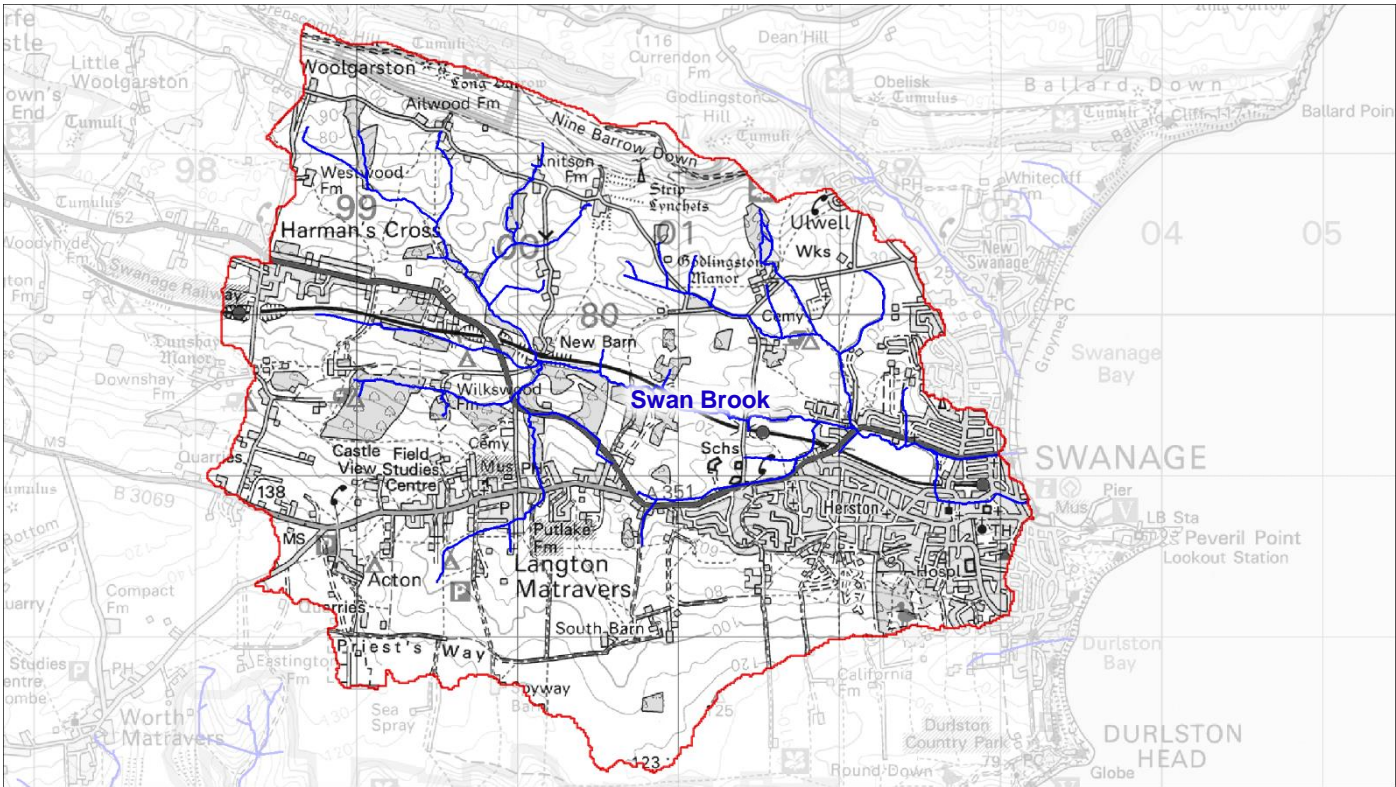




Swan Brook



Map of the Swan Brook catchment

Key

River

Catchment boundary

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Introduction

The Swan Brook rises under the Purbeck Ridge at the junction between chalk and the underlying mudstones, which it flows over the sea at Swanage. Part of the catchment is worked for the famed Purbeck Stone. Otherwise it is largely a rural catchment, with the exception of Swanage at the mouth, which is a very popular tourist destination.

The entire catchment is in the Dorset Area of Outstanding Natural Beauty and the coastal strip, known as the Jurassic Coast, has been designated a UNESCO World Heritage site.

River length	6.02 km
Catchment area	21.08 km ²
Geology	Rises in chalk or limestone before running over mudstones to the sea.
Land use	Predominantly small livestock units and permanent grassland. Urban at mouth



Principle towns and villagesLangton Matravers, Swanage

No river in England is in pristine condition, and it is the responsibility of the Environment Agency to monitor how far from pristine the condition of our waterbodies has deviated. It is up to us to tackle the issues affecting the Swan Brook and make a difference on the ground (because if we don't work together and make a difference, who will?). By conserving and enhancing existing habitats of importance, restoring habitats where possible and working with natural process, it is possible to make meaningful improvements to the condition of the water environment, and ultimately the wellbeing of communities living within the catchment.

The next sections explores the state of the river and wider catchment, the areas that have been identified as at risk from the Environment Agency and from local people, and potential areas to explore that will help deliver our aim of improving the condition of the Swan Brook.

This document should be seen as a starting point for discussion and is not meant to be comprehensive. We can work with communities to explore opportunities to help improve the river and wider catchment.



Environment

Geology

The geology under our feet heavily influences how water moves through the catchment, the soils that form above it and the plants and animals that live here. It also influences how we use the land to produce food.

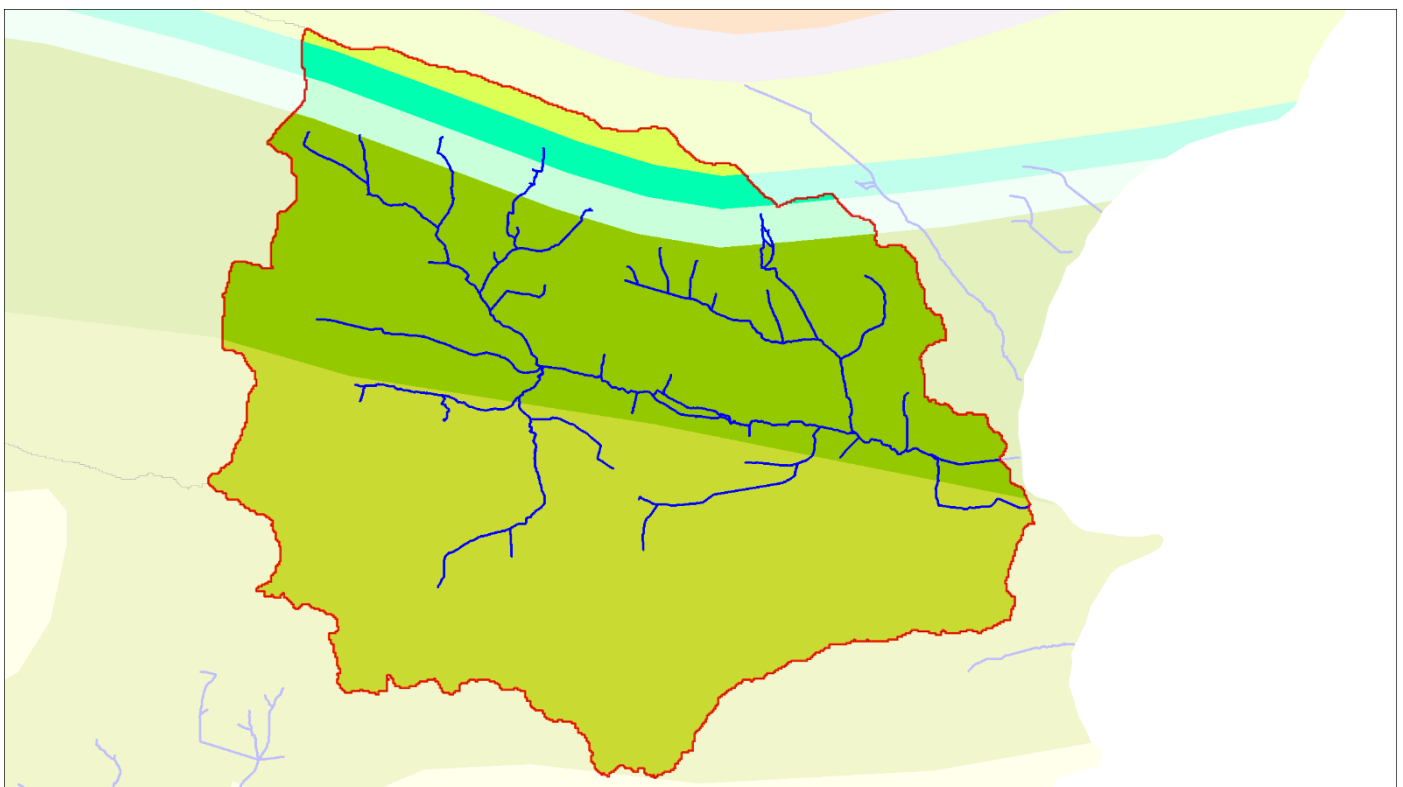
The catchment is broadly split in two, with the permeable rocks of the White Chalk subgroup, Gault Formation and Greensand Formation, along with the Purbeck Limestone Group, resulting in little surface water to the north and south of the catchment, as water is absorbed into the rock. The remaining Wealdon Group of rocks, located in the centre of the catchment, impede drainage, resulting in more surface water.

The Lower Greensand Group of sandstones and mudstones were formed approximately 100 to 125 million years ago in the Cretaceous Period. Following this, the Gault Formation and Upper Greensand Formation, again made up of mudstones, sandstones and limestone, were formed in shallow seas between 94 and 112 million years ago. Later in the Cretaceous Period, the White Chalk subgroup was formed in shallow tropical seas approximately 66 to 100 million years ago. Still in the Cretaceous Period, but now in a terrestrial situation, the Wealdon Group of mudstones, siltstones and sandstones were formed approximately 125 to 156 million years ago in marginal coastal plains with lakes and swamps periodically inundated by the sea.

The Purbeck Limestone Group were deposited in marginal coastal plains between 140 and 151 million years ago in the Cretaceous and Jurassic Periods.

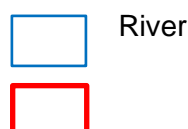
The Gault / Greensand has the potential to naturally elevate the levels of phosphate found in the watercourse.

The map below shows the extent of the geology within the catchment.



Map of the Swan Brook underlying geology

Key





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Geology Data © British Geological Survey and United Kingdom Research & Innovation 2021

Catchment boundary



White chalk subgroup



Gault Formation and Upper Greensand Formation: mudstone, sandstone and limestone,



Lower Greensand group: sandstone and mudstone



Wealdon Group: mudstone, siltstone and sandstone



Purbeck Limestone Group: limestone and mudstone interbedded



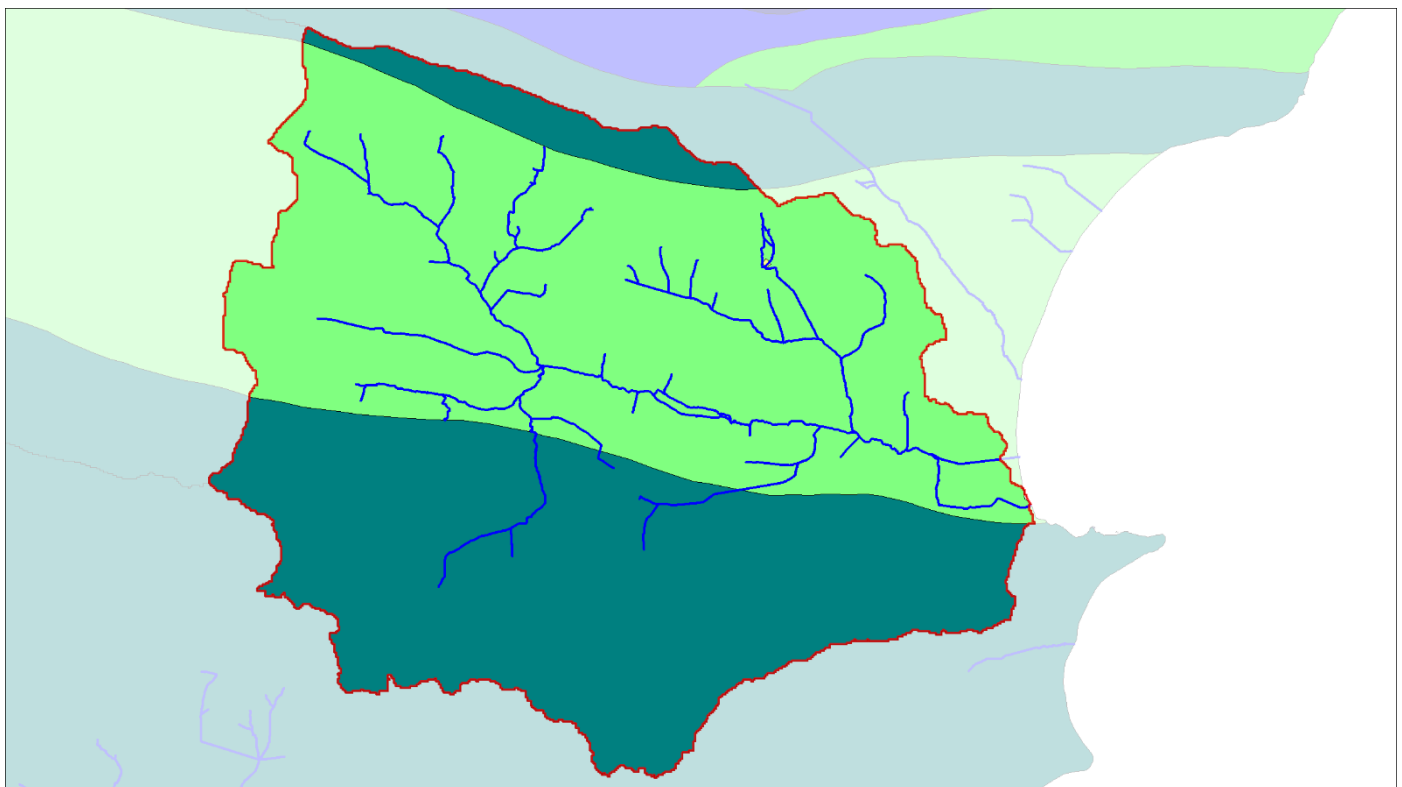
Soil types

Heavily influenced by the underlying geology, soils are at the interface between biotic (living) and abiotic (non-living) worlds. These are important stores of carbon and biodiversity in their own right and provide the foundations from which others can grow. Soils can be broadly described as basic (acid), calcareous (alkaline) and neutral. The soils of the Swan Brook catchment are split between freely draining lime rich soils and the impeded drainage of the valley bottom loamy and clayey soils.

The dominant soil types, as characterised by Cranfield University's Soilscales, are:

- 'Shallow lime-rich soils over chalk or limestone'. They are freely draining and have moderate fertility. They are suitable for herb-rich downland and limestone pastures, beech hangars and other lime-rich woodlands. There low/medium potential for carbon storage. Water drains to groundwater and is particularly vulnerable to leaching of nitrate and pesticides to groundwater and surface capping.
- 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'. They impede drainage and have moderate fertility. They are suitable for seasonally wet pasture and woodland habitat and can be used for grassland and arable, with some woodland. There is low potential for carbon storage. Water drains to a stream network (rather than groundwater) and the main risks are associated with overland flow from compacted or poached fields. Organic slurry, dirty water, fertiliser, pathogens and fine sediment can all move in suspension or solution with overland flow or drain water.

The map below shows the extent of the Soilscales in the catchment.



Map of the Swan Brook catchment soils

Key

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River



Catchment boundary

Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2021



Soilscape 3: shallow, lime-rich soils over chalk or limestone



Soilscape 18: slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils



Land use

The geology and soils of the Swan catchment have strongly influenced how this land has been used. Where it is fertile and accessible to farm machinery, it may be used for intensive grass for dairy or beef. Where the soil is less fertile or the land too steep or waterlogged, then it may be more extensively used, leaving fragments of semi-natural habitats. This fragmentation of semi-natural habitat has increased greatly since the Second World War because of improved capability of farm machinery and techniques that make farming marginal land economically viable, alongside government incentives. This was driven by an increasing population and subsequent higher demand for food. As a result, over 97% of all semi-natural habitats mapped in Dorset in the 1930s have been converted to agriculturally improved arable or grassland.

Looking in a bit more detail at the land use of the Swan catchment, we can split it down into a number of categories that are described below. The figures are derived from a study undertaken in 2018 that mapped land use in the Dorset AONB from existing data, aerial photography and satellite images.

Intensive land use

Improved grassland covers just over half of the catchment area. Improved grassland will predominantly be used to support beef and dairy cattle. The grassland will be planted 'leys' dominated with grass species, such as ryegrass, possibly with clovers. that are periodically ploughed up and replanted. To maintain their condition, they will be treated with nitrates and phosphates several times during the growing season. There is a minimal area of arable in the catchment, which reduces the risk of sediment contamination to the watercourse.

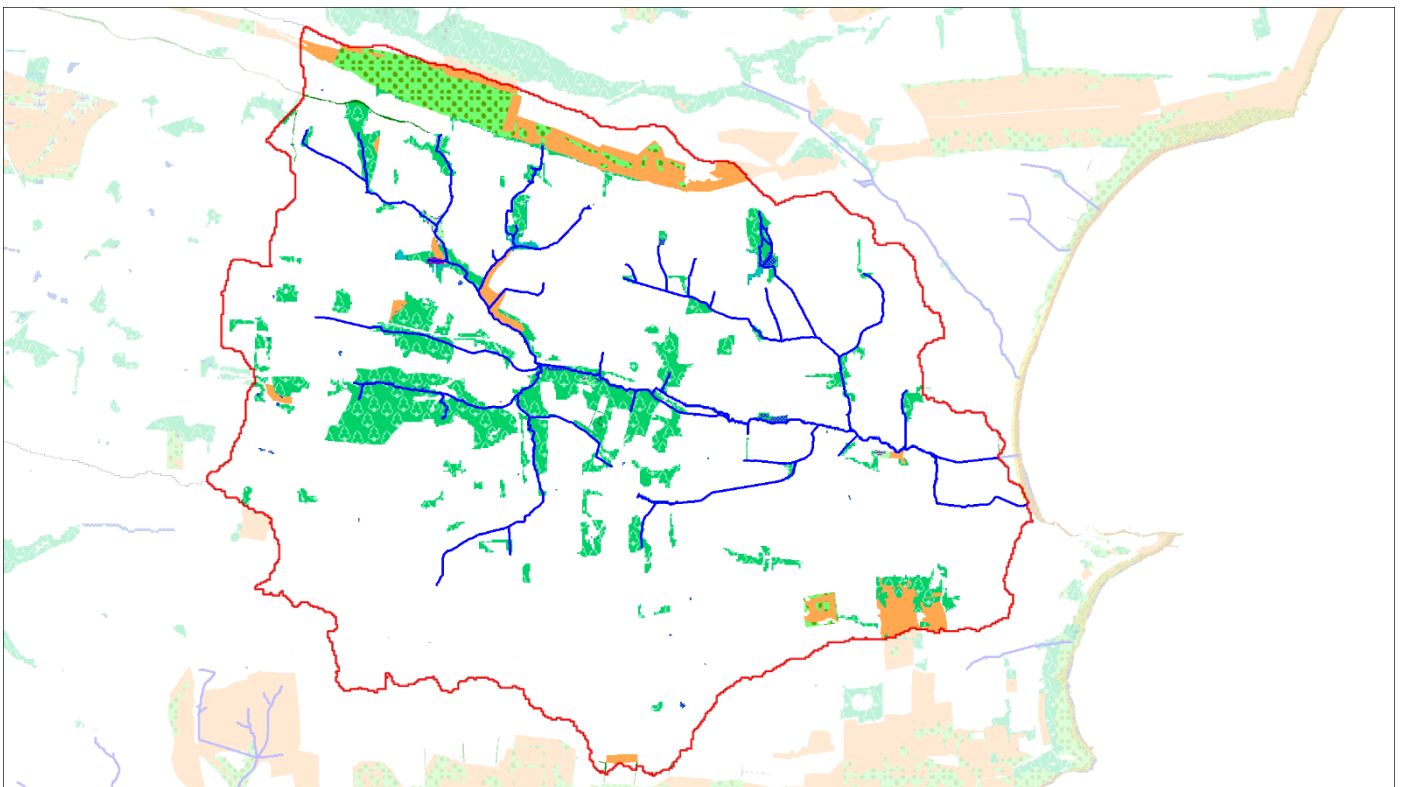
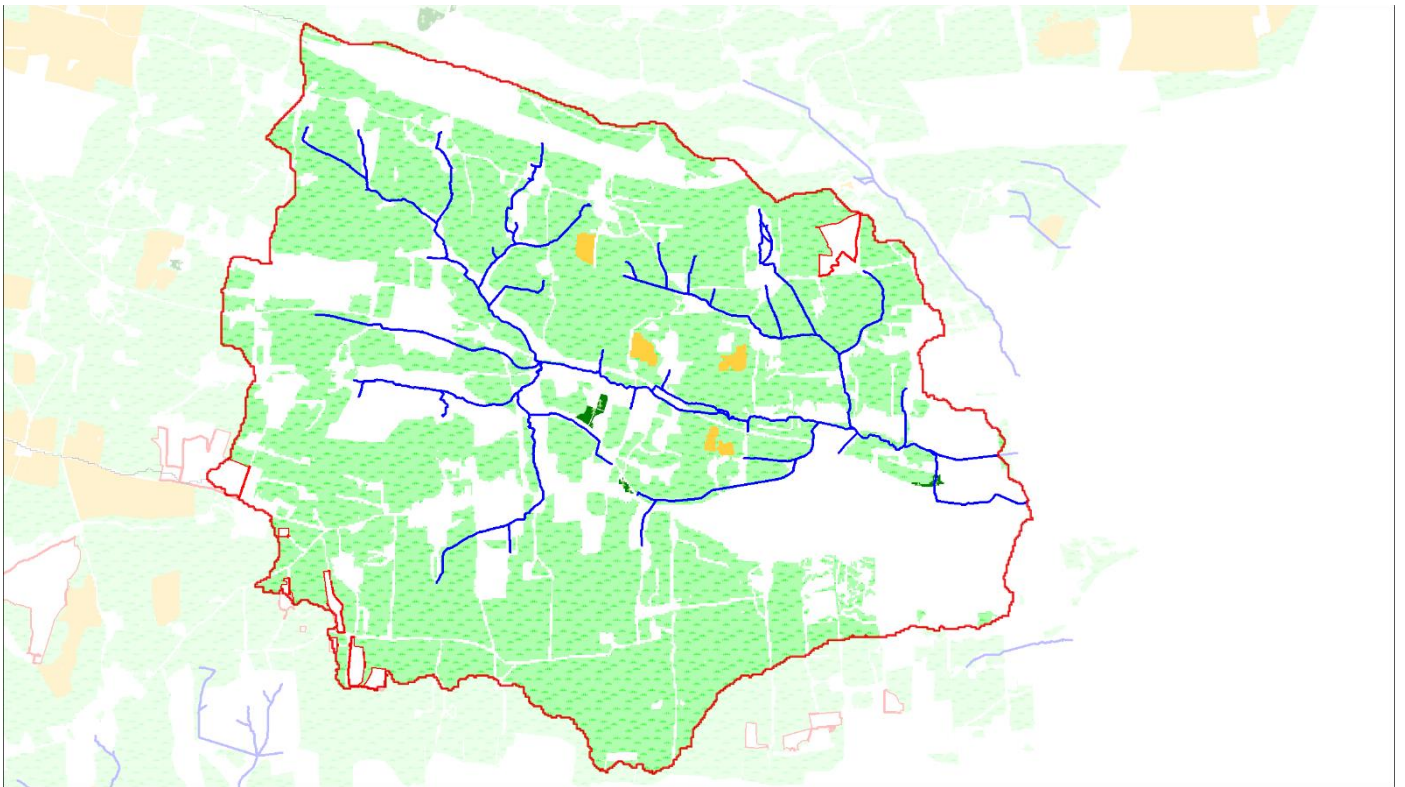
In total, intensive land use covers close to 56% of the catchment area and has the potential to have impacts on the water environment of the Swan Brook.

Extensive land use

Covering 11% of the catchment areas is broadleaved woodland, including wet woodland and 2% scrub. This is below the average for Dorset. Semi-improved grassland is not as rich in wildlife as semi-natural grasslands because it has been improved in the past to favour a grass-dominated sward. However, having not been ploughed up recently and as intensively managed, it holds great potential for restoration back to semi-natural habitat. There is 3% semi-improved grassland within the catchment.

Other land use

Urban land cover takes up 25% of the area, which is a large percentage compared to others, and there is an additional 3% that has been classified as gardens (though this category is hard to define because the individual areas are quite small). Quarries make up approximately 1% of the area.





Map of the Swan Brook catchment intensive land use (top) and extensive land use (bottom)

Key






























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River



Catchment boundary

	Arable		Quarry
	Bare ground		Saltmarsh
	Bracken		Sand dune
	Broadleaved woodland		Scrub
	Cliffs and rocky shore		Semi-improved grassland
	Coniferous plantation		Shingle above high tide mark
	Felled woodland		Tall herb and fern
	Gardens		Unimproved grassland (Acid)
	Hedgerow		Unimproved grassland (Calcareous)
	Improved grassland		Unimproved grassland (Neutral)
	Intertidal habitat		Urban
	Lowland dry heath		Water
	Marshy grassland		Wet heath
	Mixed woodland		Wet woodland
	Parkland/scattered trees		Wetland

Land use categories



Ecological networks

We have undertaken further analysis of the land use data to identify areas of habitat that are important for the survival of native species, as they provide shelter and food for them. We also looked at how easily these species can move through the landscape between these 'core' habitat sites. We have broken this analysis down into four broad habitat types: grassland, woodland, heathland and wetland. For each of these, we have identified: 'core' habitat, which are extensive land use blocks over 1ha in size; 'stepping stones', which are extensive land use blocks less than 1ha in size; and the 'ecological network', which maps how a species can move between the 'core' habitat blocks using the 'stepping stones' and wider intensive land use. It is vital for the survival of species that they have access to adequate 'core' habitats to shelter, feed and reproduce as well as adapt to extreme weather and climate change.

The most significant networks within the Swan Brook catchment are grassland and woodland. There are no heathland sites because the geology and soils are not right for this sort of habitat, and one wetland site near Harman's Cross.

It is the government's ambition to have 30% of the land managed for wildlife. If we total the 'core' habitat blocks within the catchment, this gives us a total of 11%. Even if the area classed as urban is removed from the calculation, the figure only rises to 16%. There is, therefore, significant capacity for restoration and enhancement to help meet this target. Natural England also recognise that for a site to function naturally, it should be at least 40ha in size. There are no habitat blocks above this threshold within the catchment, though there are further extensive grassland blocks to the south and woodland blocks to the north. The Swan Brook catchment could therefore act as bridge between larger habitat blocks that fall outside the area.

Grassland

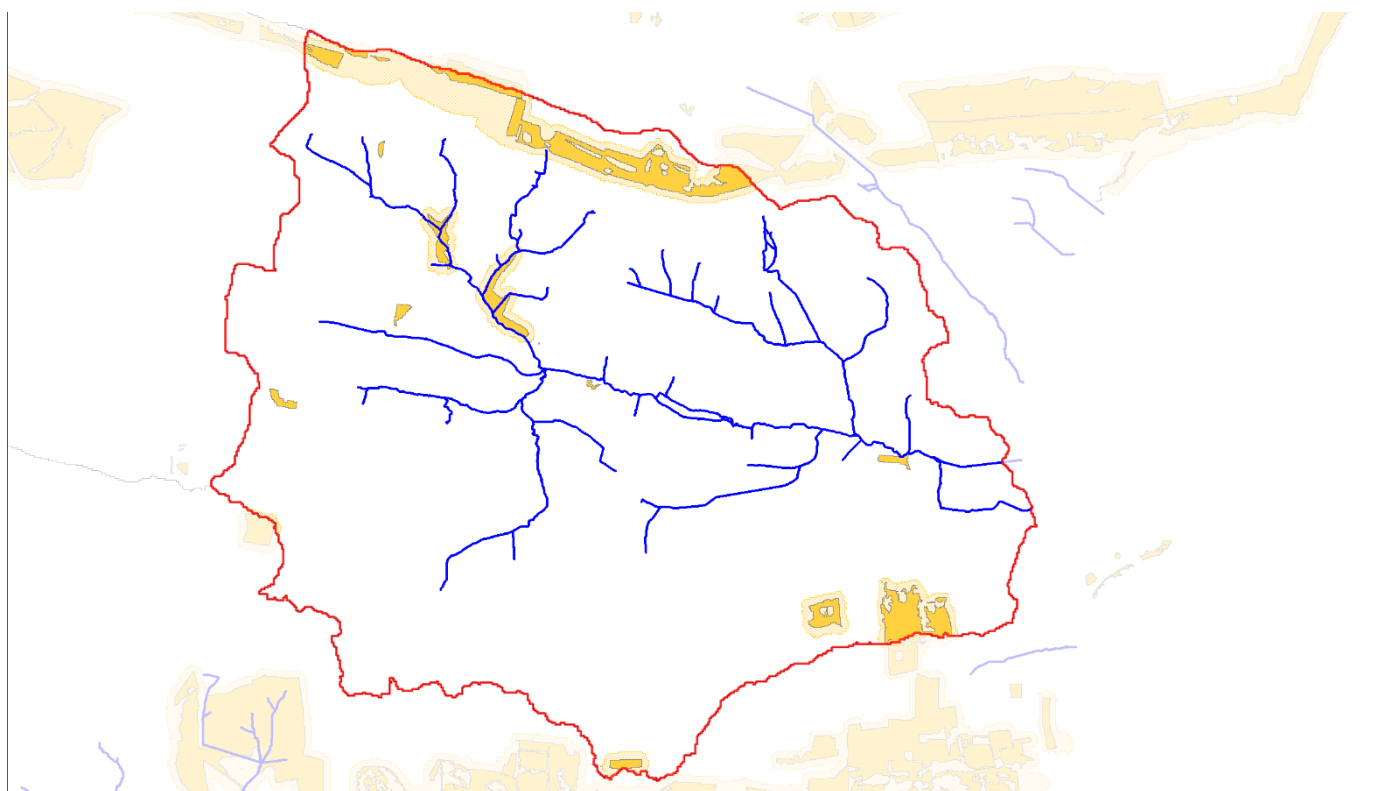
51 ha of 'core' and 'stepping stone' habitat exist within the catchment, over 31 locations. These are mostly on the steeper slopes to the north. These sites support a grassland ecological network (for an average medium dispersal species) of approximately 110ha over 5 locations.

Woodland

567 of 'core' and 'stepping stone' habitat exist within the catchment, over 137 locations. These are focussed in the centre of the catchment, where the A351 crosses the railway line. These sites support a woodland ecological network (for an average medium dispersal species) of approximately 330ha over 22 locations.





Heathland and wetland

Heathland sites are tightly restricted to specific underlying soils and geology. There is no opportunity for restoration and enhancement within the catchment. There are very few wetland sites within the catchment, which means species reliant on this habitat are poorly serviced in the Swan Brook catchment.

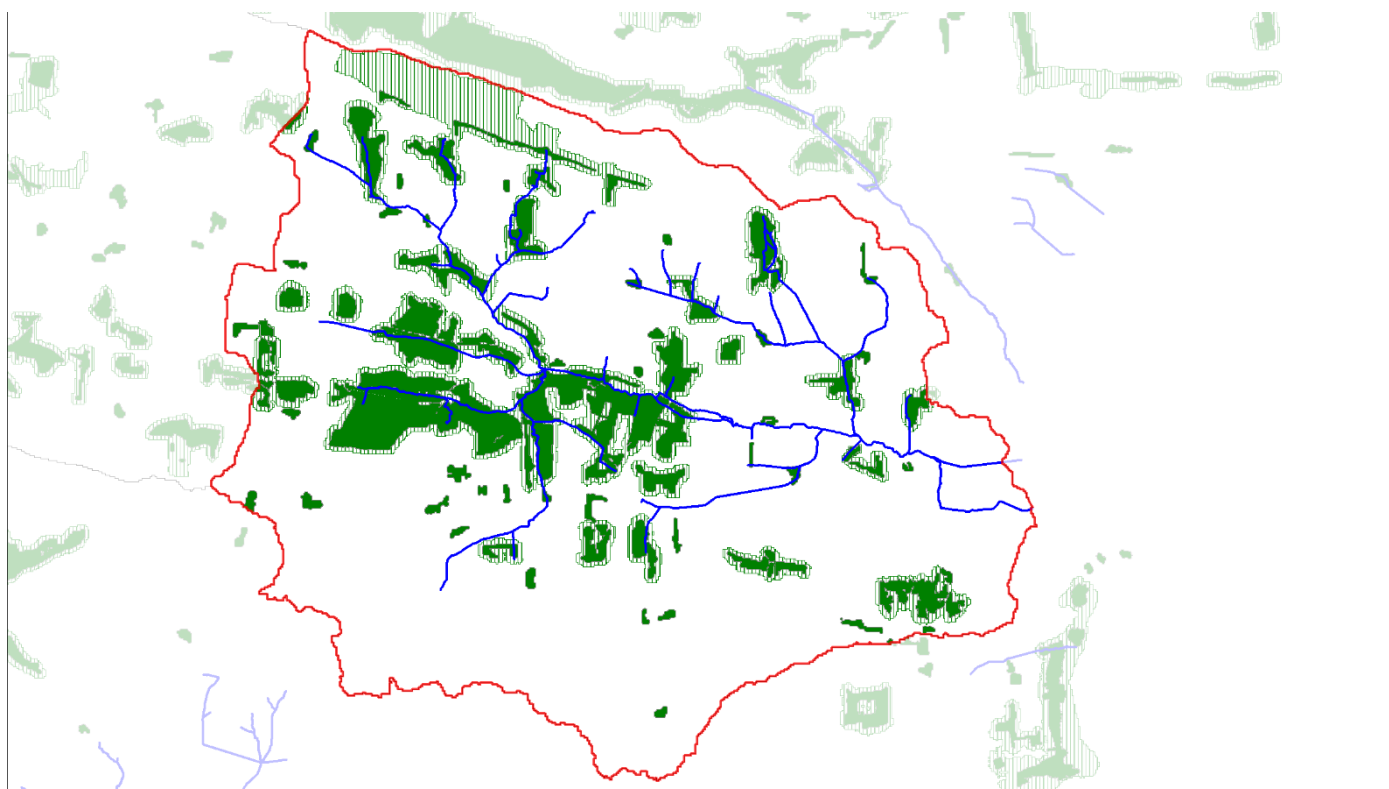


Map of the Swan Brook catchment grassland ecological network

Key





-  River
-  Catchment boundary
-  Grassland core (>1ha) and stepping stone (<1ha) sites
-  Grassland ecological network for a medium dispersal species

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Map of the Swan Brook catchment woodland ecological network

Key

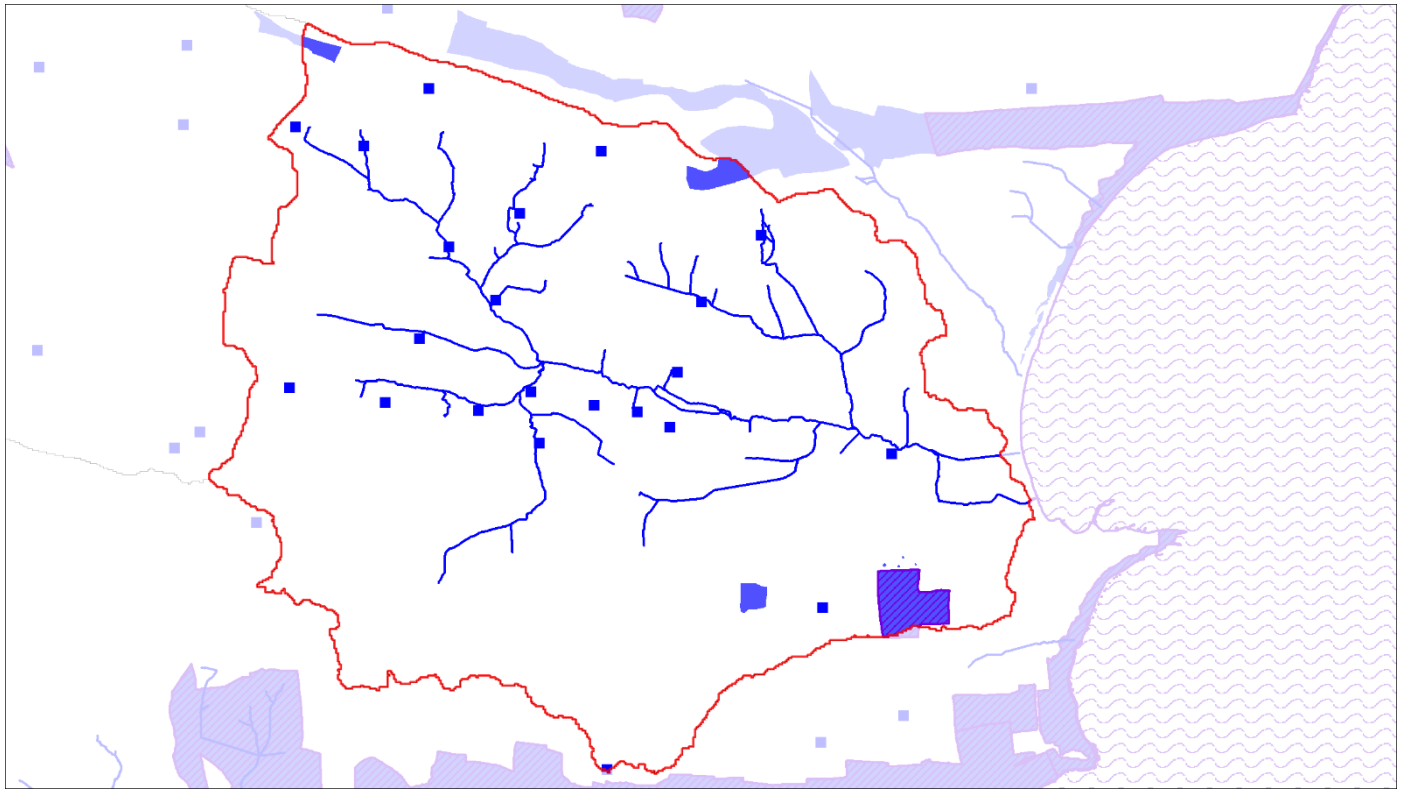
-  River
-  Catchment boundary
-  Woodland core (>1ha) and stepping stone (<1ha) sites
-  Woodland ecological network for a medium dispersal species

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Designations

There are parts of two Sites of Special Scientific Interest (SSSI) within the catchment, covering approximately 20ha. These are Belle View Quarry, Purbeck Ridge (East) and Townsend SSSIs. Townsend SSSI is part of the wider St Albans Head to Durlston Head Special Area of Conservation (SAC). There are 23 Sites of Nature Conservation Interest covering approximately 143ha.



Map of the Swan Brook catchment environmental designations

Key

-  River
-  Catchment boundary
-  Sites of Special Scientific Interest (national)
-  Special Area of Conservation (international)
-  Sites of Nature Conservation Interest – point (local)

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Issues & Impacts

Water Framework Directive assessment:

The Environment Agency classify waterbodies such as Swan Brook into categories that reflect their overall condition. These are **High** > **Good** > **Moderate** > **Poor** > **Bad**. The Swan Brook is categorised as **Poor**. The aim is to have waterbodies classed as Good, so the brook is currently considered to be a failing watercourse. It was also classified as Poor in 2015 and 2016 and Moderate in 2014.

The areas that the Environment Agency monitor to come up with their classification are summarised below. There is more detail behind these categories, which is available from the Catchment Data Explorer website¹.

Classification area		Condition assessment category
Overall		Poor
Ecological	Biological	Poor
	Hydromorphological	Supports Good
	Physico-chemical	Good
	Specific pollutants	No data
Chemical	Priority substances	Good
	Other pollutants	Does not require assessment
	Priority hazardous substances	Bad

The specific elements that are currently failing are:

- Macrophytes and Phytobenthos Combined (essentially plants and algae)
- Polybrominated diphenyl ethers (PBDE)
- Mercury and its compounds

The impacts on the biology of the river are reduced diversity and abundance of plants and algae, compared to what you would expect in a natural stream of similar characteristics. Little is currently known about the impacts of the hazardous substances on wildlife, and this an area of further work for the Environment Agency.

The Environment Agency have identified the following threats to the Swan Brook:

- Poor river morphology as a result of flood protection structures.
- More information is needed to understand the sources of PBDE and Mercury.

Local assessment:

To get a local perspective, we consulted other stakeholders about their views on the threats facing the River Bride, including Dorset Council, Wessex Water and the Environment Agency, amongst others. We did this in 2015 and updated it in 2021. The main issues are flooding, bathing water quality and rural runoff.

¹ <https://environment.data.gov.uk/catchment-planning/WaterBody/GB108044009920>



The combined areas of most concern, as identified by the Environment Agency and local stakeholders are:

1. Flooding
2. Channel morphology
3. Rural runoff issues



Action

Through our engagement with organisations and individuals over the winter of 2020, several potential opportunities were highlighted for the Swan catchment. These are highlighted below:

- Wessex Water are developing Drainage and Waste Water Management Plans² that set out how Wessex Water will enhance their assets and networks to ensure they continue to deliver for their customers and the environment in a sustainable and affordable way and in the face of future challenges such as population growth and climate change. Combined Sewage Overflows have discharged a number of times over the past three years, but not above a threshold where further action would take place.
- Litter Free Coast & Sea³ are working with agencies, businesses and local groups to engage with communities surrounding beach locations and find collaborative solutions that improve everyone's enjoyment of Dorset beaches. Currently this does not include Swanage Beach but may do in the future.
- There are funding options available to farmers to help them manage their land better for the water environment. New schemes will be starting in 2024 that will have a greater focus on managing for the water environment but up until then existing Countryside Stewardship schemes are open for new applications and extensions, along with opportunities outlined in the Agricultural Transition Plan⁴. Of particular interest / relevance are:
 - Farming in Protected Landscapes: a grant programme to help farmers deliver projects that benefit, nature, climate, people and place. It runs until March 2024⁵.
 - Woodland Creation Grants from the Forestry Commission. There are high priority areas for woodland planting along the fringes of the brook that address water quality⁶.
 - Catchment Sensitive Farming⁷

² <https://wessexwater.maps.arcgis.com/apps/MapSeries/index.html?appid=e371301c24ca4228b36db3a3a6ba8560>

³ <https://www.litterfreecoastandsea.co.uk/current-projects-and-campaigns/beach-profiles/>

⁴

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/954283/agricultural-transition-plan.pdf

⁵ <https://www.dorsetaonb.org.uk/resource/farming-in-protected-landscapes/>

⁶ <https://www.forestergis.com/Apps/MapBrowser/>

⁷ <https://www.gov.uk/guidance/catchment-sensitive-farming-reduce-agricultural-water-pollution>