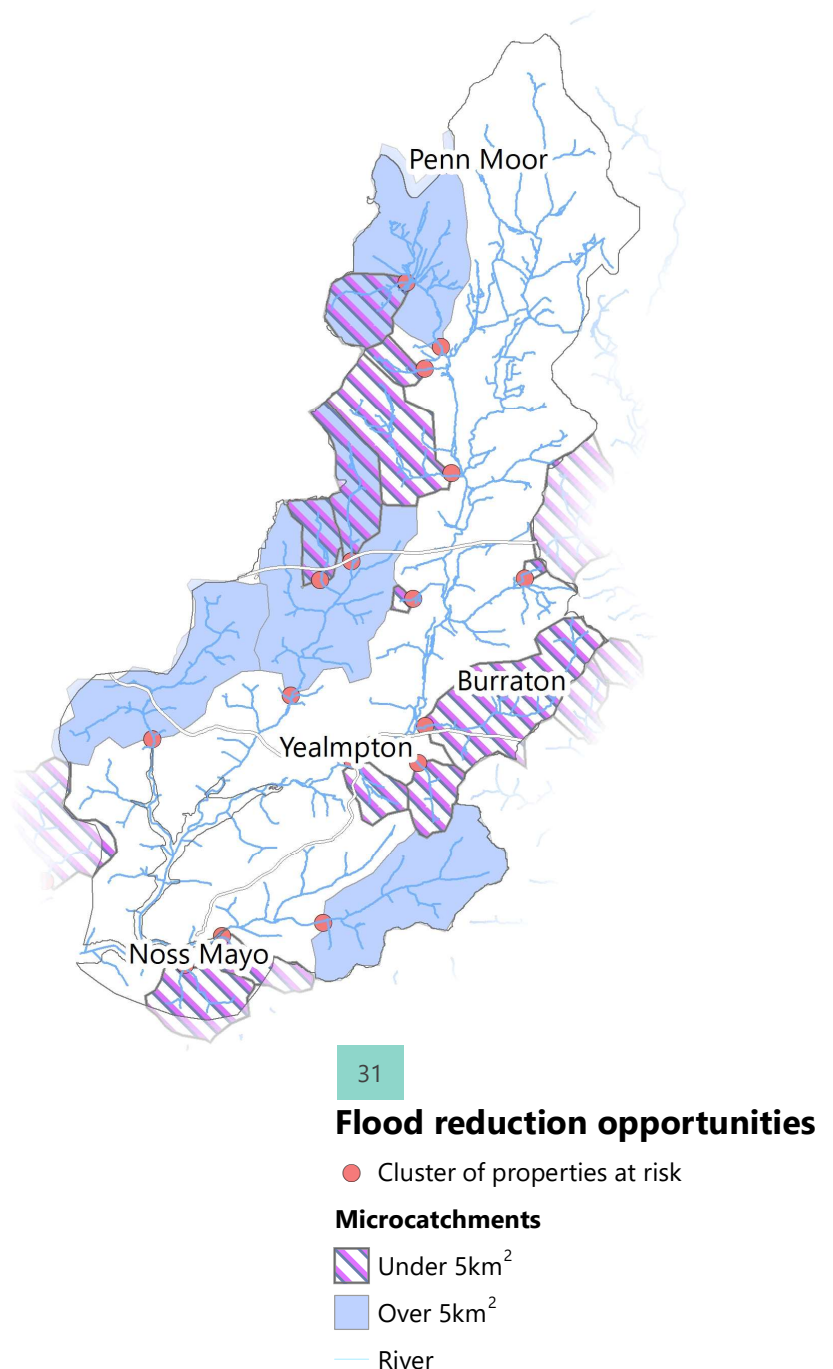
Evidence suggests that land-based interventions are likely to deliver the most cost-effective and demonstrable flood risk benefit in smaller catchments. The flood risk management opportunity mapping process first identifies properties at risk of flooding with small upstream catchments where the benefit of interventions would be greatest (less than 5 sq km = max. opportunity, 5-10 sq km = high opportunity).

What opportunities are shown in this map:

1. **Cluster of properties at risk from flooding**, where the area of the upstream catchment is less than 10km².

Method:

Clusters of properties at risk of flooding were identified where the upstream catchments were less than 10km², these were subsequently categorised as <5km² or between 5-10km² and symbolised accordingly. No scoring has been applied to these data.



Datasets presented on this page (map/graph number):

31. Detailed River Network (2016).

Habitat creation: wetland

Wetland creation

The purpose of this mapping exercise is to identify areas of land that are most suitable for wetland creation based on their inherent propensity for wetness. Using open datasets, the data are processed to illustrate the areas where further investigation into feasibility of wetland creation could be concentrated. As the map illustrates, there are small areas of the highest priority which are predominantly in close proximity to the riparian corridor.

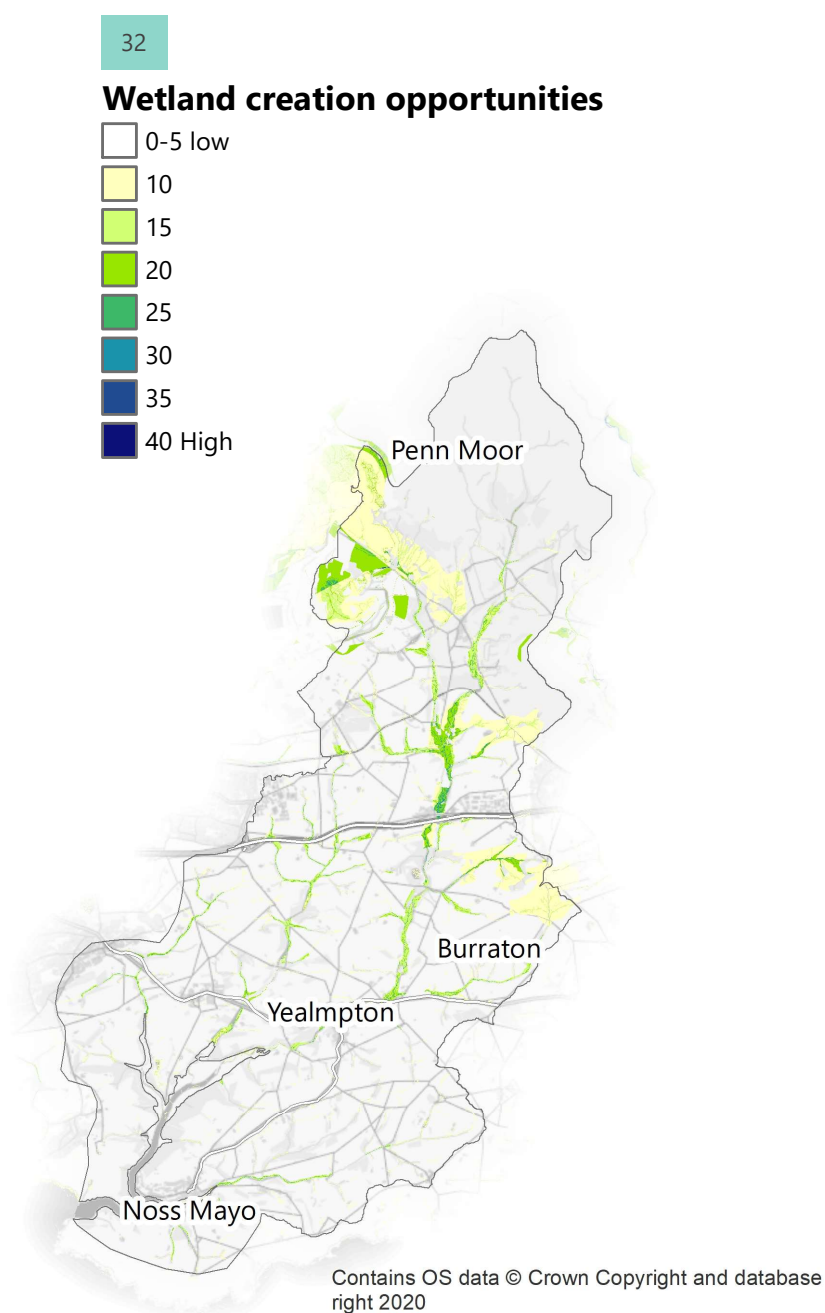
Method:

1. Surface Flow Index is modelled from topographic data using the Durham University Network Index tool in the open source SAGA 2.0 GIS package. Once calculated the 'wettest' 40 and 60% of the land surface was identified as the most hydrologically connected and scores were applied to these areas.

2. Soil types were scored based on their propensity to be water logged (wetter soils scoring highest).

3. Scores were applied to areas within an Environment Agency flood zone (propensity to be inundated).

Resulting layers from points 1, 2, and 3 were added together (taking into account excluded areas) to produce the wetland creation opportunity score.



Datasets presented on this page (map/graph number):

32. Flood Zone 2 and 3 (2018), Natmap Soils (2019), LiDAR based Digital Terrain Model (DTM) data for South West England (2014).

Habitat creation: woodland

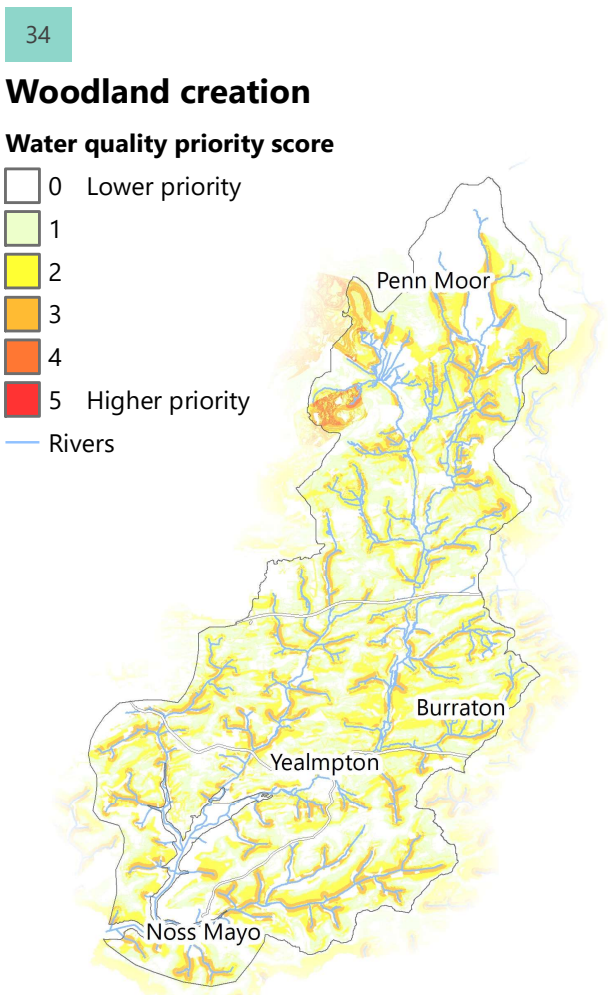
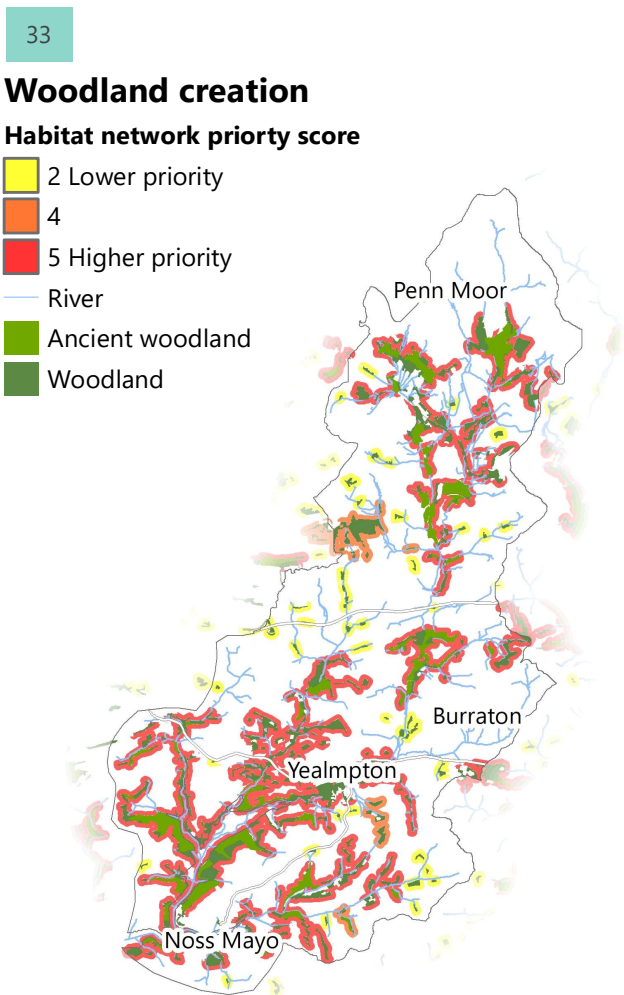
Woodland creation

The woodland creation opportunity mapping focussed on identifying the locations where creating woodland would have the greatest impact. These priorities were divided into three categories, flood risk, habitat networks and water quality and locations were weighted as per the method below:

Method

- 1. Water quality priority – areas that are higher risk to water quality (e.g steep slopes, proximity to river, soil type);
- 2. Habitat network priority – Locations that would make existing woodland bigger, better and joined;
- 3. Flood risk priority – small upstream catchments where woodland creation is suitable are the highest priority.

The resulting layers from points 1,2 and 3 were added together to give a total woodland creation score (map 36 following page).



Datasets presented on this page (map/graph number):
33. Ancient Woodland (England) (2021), Detailed River Network (2016), National Forestry Inventory (2018), Natural England Habitat Network Maps (2020).
34. Detailed River Network (2016), Natmap Soils (2019), LiDAR based Digital Terrain Model (DTM) data for South West England (2014).

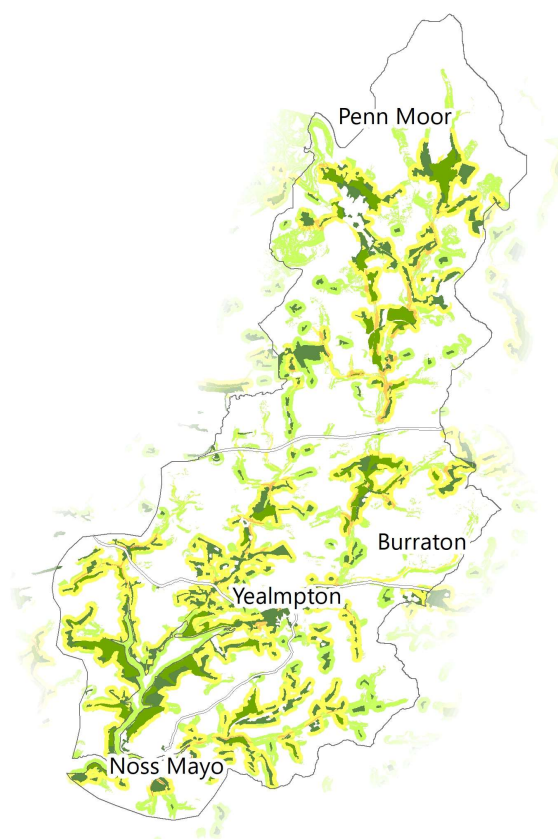
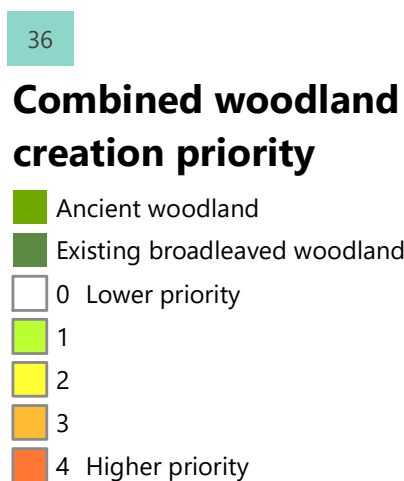
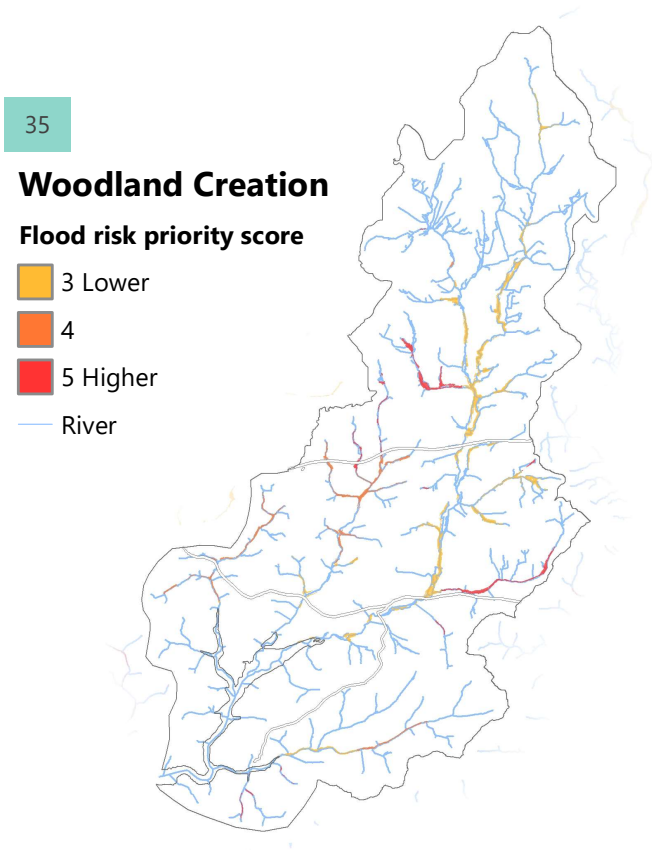
Habitat creation: woodland

Woodland creation priorities

In terms of making existing woodland **bigger**, **better** and **joined**, there are many areas of priority across the whole catchment (map 33) Most of the catchment is low risk for water quality (map 34 - light green), but there are areas of high risk concentrated in the north-west corner of the catchment. The flood risk priorities (map 35) are limited to areas in close proximity to the riparian corridor, with the strongest opportunities focussed in the centre of the catchment.

Combined woodland opportunities

This map shows where the areas of multiple priority are and will be useful for pinpointing areas of maximum impact from woodland creation, however, this should be viewed alongside the previous three maps as some detail may be lost when these data are combined. There are no areas of the very highest opportunity (score 5).



Datasets presented on this page (map/graph number):

35. Detailed River Network (2016), Working With Natural Processes (2017).

36. Ancient Woodland (England) (2021), Detailed River Network (2016), National Forestry Inventory (2018).

Next steps

This scoping study has presented the outline data and evidence which provide foundations for the next stages of the Yealm Estuary to Moor project. Using the best available data, it has highlighted the extent, distribution and condition of existing natural habitats along the River Yealm and its tributaries. It has identified issues and risks, as well as highlighting potential opportunity areas for action. It is recommended that the following tasks are subsequently carried out, in order to progress the Yealm Estuary to Moor project and take steps towards implementing measures:

1. Formalise project steering group and create a project action plan

It is important to continue to engage local stakeholders in the project development, to seek input and support where possible. It may be useful to formalise the project steering group and to clarify the roles and responsibilities of individuals involved, as well as formulate strategies and establish procedures that will ensure the longevity of the project, including project management, communication, funding and data management. A clear action plan will help to guide activity over the coming months; the consideration of timeframes is useful not only for funding but also activities such as student internships and seasonal monitoring requirements. It will be important to establish how data is stored and shared amongst stakeholders. Furthermore, the project steering group should review and discuss findings from the scoping study (and the subsequent feasibility study) in order to make decisions regarding intervention targeting and monitoring.

2. Carry out a feasibility study

While the scoping study highlights parts of the catchment that are potentially high priority for habitat restoration and creation, it does not consider the practicality or feasibility of implementing such measures, e.g. landowner agreements, costs or physical land suitability for certain measures. Therefore, the next logical step is to plan and carry out a feasibility study. The feasibility study will concentrate on interpreting data presented in this study and will determine which of the opportunities presented are possible, achievable and provide the maximum benefit for biodiversity and in terms of linking and restoring habitat. It should also consider opportunities and barriers regarding land ownership and would likely include an initial exercise in landowner engagement to gauge receptibility.

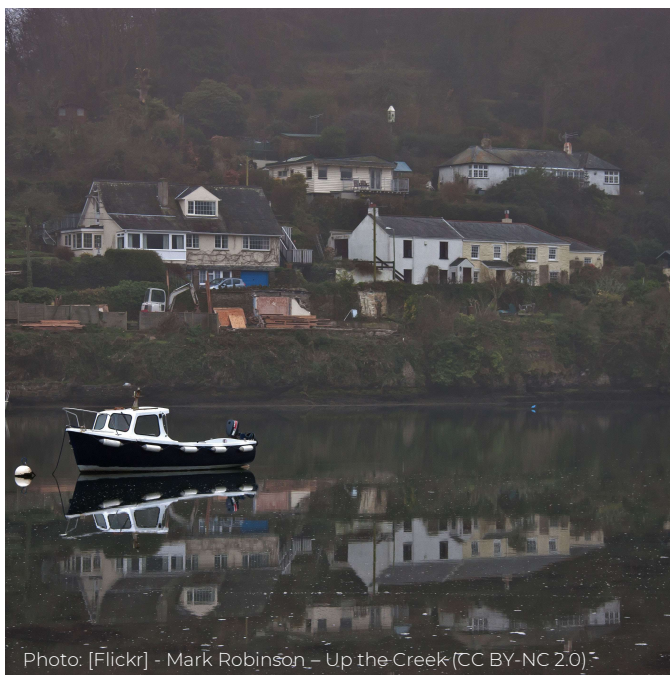


Photo: [Flickr] - Mark Robinson - Up the Creek (CC BY-NC 2.0)

Continued on the next page

Next steps

3. Create a monitoring plan

The development of a monitoring plan will be essential in the short and long term for a number of reasons, including, to establish a network of volunteer groups and practice survey techniques, address any gaps in knowledge, collect baseline data and to measure the effectiveness of interventions. The plan will need to consider terrestrial and water quality monitoring, yet as the sites of interventions are not yet known, the monitoring plan will need to be adjusted, so that pre- and post-intervention monitoring can be carried out.

Water quality monitoring

The Westcountry Rivers Trust have an established citizen science water monitoring programme, with a network of volunteers who regularly sample many of the waterways within the Westcountry. The methods and techniques used in this programme can easily be replicated and incorporated into the water quality monitoring elements of the plan.

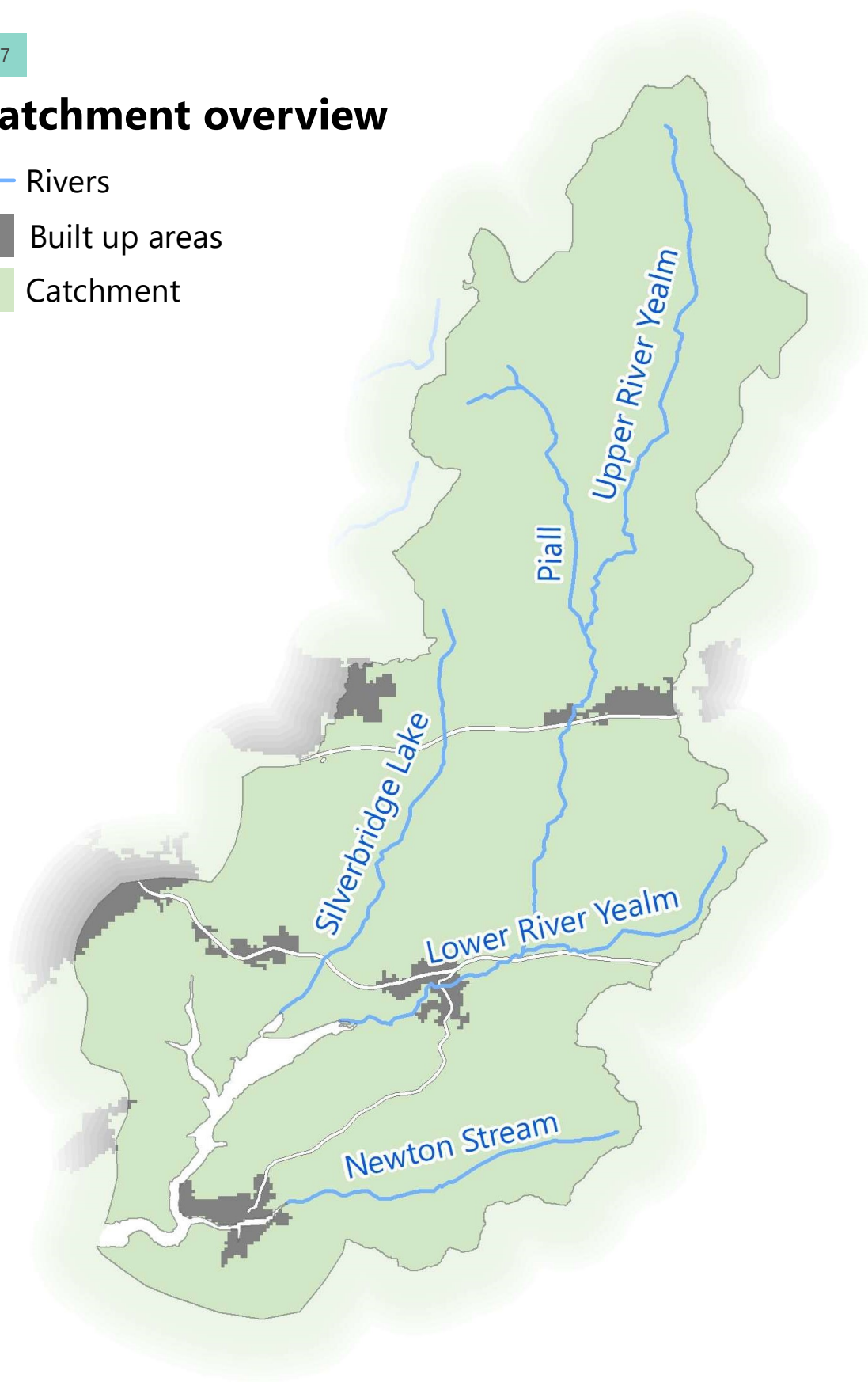
Terrestrial monitoring

While the water quality monitoring methods will be somewhat standard throughout the whole catchment, the terrestrial monitoring plan will depend on a number of different elements, including access to sites, habitat type/target species, season, number of visits needed and intervention type. Some monitoring can be undertaken before interventions are planned which would help to build a better picture of habitat condition and fill in the data gaps. Consideration needs to be given to what survey methods would be most effective, training requirements and whether the sites can be accessed without landowner permissions (see page 11 map 8). Consideration also needs to be given to how these data will be managed and analysed, as this may require additional training and/or specialist skills or technical software. Pre- and post-intervention monitoring will need to be determined once the feasibility study has been undertaken and sites have been identified. This element of the monitoring plan will be vital for measuring the impact and effectiveness of an intervention, but the scale and timeframes of the monitoring need careful consideration.



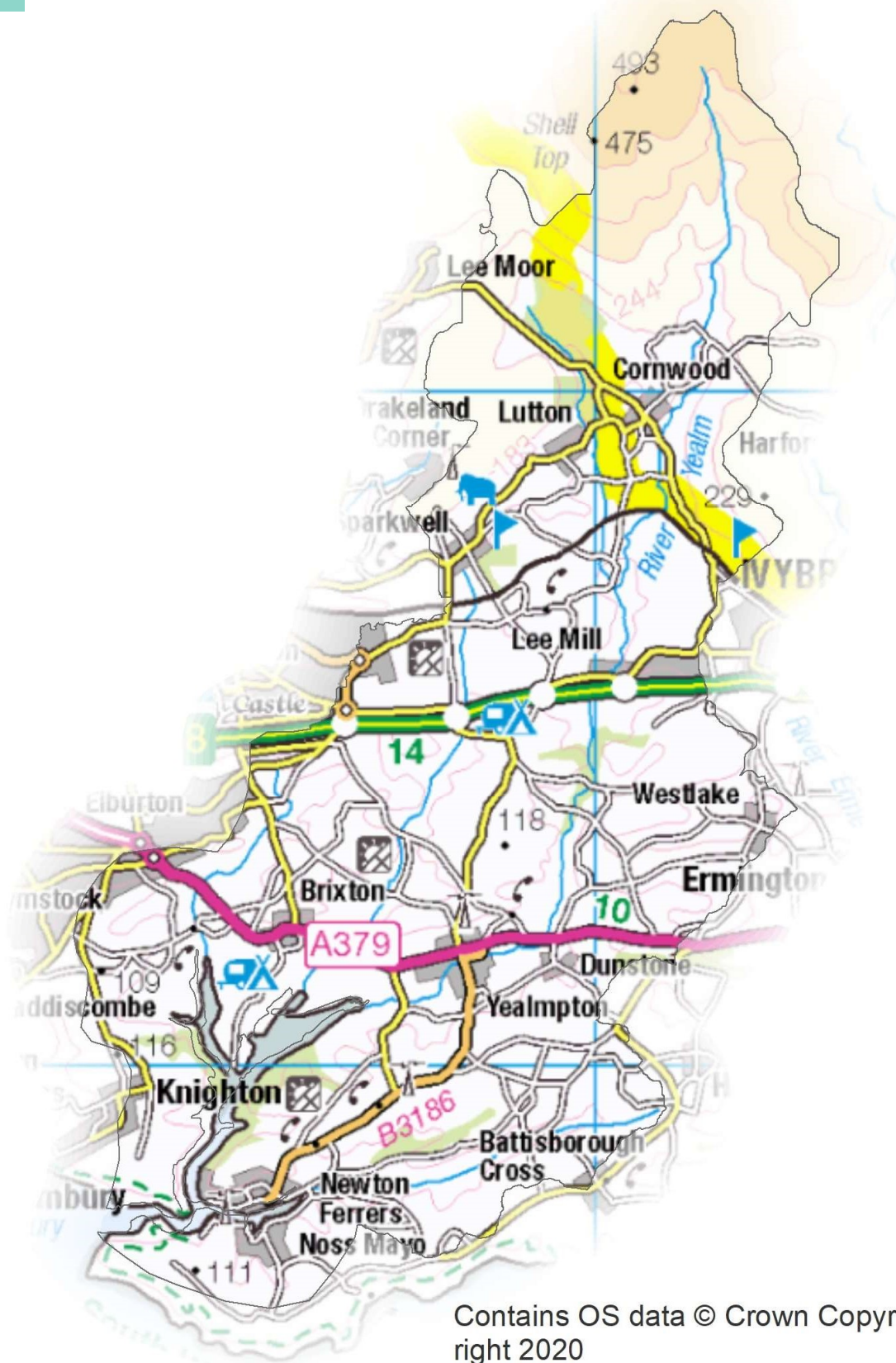
Catchment overview

- Rivers
- Built up areas
- Catchment



Datasets presented on this page (map/graph number):

37. Built Up Areas (2017), 2019 WFD information for EA cycle 2 river, canal and surface transfer waterbodies (lines) (2019).



Stakeholders

As part of the scoping study, an exercise of identifying relevant stakeholders within the River Yealm catchment was undertaken. The results of this are listed in the table below. Where possible web links have been provided for more information.

Stakeholder	link
Butterfly conservation Trust (Two Moors Project)	https://butterfly-conservation.org
Dartmoor National Park	https://www.dartmoor.gov.uk/
Dartmoor Pony Heritage Trust	https://dpht.co.uk/conservation/conservation-grazing
Dartmoor Tinworking Research Group	https://dtrg.org.uk/
Devon & Severn IFCA	
Devon Environment Foundation	https://devonenvironment.org/
Devon Hedge Group	https://devonhedges.org/
Devon Local Nature Partnership	
Devon Moth Group	https://devonmoths.org.uk/tag/new-county-record-2/
Devon Wildlife Trust	
Earne & Yealm - farm cluster (Game and Wildlife Conservation Trust)	https://www.farmerclusters.com/profiles/south-west/csff120009-earne-and-yealm/
English Heritage	
Environment Agency	
Historic England	
Moor Trees	www.moortrees.org
National Trust	
Natural England	
Newton and Noss Environment Group	
River Yealm Harbour Authority	
South Devon and Dorset Coastal Advisory Group	https://southwest.coastalmonitoring.org/
South Devon AONB	https://www.southdevonaonb.org.uk/
South Hams Council	
South West Coast Path Association	https://www.southwestcoastpath.org.uk/
South West Water	
Tamar Estuaries Consultative Forum	
The Dartmoor Preservation Association	https://www.dartmoorpreservation.co.uk/
The River Yealm & District Association Committee	https://ryda.org.uk/about%20us.html
Trees for Health	https://www.facebook.com/treesforhealth/
Upper Yealm Fishery	http://www.flyfishingdevon.co.uk/river-yealm-responsive02.html#about-us
Wembury Environment Group	https://www.facebook.com/wemburyenvironmentgroup/
West Devon Council	
Westcountry Rivers Trust	
Woodland Trust	https://www.woodlandtrust.org.uk/media/47119/4582-yealm-woods.pdf
Yealm Community Energy	https://www.yealmenergy.co.uk/service/community-fund/
Yealm Estuary Management Group	https://www.southdevonaonb.org.uk
Yealm Yacht Club	https://yealmyachtclub.co.uk/
Yealmpton Environment Group	

Reports

As part of the scoping study, an exercise of identifying relevant reports within the River Yealm catchment was undertaken. The results of this, and links to access more information are listed in the table below (continues on pages 39 & 40) .

Title	Link
River Yealm SAP Consultation	https://aquadocs.org/bitstream/handle/1834/27371/Yealm_SAP_consultation_document.pdf?sequence=1&isAllowed=y
Yealm Woods management plan	https://www.woodlandtrust.org.uk/media/47119/4582-yealm-woods.pdf
Plymouth Sound and Estuaries SAC Littoral Habitats Condition Monitoring 2017 (ER17-348)	http://publications.naturalengland.org.uk/publication/5051077840076800
Yealm Estuary Biosecurity Planx	http://south-devon.org/wp-content/uploads/2017/08/Yealm-Estuary-Biosecurity-Plan.pdf
A comparison of vegetated and unvegetated soft-sediment macrobenthic communities in the River Yealm, south-western Britain	https://www.cambridge.org/core/journals/journal-of-the-marine-biological-association-of-the-united-kingdom/article/abs/comparison-of-vegetated-and-unvegetated-softsediment-macrobenthic-communities-in-the-river-yealm-southwestern-britain/1CC870F417283EA093E77DA021BAE958
England Coast Path Stretch	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853018/cremyll-kingswear-report-3.PDF
Plant Life Important Plant Area	https://www.plantlifeipa.org/site/factsheet/1010
EA Environment Programme	http://www.brixtonparishcouncil.org.uk/_UserFiles/Files/Environment%20Agency%20presentation%20-%2011th%20January%202021.pdf
Salmon Action Plan	http://www.environmentdata.org/archive/ealit:1392/OBJ/19001619.pdf
South Devon AONB Estuaries Management Plan 2016 – 2020 Consultation	http://www.cmscoms.com/?p=5878
Home advantage? Decomposition across the freshwater-estuarine transition zone varies with litter origin and local salinity	https://pearl.plymouth.ac.uk/bitstream/handle/10026.1/4722/Franzitta%20et%20al%20(Final%20Version%20July%202015).pdf?sequence=2&isAllowed=y
The South Hams River Improvement Project (SHRIMP)	https://restorerivers.eu/wiki/index.php?title=Case_study%3AThe_South_Hams_River_Improvement_Project_(SHRIMP)
Dispersion-based weighting of species counts in assemblage analyses	https://www.researchgate.net/publication/250218690_Dispersion-based_weighting_of_species_counts_in_assemblage_analyses
Dartmoor National Park Authority Level 1 Strategic Flood Risk Assessment	https://www.dartmoor.gov.uk/_data/assets/pdf_file/0024/81276/101125-D131849-DNPA-Level-1-SFRA-Final.pdf
Water Reseiouce management plan	https://www.southwestwater.co.uk/siteassets/documents/water_resources_management_plan_june_20141.pdf
Habitats regulation assessment	https://www.plymouth.gov.uk/sites/default/files/UpdatedHabitatRegulationsAssessmentChangesAgreedStatementOfCommonGroundWithNaturalEnglandChanges.pdf
7097 Rapid Coastal Zone Assessment Survey: Phase One Desk-based Assessment for South-West England (South Coast Cornwall)	https://eprints.soton.ac.uk/440946/1/RCZA_Cornwall_South_Coast_report.pdf
Sanitary Survey Report	https://www.cefascas.co.uk/media/pqcpjavg/final-yealm-estuary-sanitary-survey-report-2010.pdf
Devon Biodiversity and Geodiversity Action Plan	http://newtonandross-pc.gov.uk/n3p/the-estuary/
The River Yealm Harbour Guide	https://issuu.com/riveryealmharbourguide/docs/river_yealm_harbour_guide_2019_final
Brixton annual report	http://www.brixtonparishcouncil.org.uk/_UserFiles/Files/Annual%20Reports/BPC%20Chairman%20Annual%20report%202020%202021.pdf
Port of Plymouth Evidence Base Study	https://www.plymouth.gov.uk/sites/default/files/PortOfPlymouthVolume2Appendices.pdf

Reports:

Title	Link
Assessment of Coastal Access Proposals between Cremyll and Kingswear	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853015/cremyll-kingswear-nature-conservation-assessment.PDF
South Hams River Improvment Project	https://issuu.com/westcountryriverstrust/docs/wrt_crf_shrimp_report_v2-1_final
Tamar Annual Review December 2000	http://ea-lit.freshwaterlife.org/archive/ealit:1512/OBJ/20001216.pdf
SHRImP 2014 Semi-quantitative Electro-fishing Survey	http://auneconservation.org.uk/wp-content/uploads/2009/10/SHRImP-EF-Report-2104.pdf
Evaluating options for sea trout and brown trout biological reference points	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290994/scho0808bomj-e-e.pdf
South Devon Estuaries Environmental Management Plan 2018 – 2024	https://www.southdevonaonb.org.uk/wp-content/uploads/2019/07/Annex_2_SDEMP_-_all_files_combined.pdf
South Hamsn Green Infrastruce Framework	https://www.plymouth.gov.uk/sites/default/files/SouthHamsGreenInfrastructureFramework.pdf
Tamar CC Feedback	http://my-tamar.org/wp-content/uploads/2020/03/Tamar-CC-Feedback.pdf
Achieving a sustainable marine economy	https://consult.defra.gov.uk/mmo/sw-mp-iteration-3-online-engagement/user_uploads/sw-aq-1_clean.pdf
The pacific Oyster in the UK	http://www.shellfish.org.uk/files/PDF/73434Pacific%20Oysters%20Issue%20Paper_final_241012.pdf
Management Plan 2014 - 2019 Part 1: Strategy	https://kingsbridge.gov.uk/wp-content/uploads/2020/01/D1-AONB-Management-Plan-2014-2019.pdf
Annual Assessment of Salmon Stocks and Fisheries in England and Wales 2006	https://www.cefas.co.uk/Publications/salmon/salmon_stocks2006.pdf
The rod and net sea trout fisheries of England and Wales	
Water quality benefits from an advice-led approach to reducing water pollution from agriculture in England	https://reader.elsevier.com/reader/sd/pii/S0167880920301109?token=BAD47CA5B098444B563C8B02663CA9A67BE9DF7FFD0DD8356EC5A60C6FCF3F08E7CBDF45A8B74F8B44668EEC4DD7834&originRegion=eu-west-1&originCreation=20210916154139
Widespread occurrence of the non-indigenous ascidian Corella eumyota Traustedt, 1882 on the shores of Plymouth Sound and Estuaries Special Area of Conservation, UK	http://plymsea.ac.uk/id/eprint/6643/1/AI_2010_5_2_SCollin_etal.pdf
Flood estimation for small catchments	http://nora.nerc.ac.uk/id/eprint/7367/1/IH_124.pdf
Plymouth Sound & Estuaries Coastal Planning Study	https://www.plymouth.gov.uk/sites/default/files/PlymouthSoundAndEstuariesCoastalPlannin gStudyProjectReport2006.pdf
West Devon Level 1 Strategic Flood Risk Assessment	https://www.plymouth.gov.uk/sites/default/files/WestDevonLevel1StrategicFloodRiskAssess ment.pdf
Tamar Catchment Flood Management Plan	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/294024/Tamar_Catchment_Flood_Management_Plan.pdf
South Devon AONB annual review 2017-2018	https://www.southdevonaonb.org.uk/wp-content/uploads/2020/01/Annual_report_1718.pdf
Cirl Bunting Bulletin	https://www.rspb.org.uk/globalassets/downloads/documents/conservation-projects/cirl-bunting-bulletin---summer-2011.pdf

Reports:

Title	Link
THE INVASION ECOLOGY OF COMMON WALL LIZARD (PODARCIS MURALIS): POPULATION DYNAMICS, INTERACTIONS AND ADAPTATIONS	https://etheses.whiterose.ac.uk/25978/1/THE%20INVASION%20ECOLOGY%20OF%20COMMON%20WALL%20LIZARD.pdf
HABITAT REGULATIONS ASSESSMENT FEBRUARY 2017 DRAFT	https://www.plymouth.gov.uk/sites/default/files/HabitatRegulationAssessmentFebruary2017_2.pdf
DEVELOPMENT OF A PACIFIC OYSTER AQUACULTURE PROTOCOL FOR THE UK – TECHNICAL REPORT	
Water Future proposals and choices 2020-2025	https://www.southwestwater.co.uk/siteassets/document-repository/proposals-and-choices/proposals-choices.pdf
South Hams Green Infrastructure Framework	https://www.plymouth.gov.uk/sites/default/files/SouthHamsGreenInfrastructureFramework
Baseline Document for Maintenance Dredging in Plymouth Sound and Estuaries European Marine Site	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/331063/mdp.pdf
River Yealm Final Salmon Action Plan	https://aquadocs.org/bitstream/handle/1834/27370/Yealm_Final_SAP.pdf?sequence=1&isAllowed=y
SHRIMP 2014 Semi-quantitative Electro-fishing Survey	http://auneconservation.org.uk/wp-content/uploads/2009/10/SHRIMP-EF-Report-2104.pdf
Variability of UK seagrass sediment carbon: Implications for blue carbon estimates and marine conservation management	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0204431
DARTMOOR BIRD REPORT 2018	https://www.devonbirds.org/files/birdwatching/DartmoorBirdReport2018.pdf
Sanitary survey report Yealm Estuary 2004	https://www.cefas.co.uk/media/pqcpjavg/final-yealm-estuary-sanitary-survey-report-2010.pdf
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Centre for Ecology and Hydrology	CEH Natural Capital Maps - Plant Indicators	Maskell, L.; Henrys, P.; Norton, L.; Smart, S. (2016). Model estimates of expected diversity of positive plant habitat condition indicators. NERC Environmental Information Data Centre. http://doi.org/10.5285/cc5ae9b1-43a0-475e-9157-a9b7fcb24e7 .	21
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	Detailed River Network	Accessed via the CaBA Data Package.	1, 2, 4, 5, 6, 7, 8, 9, 10, 18, 20, 23, 24, 25, 28, 29, 30, 31, 33, 34, 35, 36
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	2019 WFD information for EA cycle 2 river, canal and surface transfer waterbodies (lines)	© Environment Agency copyright and/or database rights 2019.	11, 12, 13, 14, 15, 16, 37
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NBN and Environment Agency	England Non-Native Species records 1965 to 2017	Records provided by England Non-Native Species records 1965 to 2017, accessed through NBN Atlas website. (Open Government Licence (OGL); Records provided by Environment Agency, accessed through NBN Atlas website.	25
NERC Environmental Information Data Centre	LiDAR based Digital Terrain Model (DTM) data for South West England	Ferraccioli, F.; Gerard, F.; Robinson, C.; Jordan, T.; Biszczuk, M.; Ireland, L.; Beasley, M.; Vidamour, A.; Barker, A.; Arnold, R.; Dinn, M.; Fox, A.; Howard, A. (2014). LiDAR based Digital Terrain Model (DTM) data for South West England. NERC Environmental Information Data Centre. https://doi.org/10.5285/e2a742df-3772-481a-97d6-0de5133f4812	1, 2, 32, 34
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