



Biodiversity Action Plan 2021-2030 for Water Voles on the Manhood Peninsula





Water Vole habitat in Almodington, May 2022

Jane Reeve, BSc (Hons) MSc and Dr Jill Sutcliffe, BSc Hons Comb Sci; MSc PhD Funded by Portsmouth Water Biodiversity Fund

April 2023





Acknowledgements

The Manhood Wildlife and Heritage Group gratefully acknowledges the award of the Portsmouth Water Biodiversity Grant that has enabled MWHG to carry out this important work designed to aid the conservation of the water vole on the Manhood Peninsula, an updated version of that produced in 2011, covering the period 2011-2020.

We would also like to thank the partner organisations and the MWHG volunteers who have selflessly given of their time and effort to continue the water vole data collecting and practical habitat restoration.

Executive Summary

The Manhood Wildlife and Heritage Group recognises the important role that the endangered water vole has on the peninsula and the potential it has as a flagship species, whose numbers are threatened by the loss of good and extensive riparian habitat. The Manhood Peninsula is able to provide a network of waterways that make up extensive habitat for water voles and this area is now a stronghold for this declining species in West Sussex. However, there is still pressure on these waterways through lack of sympathetic management, development, and changes in land use.

Since 2015, the Fixing and Linking Our Wetlands (FLOW) project carried out a comprehensive assessment of waterways across the Manhood Peninsula and this has been used to target areas for improvement and to prioritise future work. Parishes were given important information in action plans on the ditch systems carrying surface water, water vole habitat and any flood risk reduction recommendations.

The format of this Action Plan covers the national approach and looks at why water voles are special, how they are protected on international, national, and local levels, the role that the MP plays in their conservation, an examination of the history of water vole conservation in the area, priority habitats and other species, communication and publicity and then a look at the future of water voles and pertinent threats.

Included in this action plan is a large appendix document on the creation, recovery, and management of water vole habitat that can be used as a standalone document by land-owners and managers.

Recommended future actions :

- To ensure the continuation of the mink control programme.
- The formation of a water vole forum where all agencies meet regularly.
- The employment of a Water Vole Project Officer to continue to shine a light on this important species and to drive forward habitat improvement and protection.
- To continue to attract and train an independent group of volunteers that are selfmotivated and confident to carry out a sustained programme of water vole surveys.
- To increase the profile of the water vole through education in schools, talks to parish councils, and interested groups, and through the press.
- To fill in data gaps about water quality of the waterways and standing water on the MP.
- Encourage enforcement and keep records on the damage to water vole habitat across the MP as well as other wildlife crimes.







| Section | Title | Page |
|---------|--|------|
| 1.0 | INTRODUCTION | 7 |
| 1.1 | Introduction to our Water Vole Biodiversity Action Plan | |
| 1.2 | The Water Vole Biodiversity Action Plan for the MP | |
| 1.2.1 | Who should be involved? | |
| 1.2.2 | The Manhood Peninsula Water Vole Biodiversity Action Plan aims | |
| 1.2.3 | It is also intended to set out | |
| 1.2.4 | Scope | |
| 1.2.5 | Actions | 8 |
| 1.2.6 | Water voles and biodiversity threats | 8 |
| 1.2.7 | Why should we care about water voles and biodiversity? | 9 |
| 2.0 | WATER VOLES | 11 |
| 2.1 | Priority species | 11 |
| 2.2 | Legal protection | 12 |
| 3.0 | A NATIONAL APPROACH | 13 |
| 3.1 | The Environment Act | 14 |
| 3.2 | International approach | 14 |
| 3.2.1 | UN Sustainable Development targets | 14 |
| 3.3 | Ramsar designation | 15 |
| 4.0 | A LOCAL APPROACH - THE MANHOOD PENINSULA | 16 |
| 4.1 | The area | 16 |
| 4.2 | Water Vole Distribution on the Manhood Peninsula | 17 |
| 4.3 | Water voles on the Manhood Peninsula | 17 |
| 4.4 | Water Vole distribution off the Manhood Peninsula | 18 |
| 4.5 | CDC strategic wildlife corridors and water vole habitat | 19 |
| 4.6 | Water Vole Conservation | 20 |
| 4.6.1 | Factors causing loss or decline | 20 |
| 4.6.2 | Good practice in conservation management for Water Vole | 21 |
| 4.7 | Conservation Actions to date on the MP | 21 |
| 4.7.1 | Mink Monitoring on the Manhood Peninsula | 22 |
| 4.7.1.1 | Mink rafts and monitoring | 22 |
| 4.7.1.2 | Funding mink monitoring | 23 |
| 4.8 | History of water vole conservation on the Manhood Peninsula | 23 |
| 4.8.1 | MWHG Water Vole Projects | 23 |
| 4.8.1.1 | Which waterways to prioritise management and protections | 25 |
| 5.0 | HABITATS AND SPECIES | 26 |
| 5.1 | National (UKBAP) Priority habitat on the MP | 26 |
| 5.1.1 | Features needed in rife and ditch habitat for species | 26 |





| Section | Title | Page |
|----------|---|------|
| 5.1.2 | Species supported by rifes and ditches | 27 |
| 5.1.2.1 | Mammals | 27 |
| 5.1.2.2 | Birds | 27 |
| 5.1.2.3 | Reptiles and amphibians | 27 |
| 5.1.2.4 | Fish | 27 |
| 5.1.2.5 | Invertebrates | 27 |
| 5.1.3 | Conservation | 27 |
| 5.1.4 | Factors causing loss or decline of priority habitat | 27 |
| 5.1.5 | Positive conservation management | 28 |
| 5.1.6 | Legal protection | 29 |
| 5.2 | Local Priority Habitats | 29 |
| 5.2.1 | Standing Water | 30 |
| 5.2.1.1 | Standing water features | 31 |
| 5. 2.1.2 | Standing water species | 31 |
| 5. 2.1.3 | Standing water conservation – factors causing loss or decline | 32 |
| 5. 2.1.4 | Good practice in conservation management | 32 |
| 5. 2.1.5 | Legal protection | 32 |
| 5. 2.1.6 | Key objectives for biodiversity in standing water | 33 |
| 5. 2.1.7 | Marking Progress | 33 |
| 5. 2.1.8 | Roles | 33 |
| 5. 2.1.9 | Voluntary groups and volunteers: | 34 |
| 5.2.1.10 | Actions taken | 34 |
| 5.2.1.11 | Proposed actions | 34 |
| 5.2.2 | Wetlands, including reedbeds | 35 |
| 5.2.2.1 | Priority habitats | 35 |
| 5.2.2.2 | Factors causing loss or decline of wetland habitats | 36 |
| 5.2.2.3 | Good practice in management of wetland habitats | 36 |
| 5.2.2.4 | Regular management helps reedbed habitat | 36 |
| 5.2.2.5 | Status | 36 |
| 5.2.2.6 | Legal protection | 36 |
| 5.2.3 | Waterways (flowing water), running water, rifes and ditches | 37 |
| 5.2.3.1 | Running water species | 37 |
| 5.2.3.2 | Human influence | 37 |
| 5.2.3.3 | Water quality | 38 |
| 5.2.3.4 | Running Water: Key objectives | 38 |
| 5.2.3.5 | Marking progress | 38 |
| 5.2.3.6 | Roles | 38 |
| 5.2.3.7 | Proposed actions | 39 |
| 5.2.3.8 | What is being done | 39 |







| Section | Title | Page |
|---------|---|------|
| 5.2.4 | Hedgerows | 40 |
| 5.2.4.1 | Conservation of hedgerows | 41 |
| 5.2.4.2 | Factors causing hedgerow loss or decline | 41 |
| 5.2.4.3 | Good practice | 41 |
| 5.2.5 | Other important habitats | 42 |
| 5.2.5.1 | Scrub | 42 |
| 5.2.5.2 | Wet woodland | 42 |
| 5.2.5.3 | Arable field margins | 42 |
| 5.2.5.4 | Mixed deciduous woodland | 42 |
| 5.2.5.5 | Open mosaic on previously developed land | 43 |
| 5.2.5.6 | Urban areas | 43 |
| 6.0 | COMMUNICATION AND PUBLICITY | 44 |
| 7.0 | THE FUTURE FOR WATER VOLES | 46 |
| 7.1 | The long-term future - water voles and beavers – the intrinsic link | 46 |
| 7.2 | Future threats | 47 |
| 7.2.1 | Change in protection | 47 |
| 7.2.2 | Delay in ELMs | 47 |
| 7.2.3 | Lack of enforcement | 48 |
| 7.2.4 | Future study or missing information | 48 |
| 8.0 | REFERENCES | 49 |
| | APPENDICES | |
| A.1 | Water Vole Habitat Management and Creation | |





| CDC | Chichester District Council | |
|---------|---|--|
| ELMs | Environmental Land Management scheme | |
| FWAG | Farming and Wildlife Advisory Group | |
| HBIC | Hampshire Biodiversity Information Centre | |
| LAPWING | South Chichester Farm Cluster | |
| LNRS | Local Nature Recovery Strategy | |
| LR | Landscape Recovery | |
| MAVES | Mid Arun Valley Environmental Survey | |
| MWHG | Manhood Wildlife and Heritage Group | |
| MP | Manhood Peninsula | |
| PTES | Peoples Trust for Endangered Species | |
| SDNP | South Downs National Park | |
| SFI | Sustainable Farming Incentive | |
| SxBRC | Sussex Biodiversity Records Centre | |
| WildCRU | Wildlife Conservation Research Unit | |
| WSCC | West Sussex County Council | |





1.0 Introduction

1.1 Introduction to our Water Vole Biodiversity Action Plan

The Manhood Peninsula is a special place for nature: flat, open, and criss-crossed by connecting wetlands with breeding water voles; hedgerows providing a home for farmland birds; salt marshes, vegetated shingle, and woodlands and grasslands all support biodiversity. Water voles are the fastest declining mammal in England and despite efforts to stop this freefall in their numbers with localised projects to bolster their populations, conserve their habitat and reintroduce them, nationally they are still disappearing.

The Manhood Peninsula has been a stronghold for water voles since 2000 when a WildCRU and FWAG project centred on Pagham Harbour Local Nature Reserve and the Bremere Rife, brought together landowners, reviewed farming practices, and bolstered the native population of water voles. This nationally recognised initiative and research is included in the *Water Vole Conservation Handbook*, editions 2 and 3, and is seen as the successful template for future water vole projects. However, ten and twenty years on, ensuring that the momentum is kept up on water vole conservation is the real challenge.

It's up to us to care for this special place with its wetland species and water voles. This is what our Biodiversity Action Plan is about.

1.2 The Water Vole Biodiversity Action Plan for the MP

A water vole biodiversity action plan for the Manhood Peninsula was first published in 2011 and dated to cover the period until 2020. Given the impact of the pandemic and the need to obtain requisite finance this was delayed and now covers 2020 to 2030. A steering group of those with knowledge of water voles was established to include Alex Ainge of MWHG; Gillian Branson; Jenna Dewhurst, Portsmouth Water Environment and Biodiversity Specialist; Sarah Hughes, CDC and Arun and Rother Rivers Trust; Pete Hughes, Chichester Harbour Conservancy ecologist; Dr Aliosn Barker, freshwater invertebrate expert; and Dr Jill Sutcliffe, MWHG.

This Biodiversity Action Plan looks to:

- build on what we have already achieved and the good practice being developed
- the future on how to achieve the best environment for water voles
- communicate to landowners with water voles on their land
- reflect the changes in national policies and guidance

1.2.1 Who should be involved?

Natural England, Environment Agency, Chichester Harbour Conservancy, RSPB who manage Pagham Harbour and Medmerry, WSCC, CDC, Parish Councils, Hampshire and Isle of Wight Wildlife Trust who manage the national mapping project, PTES, Water Companies, other public bodies, statutory agencies, schools and colleges, voluntary and private sector organisations, farmers, land managers, community groups, and individuals, all should be involved.

The intention is that all these organisations and groups, as well as individuals, will find the Water Vole Biodiversity Action Plan useful in informing what they do and how they can contribute to safeguarding our important population on the MP.





1.2.2 The Manhood Peninsula Water Vole Biodiversity Action Plan aims

- Provide a sound basis and framework for local action to conserve, protect and enhance the water vole population within the Manhood Peninsula and the wider area.
- Help the community on the MP to become more aware of water voles and their habitat and of the need to conserve them.
- Produce a more detailed understanding of water voles and their habitat needs.
- Develop opportunities for active participation in water vole conservation action by all members of the community.

1.2.3 It is also intended to set out

- Good practice in the conservation of water voles for local landowners, tenants, managers, and developers, including public bodies
- Update changes and understand the Implications of legislation, planning guidance and government policy for the conservation of water voles in the local area
- Information on the duty of public bodies to have regard to water vole conservation when carrying out their functions.

1.2.4 Scope

The water vole BAP covers the problems and threats caused to water voles by:

- habitat loss or damage as a result of new development
- habitat decline or loss through lack of appropriate management
- habitat fragmentation and a lack of connectivity
- invasive non-native species damaging habitats and species
- changing climate and weather extremes

1.2.5 Actions

The Water Vole Biodiversity Action Plan includes actions agreed as necessary. In some cases, these will already be underway; some will be in the planning stages; some will be the subject of bids for funding; and some will be markers for future action when resources are available and the conditions are right.



1.2.6 Water voles and biodiversity threats

Our natural environment and the variety of its plants, birds and animals is something that we take for granted. We know that if we go to the right places, we can experience this diversity of wildlife, sometimes in large numbers. However, biodiversity is under threat with the numbers of many species having declined significantly.



© Terry Whittaker





Habitat loss as a result of more intensive agriculture and increasing demands for housing and business; inappropriate management; environmental pollution; and pressure from nonnative species; all play a part. To this we now add the changes in our climate and more extremes of weather.

1.2.7 Why should we care about water voles and biodiversity?

We have a moral obligation to hand on to the next generation an environment as rich as we inherited, and one that benefits the diversity of wildlife species we share it with.

We derive many direct benefits from our environment and nature: air to breathe, food, water, materials, and air quality; and it helps to prevent floods and reduce climate change. Our mental and physical health also improve with access to nature, as it provides recreation and interest, and benefits tourism and the economy.

The loss of biodiversity affects the ability of natural systems to adapt to change and reduces the resources available for us. The pressures on our environment are likely to continue with population increase and we need to manage our natural environment in sustainable ways for the long-term survival.



Water vole numbers nationally have declined dramatically over the last 20 years despite a number of high-profile reintroduction and conservation projects. The most recent population estimates put water numbers at approximately 132,000 nationwide (Mammal Society Red List of British Mammals (2020) or 130,000 – 77,000 left across the country (Gow, D, 2022).

The National Water Vole Database and Mapping Project (NWVDMP) run by the Hampshire & Isle of Wight Wildlife Trust (HIWWT) is the only project of its kind in the UK. It brings together and maps water vole and mink data, and therefore can inform conservation efforts for water voles. The adjacent map shows the water vole regional key area covering the MP has increased in size in England compared to the majority which have decreased.





The map below shows the water vole presence on the MP and that it is a significant population on the south coast where data gathered points to a shrink in range size.







2.0 Water Voles

Water Vole, *Arvicola amphibius*, 'Ratty' in Wind in the Willows is a water vole! Despite that name, they are not rats and suffer from much unfair persecution when mistaken as such. Once common and widespread, this species has suffered a significant decline in numbers and distribution. The water vole is the largest of the British voles with a head and body measuring around 20 cm. Found in and along our waterways, it has a blunt nose, small fluffy ears, and furry tail. It is the rarest English mammal.

Water voles inhabit the banks of slow-flowing rivers, streams, and ditches as well as still water such as lakes, ponds, and ditches. They need silt-shored banks for burrowing or slow-moving and relatively deep-water courses.

Their presence can be determined by searching for their burrows at and above water level, together with footprints, characteristic piles of droppings (latrines) and feeding remains. Water voles do not hibernate but remain in their burrows for much of the winter with a food store.

Water voles need suitable habitat in close proximity to allow populations to expand and recolonise areas. They also need areas to retreat to in the event of flooding.

Unfortunately, the American Mink has moved into many areas nationally , increasing the threat to remaining populations.

As the lower reaches of rivers become unsuitable for habitation, the distribution of water voles becomes discontinuous and existing sites become isolated and vulnerable. Information on the conservation of water voles, their distribution, conservation, and proposed actions can be found via the links below.

Peoples Trust Endangered Species <u>https://ptes.org/get-informed/facts-figures/water-vole/</u>

The Mammal Society - <u>https://</u> www.mammal.org.uk/species-hub/fullspecies-hub/discover-mammals/species -water-vole/

National mapping scheme, Hants Wildlife Trust <u>https://www.wildlifetrusts.org/</u> national-water-vole-database-mapping-



2.1 Priority species

Water vole, *Arvicola amphibious*, is a Priority Species in the UK Biodiversity Action Plan 2007 (UK BAP). It remains a Section 41 species of principal importance under NERC Act (2006). As such it is a Biodiversity 2020 priority species (DEFRA document – Biodiversity 2020 - A strategy for England's wildlife and ecosystem services). It is identified as endangered in the Red List for mammals (Mathews F & Harrower C, 2020)

It is a local priority species owing to its national status, its general decline, and the potential for conservation.





2.2 Legal protection

Water vole legal protection is covered by the Office of Environmental Protection, created in November 2021 under the Environment Act 2021. Its mission is to protect and improve the environment by holding government and other public authorities to account. Water voles are fully protected under Schedule 5 of the Wildlife & Countryside Act 1981.

It is an offence whether on purpose or by not taking enough care to:

- capture, kill or injure a water vole
- damage, destroy or block access to their places of shelter or protection
- disturb them in a place of shelter or protection
- possess, sell, control or transport live or dead water voles or parts of them.

Water voles also have the same protection as other mammals from deliberate cruelty under the Wild Mammals Protection Act.

The water vole is a Section 41 species of principal importance for conservation and as such need to be taken into consideration by any public body in managing their estate (NERC Act (2006).



Fishbourne meadows water vole habitat





3.0 A National Approach

New approaches place greater emphasis on reversing the decline and loss of wildlife species through a focus on improving their habitats and the specific features they need. Integrating needs of priority species into habitat management (2010), Natural England

The value of the natural environment is increasingly recognised for the many direct economic, health and social benefits we obtain. <u>The UK National Ecosystem Assessment, 2011</u>, analyses the natural environment's value.

This was reinforced in the <u>Dasgupta Review (2021)</u> on 'The Economics of Biodiversity' and the introduction of a 'Natural Capital' approach. This considers the value of the natural environment for the economy and the wellbeing of everyone in policy and decision making. [ENCA.gov link]

It also recognises that nature is highly fragmented and unable to respond well to new pressures. There is a requirement to shift to a more integrated and larger scale approach to conservation with prime wildlife sites needing to be, in better, condition and more joined-up for nature. Sir John Lawton Report, <u>Making Space for Nature (2010</u>) This is reflected in the concept of a Nature Recovery Network put forward in the Government's 25 Year Environmental Plan 2018.

Natural England published guidance in 2020 on the design of Nature Networks and they include:

- Nature Recovery Network. A key action in the Government's 25 Year Environmental Plan (2018) is establishing a Nature Recovery Network. This is to protect and restore wildlife, as well as providing greater public enjoyment of the countryside; increased carbon capture; and improvements in water quality and flood management.
- Nature Networks. Natural England published guidance in March 2020 on the design of nature networks and evidence for their implementation. Priority actions include
- improve core wildlife sites
- increase the size of core sites
- increase the number of core sites
- improve 'permeability' of the surrounding landscape for movement of wildlife
- create corridors of connecting habitat.
- 3) **Network Enhancement Zones** identify land that may be suitable for (1) habitat re -creation of the nearby habitat or for (2) the creation of other types of habitat, enhancement of land management and suitable green infrastructure where habitat re -creation is not possible.
- Network Expansion Zones identify land close to Network Enhancement Zones that is more likely to be suitable for particular habitat creation and where possible locations for connecting and linking up networks across a landscape may be identified.
- 3) **Fragmentation Action Zones.** The mapping also identifies land immediately adjoining existing habitat patches where habitat creation is likely to help reduce the effects of habitat fragmentation.





3.1 The Environment Act

The Environment Act 2021, overseen by the newly formed Office of Environmental Protection, requires local planning authorities to take into account Local Nature Recovery Strategies (LNRS) and the requirement for all new development to demonstrate Biodiversity Net Gain, BNG, of 10% of key habitat using an NE metric. It will be mandatory from Sept 2023.

The Environment Act now strengthens the duty, under the NERC Act 2006, for public authorities to have regard for the conservation of biodiversity.

It makes explicit the requirement for public authorities to assess how they can take action to conserve and enhance biodiversity, and then take these actions. In addition, it includes an important target to reverse the decline in species abundance by the end of 2030.

The LNRS is part of Defra's ELMs (Environmental Land Management scheme), along with SFI (Sustainable Farming Incentive) and LR (Landscape Recovery). It is in an early stage of development, and it will be 2024 before it is available

These schemes are intended to support the rural economy while achieving the goals of the <u>25 Year Environment Plan</u> and a commitment to net zero emissions by 2050.

Through these schemes, farmers and other land managers may enter into agreements to be paid for delivering the following:

- clean and plentiful water
- clean air
- thriving plants and wildlife
- protection from environmental hazards
- adaptation to climate change
- beauty, heritage, and engagement with the environment

3.2.1 UN Sustainable Development targets

In September 2015, the General Assembly adopted the 2030 Agenda for Sustainable Development that includes 17 Sustainable Development Goals (SDGs). Building on the principle of "leaving no one behind", the new Agenda emphasizes a holistic approach to achieving sustainable development for all. Three of the goals have sections that are relevant to the MP:

Goal 13: Climate Action:

• Strengthen resilience & adaptive capacity to climate-related hazards and natural disasters.

Goal 14: Life Below Water:

• By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

Goal 15: Life on Land:

♦ By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.





- Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
- By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species
- By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

3.2.2 Ramsar designation

On the MP there are two internationally protected sites – Pagham Harbours Nature Reserve and Chichester Harbour. These have been included as wetlands of international importance that have been designated under the criteria of the Ramsar convention for Wetlands for containing representative, rare, or unique wetland types or for their importance in conserving biological diversity. This adds to the legal protection of these habitats and therefore covers the species, such as the water vole, that live within them.



Long Pool, Pagham Harbour, a RAMSAR site





4.0 A Local Approach - The Manhood Peninsula

4.1 The area

Within an area roughly eight miles from north to south and 6 miles from east to west, the richness of the biodiversity of the peninsula is dependent on the area's range of habitats. These result from small differences in soils, land management and water from the South Downs.

The land on the peninsula has grade A1 soil, despite being heavy clay, and is therefore intensely farmed for valuable arable crops. The high light intensity levels and warm temperatures also make the area attractive for salad growers and there is a large footprint of commercial glasshouses. Across this landscape the fields are edged with hedgerows and drainage ditches that link with farm ponds, village ponds, canal, and small reedbed areas within the protected areas of Chichester Harbour, Medmerry and Pagham Harbour.



The drainage ditches run into larger channels, locally called rifes, and these remain wet year-round when the ditches dry out during long periods of hot dry weather in the summer months. There are 3 small areas of ancient woodland left on the peninsula: Hunston Copse, Keynor Copse, Church Norton Copse. Other small patches of deciduous woodland are found across the peninsula on farmland and are often used by landowners for game bird rearing and shooting.





The arable farms in stewardship plant wildflower margins for bird food and as cover crops, and there are some areas of grassland left for overwintering wildfowl adjacent to Chichester Harbour.

Species rich hedgerows are common across the area, and many also have a drainage ditch associated with them adding biodiversity and habitat value.



4.2 Water Vole Distribution on the Manhood Peninsula

Within the 11 parishes that make up the peninsula area there are up to date water vole records. They have been found consistently over the last few years, in the larger ditches, rifes, canals, and gently managed farm ponds.

There is a presumption by CDC that all waterways on the peninsula contain water voles and therefore any planning application near a ditch or waterway must include a water vole survey and a review of historic water vole data.

4.3 Water voles on the Manhood Peninsula

Water voles (*Arvicola Amphibius*) are extremely vulnerable to mink predation and their numbers across the UK have dropped dramatically over the last 30 years, in part to poor habitat management but also due to the rise in the mink population.





The water vole population of the MP has persisted in the linked-up rifes, ditches, ponds, canal and reedbeds that make up a wetland habitat across the area. Their ability to move about has been the key to their success but it is only by removing mink that their survival can be assured. The MP water vole population is regarded as a nationally important population and it has persisted due to the connected nature of the habitat and the commitment to mink monitoring. Successful water vole conservation is dependent on good and joined up habitat management and long-term mink control.

The map below has been created using data from surveys by the MWHG and information gained from many sources held by the Sussex Biodiversity Records Centre (SxBRC). Where there are gaps in the landscape there may be water voles present but no survey records have been submitted.

The map also shows where water voles surveys have been carried out but no signs found as these may be future areas to target for improvement or to analyse the habitat to understand why.



Map of the main areas for water voles on the peninsula and to the east and west.

4.4 Water Vole distribution off the Manhood Peninsula

It is essential for the long-term survival and health of the MP water vole population that there are good corridors out of the area with genetic mixing with neighbouring colonies. The insert maps above show information gained from the Sussex Biodiversity Records Centre (SxBRC) and Mid Arun Valley Environmental Survey (MAVES) on water vole distribution to the immediate east and west of the MP.





There is a lack of information about water vole presence between Tangmere, Fontwell, Barnham, and Walberton, while there are many water vole records for the Arun and Rother river catchments.

Further north and east, including the South Downs National Park (SDNP), with information from the SxBRC, Peoples Trust for Endangered Species (PTES), Mammal Society and Chichester District Council (CDC) water vole colonies are evident on the south-east coast, however, there appear to be concerning large gaps between these populations.

To the west in Hampshire, records were gained from the Hampshire Biodiversity Information Centre (HBIC), and the Hampshire and Isle of Wight Wildlife Trust, and individual colonies are recorded around Bishops Waltham, Thorney Island, the Alver valley, and the River Meon.

There was a large water vole reintroduction project by the SDNP into the River Meon in 2013, that saw 2,548 water voles released within the Meon Valley, including two areas of land owned by the Wildlife Trust: St Clair's Meadow near Soberton, and Upper Titchfield Haven near Fareham. The latest surveys show that water voles are now established on the river and doing well.



Bremere Rife, Hunston

4.5 CDC strategic wildlife corridors and water vole habitat

Long-term water vole population survival is reliant on good connections between colonies and their ability to move through the landscape to respond to environmental changes.

In the Chichester area it is important that the MP water vole population has a route off the peninsula and into the wider area to link up with colonies to the east and west, to the north and the South Downs National Park. It is hoped this will be aided by the Chichester District Council Plan's proposed strategic wildlife corridors that could be included in the next Local Plan. These corridors travel north to south and are made up of waterways, hedgerows, copses, and wide field margins.

The map overleaf shows the current (March 2023) proposed 7 strategic wildlife corridors linking Chichester Harbour with the South Downs National Park. These include:

- The River Ems through Westbourne
- Nutbourne marshes and up through Hambrook
- Bosham to West Ashling along the Bosham chalk stream
- Fishbourne to Lavant
- South Mundham and Pagham Harbour with the SDNP at Goodwood and Crockerhill along the Aldingbourne Rife





Map of the proposed CDC Strategic Wildlife Corridors for the area to the east and west of Chichester (hashed in green).



4.6 Water Vole Conservation

There is potential through local conservation measures to increase the numbers and distribution of water voles on the MP.

4.6.1 Factors causing loss or decline

- Loss of suitable bank-side habitats: as a result of engineering, bank-side development or over-zealous vegetation clearance, or lack of management.
- Population fragmentation: water vole populations are being isolated by new roads, canalisation, development, and loss of habitat.
- Water level fluctuations: water voles need slow changes in water level or refuge areas to retreat to when water levels rise quickly.

Canalisation adjacent to Fishbourne meadow









- Predation: the spread of non-native mink throughout the UK has significantly increased the severe decline in water vole numbers.
- Water quality: contamination of water by pesticides, heavy metals, slurry, and sewage may have contributed to the decline.
- Poisoning: indirect poisoning of water voles by brown rat poison.
- Invasive plant species dominating the floral diversity of the banks.

4.6.2 Good practice in conservation management for Water Vole

- Ensuring that water quality is maintained or improved
- Maintaining and enhancing bank and vegetation structure
- Providing slow-moving but relatively deep-water course
- Ensuring that there are areas for water vole to retreat to in the event of flooding and that water levels do not rise too quickly
- Avoiding disturbance
- Controlling the presence and numbers of Mink
- Creating new water vole habitat near existing populations to allow populations to expand and colonise areas
- Creating and maintaining a buffer zone along the water course not less than 10 metres and not less than 50 metres around the colony.

4.7 Conservation Actions to date on the MP

4.7.1 Mink Monitoring on the Manhood Peninsula

The MWHG have been responsible for mink monitoring and removal on the peninsula for 10 years, since 2013. There have been 2 appearances by individual mink in the area and in January 2023 a mink was caught and dispatched on the Pagham Rife. Continual vigilance and monitoring is needed to keep them off the MP as they are present in the wider area on the Arun and Rother. However, across West Sussex there is no cohesive mink removal strategy and the map below shows records for the area. Mink presence represents a real threat to the long-term survival of water voles.



Mink Monitoring raft on Broad Rife in Earnley







4.7.1.1 Mink rafts and monitoring

Mink rafts designed by Game & Wildlife Conservation Trust (GWCT) have been placed across the MP in ditches, rifes, reedbeds, the canal and lakes where historically there have been mink sightings and successful captures. Information is sought from fishermen and other interest groups about whether mink have been spotted, evidence of dead wildfowl seen or any unexpected fish deaths. Volunteers trained and supervised by a member of the Manhood Wildlife and Heritage Group (MWHG) Heritage Lottery Funded (HLF) Fixing and Linking Our Wetlands (FLOW) team now monitor the rafts across the area including the protected areas of Pagham Harbour, Chichester Harbour Conservancy and the new Medmerry site, to ensure complete coverage.

The rafts are placed in waterways and hold a clay pad that captures the tracks of animals that explore them. It is with experience and skill that these are interpreted and it can be a good way of finding out if not only mink are in the area, but water voles too. When mink are detected, a trap can be placed on the raft and it is monitored with frequent checks. If a mink is captured, then an expert removes the cage and the mink is quickly dispatched.

The location of the rafts is key and is helped by the shape of the MP. Locations are based on historic records of previous mink presence, easy access to the site with landowner permission, and the suitability of the bank for regular checking. The rafts have been placed on the main waterways and larger water bodies across the MP and these are checked weekly or fortnightly according to the GWCT recommendations.





4.7.1.2 Funding mink monitoring

In April 2016 with the withdrawal of funding from other sources, the MWHG took on the mink monitoring across the area and new sponsors were sought to support this important work:

- The RSPB
- Vitacress, a leading herb and salad grower from Runcton
- Barfoots a large grower from Pagham

We are extremely grateful to these organisations for committing to biodiversity improvement through mink monitoring and removal, helping to ensure that water voles continue to live on the MP. It is also with the kind permission of the landowners that allow continued access to the rafts on their land, that this work can be carried out.

An independent review of mink monitoring between 2017 and 2021 by the MWHG FLOW project was carried out to assess the value of the effectiveness and value going forward, Gray, N. 2021). It was concluded that this activity is extremely valuable for monitoring the presence of any mink and also as a tool for engaging volunteers and highlighting conservation of water voles.

4.8 History of water vole conservation on the Manhood Peninsula

- **1989 1990**, the MP was not included in The Vincent Trust baseline survey of the national water vole population it can be assumed that at the time there was a population of wild water voles and that they were spread across the area.
- 2000, the Chichester Coastal Plain Sustainable Farming Partnership was formed between WildCRU (Oxford), Sussex FWAG, Sussex Wildlife Trust, Environment Agency, and West Sussex County Council to work directly with the farming community and focus on restoring biodiversity to farmland. A farmers' pack, Farming and Wildlife, was developed as a practical guide to monitoring and enhancing biodiversity of water courses, ditches, and wetlands. It was distributed to landowners across the peninsula. The pack includes a topic on how to monitor water voles, and recommendations about what best practice such management involves. A small reintroduction of 20 individual water voles into Bremere Rife took place as part of this project. (Strachan and Holmes-Ling 2003)

4.8.1 MWHG Water Vole Projects

MWHG has carried out 3 water vole focussed projects over the last 11 years looking to improve habitat, connectivity, and the focus of landowners, land managers, and the various conservation bodies in the protected areas of the MP to the plight of water voles and the role they could play in ensuring its survival.

Water vole trapping at Medmerry as part of the monitoring after the installation of compensatory water vole habitat







Action Plan for Water

Voles on the Manhood Peninsula, West Sussex, 2011-2020



2010 – 2011 BAP for water voles on the MP

Biodiversity Action Plan for Water Voles on the Manhood Peninsula funded by the Big Lottery Fund.

- Written to highlight the nationally important population of water voles in the area.
- A plan to focus conservation efforts and for future grant applications.
- The analysis highlighted that a number of targets needed more work.

HLF Water Vole Project

Manhood Peninsula, West Sussex, 2012 - 2015



2012 – 2015 HLF Water Vole Project

3-year project to carry out many of the actions suggested in the Action plan

- · Worked with volunteers to recover many sites
- Programme of water vole training and surveying
- Education programme in schools
- Adult education through presentations to parish councils, partnership groups and community groups
- Supporting scientific research
- Mink monitoring





Manhood Wildlife and Heritage Group



Jame Renne and Christopher Diske Antonial Weilik and Herlinge Chrosp Hersenker 2020



2015 - 2021 HLF FLOW project

6-year project to continue the habitat improvement work and information gathering

- Comprehensive ditch surveys across the area (= 300km+)
- Additional hedge surveys (= 30km+)
- Parish management plans written for future improvement work
- Multiple wetland improvements carried out in each parish (51 sites = 55000m²
- Water vole colonisation of new / recovered sites within two years = 25%, and within 3 years = 50%
- Supported parish councils with flood risk reduction





4.8.1.1 Which waterways to prioritise for management and protections

As part of the FLOW project plans for each parish were developed to show parish councils and landowners which waterways and areas were important for habitat recovery, as well as flood risk reduction. These ranged from pond management, junction pond creation, to reconnecting ditches and pollution mitigation.

Taking a holistic view, the sites that have the most value for water voles will be those that stay wettest for the longest, ideally year-round, have good connectivity to other sites, and are managed sympathetically. The rifes across the area carry the water from the drainage ditches out to sea and they have to have holding capacity to tank water during high tide. Therefore, these are significant water ways and do stay wet. Most are currently not botanically diverse or managed as valuable habitat. The water they carry is nutrient rich and the floristic range small with bramble, nettle, and Hemlock water dropwort dominating the banks.

Farm and village ponds can be extremely valuable areas for water voles as they often stay wet year-round as they are spring fed. The management of these water bodies can be quite haphazard with over management of village ponds where the amenity value and the visual neatness is prioritised over habitat and species. There then the farm ponds that are not managed at all and have become overgrown with bramble and willow and which over time revert to dark wet willow carr with its suitability for water voles lost.

If the rifes, ditches and ponds could be managed as water vole habitat in a cohesive plan that all landowners and managers agree to, the MP would be able to offer a secure long-term home to water voles.



Hemlock Water Dropwort, Earnley





5.0 Habitats and Species

5.1 The national (UKBAP) river priority habitat on the MP

There are 56 habitats of Principal Importance listed in Section 41 of the NERC Act. These are the habitats in England identified in the UK Biodiversity Action Plan which continue to be priorities in the UK Post 2010 Biodiversity Framework; and there are 943 Species of Principal Importance. Local Authorities and public bodies have a DUTY to conserve biodiversity.

Rifes and ditches compose the riverine habitat on the MP with priority species dependent on habitat quality. The EA identify rifes as main river, managing them accordingly, and they fall under this priority habitat category with:

- at least one priority species strongly dependent; or
- six priority species less dependent on habitat quality

5.1.1 Features needed in rife and ditch habitat for species

Species associated with rifes and ditches include aquatic species occurring in the water course itself (for example fish, riverfly larvae), and terrestrial species on the exposed sediments and on the banks using the water for feeding.

Banks and exposed sediments such as shingle beds, mud and sand bars are important for a range of invertebrates, as well as certain mammals and birds, e.g., Water Vole and Kingfisher.

Marginal and bank-side vegetation has an integral/important role in supporting wildlife in rivers and streams. It provides overhead cover, shelter, shaded conditions, and invertebrate food for aquatic species including for example fish like Brown Trout. It also helps maintain the structure of the banks and reduces erosion and acts as a wildlife corridor and a habitat in its own right.

Some migratory fish species such as Eel need water systems that are unobstructed and contain varied habitat niches, such as backwaters, gravel beds, riffles, and pools for spawning. As would be expected, aquatic species require good water quality, easy movement, and exposed sediments. They also need abundant food whether from plant material or invertebrate or other prey.

Some species require coarse woody debris to provide shelter and food and suitable conditions for larval development, spawning etc. A lack of links/connectivity with other habitats limits the possible range of species.

Certain pollution sensitive aquatic insects, often living on the bottom of the stream, serve as indicators of good water quality, affected by nutrient enrichment, siltation, and toxic pollution. They include mayfly and stonefly nymphs, and caddisfly larvae.







5.1.2 Species supported by rifes and ditches

Many invertebrates, fish, mammals, and birds are associated with running water, including national priority species.

5.1.2.1 Mammals

Mammals supported by rivers and stream habitat include Otter, Water Vole, Water Shrew.

Bats such as Daubentons, Noctule, and Soprano Pipistrelle feed over the water surface.

5.1.2.2 Birds

Running water habitat supports a range of birds feeding on flies and other invertebrates, and fish. It is particularly notable for: Kingfisher, Reed bunting, Grey wagtail, Common Sandpiper and Goosander.

5.1.2.3 Reptiles and amphibians

Running water habitat supports Grass Snake and, where slowly moving, amphibians. 5.1.2.4 Fish

Eel, Chub, Barbel, Perch, Dace, Roach, and Pike have been recorded in the waterways of rifes. Minnow and Stickleback are also found. 5.1.2.5 Invertebrates

Mayfly, stonefly, caddisfly, dragonfly, damselfly including Banded Demoiselle, important species for both the food chain and the indicators of good water quality.



5.1.3 Conservation

Although the water quality and conditions of our rivers and streams has improved due to legislation, changes in industrial practice, direct conservation action and public awareness raising, more can be done.

5.1.4 Factors causing loss or decline of priority habitat

- River channel modification, causing siltation and damage to the riverbed; excessive abstraction resulting in reduced flows
- Impact of water runoff from upland moors causing flooding and consequential bank erosion, silting and damage to ecosystem
- Land drainage, flood defence works and development close to the river corridor not taking account of ecological issues
- Overgrazing along riverbanks and reduction in bank-side vegetation damaging the habitat for wildlife as well as causing erosion.
- Conifer planting may create 'dead' areas in streams due to loss of light
- Reduced water quality, changes in acidity and excess nutrients from agricultural runoff, industrial discharges, and other pollution.
- Structures within the river and its banks, such as weirs, hindering movement of fish and other species.
- Biological stress caused by over stocking with fish or by non-native invasive species such as Signal Crayfish.





5.1.5 Positive conservation management

Rivers, streams and running water are best sustained for wildlife by:

- Maintaining and restoring natural habitat features including riverbeds.
- Retaining and improving bank side cover, fenced off from grazing, but periodically opening up to allow intermittent vegetation removal or controlled grazing to prevent domination by brambles or colonisation by shading willow.
- Maintaining water flow, preventing siltation, promoting aeration.
- Taking steps to moderate the impact of extreme weather, damaging flooding and droughts in river catchments.
- Improving connectivity with and within the flood plain.
- Having buffer zones to prevent farm nutrient and other runoff.
- Enabling fish migration by removing barriers, or installing fish passes.
- Controlling invasive species in the water course and on the bank.



Bremere Rife, Sidlesham





5.1.6 Legal protection

The Water Framework Directive, still relevant post Brexit, sets standards and targets to protect, improve and promote the sustainable use of water through a system of integrated water management.

Landowners with land adjoining a water course have responsibilities set out in Environment Agency guidance. <u>Liv-ing on the Edge</u>

Water courses are also protected by inclusion in designated sites.

Certain species are protected under the Wildlife and Countryside Act 1981.

Links for further information:

- Freshwater Habitats Trust
- <u>Freshwater invertebrates Buglife</u>

5.2 Local Priority Habitats

For water vole conservation on the MP a mosaic of wetland habitats are vitally important. A number of these habitats have been identified as requiring protection, restoration, and positive conservation management. These priority habitats have special characteristics that support wildlife and water voles: they have distinctive plant communities and provide food supplies, shelter and sites for nesting and roosting for a range of wildlife species including water voles.

Different habitats support very different communities of plants and animals. Their differences stem from the underlying rocks and soils, the prevailing climate and how wet and cold it tends to be, the interactions between plants and animals, and not least the interventions of humans. The local priority habitats are in the main the same as those identified nationally as threatened and requiring conservation action. Other habitat features for example scrub, field edges, ditches, and road verges are also important by adding diversity.

The best priority habitat sites should be protected and conserved, others should be retained if viable and their value for wildlife improved. As well as having objectives for priority habitat site an overall objective should be to secure the connection of priority habitat sites in a network through the landscape which allows wildlife to move and to thrive.

The main priority habitats for water voles identified on the MP are:

- Standing water (ponds)
- Wetlands, including reedbeds
- Waterways (flowing water)
- Hedgerows
- Other important habitats (Scrub, Wet Woodland, Arable Field Margins, Mixed Deciduous Woodland, Parkland, and Wood Pasture)











Haydons pond, Earnley

5.2.1 Standing water

This local priority habitat includes all standing water that is capable of supporting biodiversity and populations of key species. It includes ponds and both nutrient poor and rich water bodies. Standing open water is a broad UK BAP habitat category including Ponds and other larger national priority habitats such as canals.

The Peninsula's series of wetlands and their open standing water supports important assemblages of species - breeding, migrant and wintering birds, scarce plants, and insects. Standing water on the MP ranges from Chichester canal to small lakes and ponds, drainage ditches and rifes, to areas of open water within flooded wetlands.

Many standing water bodies remain from previous landscapes and water usage, including mill ponds, farm ponds, flooded pits, drainage ditches, farm reservoirs for supplying water, and Chichester canal. These provide many of the richest areas for wildlife.

Two thirds of all freshwater species are supported by standing water, including amphibians, dragonflies, and many other aquatic insects. Bottom-dwelling invertebrates such as snails, dragonfly larvae and water beetles are often abundant and some sites may support fish including Eel.

Amphibians including the protected Great Crested Newt can be present and Grass Snake is sometimes seen swimming across larger ponds.

Regionally scarce plants may be found in some standing water habitats, as well as Marsh Marigold, Yellow Flag, Bogbean and Water mint.

Mammals such as Water Vole and Water Shrew use standing water and Daubenton's, Noctule and Soprano Pipistrelle Bats are all found feeding on insects on or above standing water.

Standing open water also provides feeding areas for wildfowl like Mallard, Teal, Coot, Moorhen, Tufted Duck, Pochard and Goosander. In the winter, visitors, and more migrants such as Brent geese occur.

Ponds as a National Priority Habitat have higher conditions than the local priority habitat. It consists of ponds, ditches, canals, and other standing water, less than 2ha in size, supporting:

- species of high conservation importance
- exceptional populations or numbers of key species amphibian, dragon or damselfly
- exceptionally rich sites for wetland plants (≥30 species) or aquatic invertebrates (≥50 species).





5.2.1.1 Standing water features

- Species associated with standing water include aquatic species occurring in the water body itself such as fish and insect larvae.
- Terrestrial species use exposed sediments or use the water body for foraging for food for example Water Vole, Heron, and various duck species. Standing water also supports species like bats that, although their use of standing water for foraging, they are not necessarily reliant on them.
- A key feature of standing water is to provide the environment for breeding and the early stages of development of some species for example: amphibians, and dragonfly and damselfly species.
- The loss of farmland ponds due to agricultural intensification is largely the reason for the decline in numbers of Great Crested Newt and its designation as a European Protected Species.
- For standing water, high water quality, seasonal fluctuation and open, unshaded habitat are identified as being very important for many species, and, for ponds in particular, wet bare mud is of high importance for some species.
- The surrounding habitat features are also important, partially to ensure the quality of the standing water itself, and significantly to support the requirements of amphibians and other partially land-based species.



5.2.1.2 Standing water species

- Amphibians: Ponds and standing water support the amphibian species: Common Toad, Common Frog the 3 species of Newt – Great Crested, Smooth and Palmate.
- **Reptiles**: Grass Snake is sometimes present in larger ponds in an appropriate wider habitat.
- **Fish**: Some sites support fish including Eel. The presence of fish can however prohibit the presence of some other species.
- Invertebrates: Bottom-dwelling species such as snails, dragonflies, water beetles and many other aquatic insects are found in ponds.
- White-clawed Crayfish can do well in ponds and standing waters of high-water quality and we hope to use or create one or two ponds as ark sites to help support their survival.
- Plants: Regionally scarce plants such as Autumnal Water Starwort, Frogbit, Whorled Water Milfoil, Hair-like Pondweed, the nationally scarce Sweet Flag may be found as well as Marsh Marigold, Yellow Flag and Purple loosestrife.
- Mammals: Mammals such as Water Vole, Daubenton's Bat and Soprano Pipistrelle are all heavily dependent on larger ponds and canals. Water Shrews can also be found and Noctule Bat feeds over standing water.
- **Birds**: Ponds and standing water provide foraging areas for breeding, migrating, and over-wintering birds, especially waders and waterfowl.

Characteristic breeding birds associated with standing water include Coot, Gadwall, Great Crested Grebe, Little Grebe, Moorhen, Mallard, and Tufted Duck.

Sane Reeve, Hilton Park pond, East Wittering





5.2.1.3 Standing Water Conservation - factors causing loss or decline

- Ponds may fall into disuse and neglect, and may be lost as a result of development, siltation, 'tipping' and infilling for 'safety' reasons.
- Inappropriate drainage schemes or abstraction of water may lower water levels in standing water bodies; manmade structures such as canals, small dams, are prone to leaks and drying out.
- Run off of fertilisers causes nutrient enrichment of the water which damages plant and animal communities, as does pesticide runoff.
- Pollution from run-off from roads includes tyre damage, landfill, from sewage overflow and from industry, can also seriously degrade standing water habitats.
- The removal of waterside vegetation and reed swamp, which form effective barriers, can increase the risk of pollution and of siltation.
- Introduction of fish and removal of predators may lead to loss of natural fish populations and affect plant & invertebrate communities.
- Introduced, non-native species can have a devastating effect on the natural balance of standing water and adjacent habitat ecosystems.
- Recreational use of water bodies can cause disturbance to wildlife, damage to vegetation, and degradation of habitats through bank erosion, trampling and stirring up sediment.

5.2.1.4 Good practice in conservation management

- Ponds and standing water bodies are best sustained by:
- Creating new ponds and water bodies with suitable nearby habitat.
- Maintaining natural processes and not intervening too much.
- Minimising disturbance resulting from recreational use.
- Maintaining semi-natural habitat features, including the profiles of natural banks, water quality, seasonal water levels, bank side cover.
- Managing any grazing carefully; preventing farm nutrient runoff and other forms of pollution.
- Controlling or removing invasive plants.
- Clearing any plant material removed from ponds from the bank of the pond to prevent leaching into the water as the material rots.
- If dredging, removing weed, clearing banks, tree or shrub pruning or bank profiling is necessary, measures taken should be proportionate and not affect all of the water body at any one time.

5.2.1.5 Legal protection

• On the MP there are some small ponds and standing water which are given legal protection as they occur areas designated as SPA or SSSIs e.g., Pagham Harbour.





- Stretches of canal, are in areas designated as Local Wildlife Sites and therefore there
 is a presumption against development or change of use when planning consent is required.
- Specific wildlife species of ponds and standing water are given protection under the Wildlife and Countryside Act 1981.
- Licences are required from Natural England for Great Crested Newt, including pond dipping where great crested newts are present. These have made a recent appearance on the MP after gradually moving west across the MP.

5.2.1.6 Key objectives for biodiversity in standing water

- Raise awareness of importance of standing water for biodiversity.
- Review extent and condition of standing water habitats on the peninsula.
- Collect and analyse records of populations and assemblages of standing water wildlife species including Water Vole, amphibians, invertebrates.
- Maintain the extent of standing water habitat and create new ponds where other valuable habitats would not be damaged.
- Create appropriate links and corridors between standing water sites.
- Monitor the extent of the spread of invasive species and promote the control or removal of invasive species.
- Promote improvement of the conservation value of standing water habitats through appropriate management and site protection:
 - managing sites for their invertebrate, amphibian, mammal, bird, and plant interest as a whole.
 - promoting changes in land management practices that are having an adverse impact on ponds and standing water habitats.

5.2.1.7 Marking Progress

- Sites/extent of standing water in 'moderate/good ecological condition'.
- Sites/extent of standing water supporting key priority species.
- Number and populations of priority species increasing.
- Sites of standing water connected in wider ecological network.
- Extent of invasive species / extent removed and controlled.

Water vole, Keynor Rife

5.2.1.8 Voluntary groups and volunteers

- help with conservation work of ponds and standing water and their surroundings.
- help provide information about the condition of our ponds and standing water and collect records of the wildlife there.







5.2.1.9 Roles

Landowners and tenants: seek the best results for wildlife by following best practice in managing standing water. Support and working with the newly formed south of Chichester Farm Cluster Group.

Also take up opportunities to create standing water habitats, including where this can help sustainable drainage and flood prevention.

Environment Agency, RSPB, Chichester District Council, and others are working to improve wetlands and provide more seasonal standing water as flood defence.

A number of organisations including land fill bodies may offer grants for habitat improvement involving standing water.

Natural England funds pond creation and maintenance through Great Crested Newt District Level Licensing Scheme.

Chichester District Council as planning authority:

- sets conditions in planning approvals to ensure in relevant cases that the biodiversity value of ponds and standing water is maintained and enhanced.
- promotes ponds as sustainable drainage systems (SuDS) in developments.
- promotes creation of ponds within district level great crested newt licensing scheme
- ensures that biodiversity net gain requirements are met or exceeded



5.2.1.10 Actions taken

The HLF Fixing and Linking Our Wetlands (FLOW) project 2015 - 2021 focused on improving and linking up wetland areas across the peninsula to create better quality habitat and corridors for wildlife. 1500 ditches and 30+ hedges were surveyed and then 50 sites were recovered totalling 55000m², 30 landowners engaged, with water voles moving into 50% of the sites (that didn't previously have them), within 3 years.

5.2.1.11 Proposed actions

- Additional ponds, pools, and scrapes, including through development requirements and GCN District Level Licensing.
- Regular analysis of records of wildlife species* in standing water bodies.
- Additional ponds identified for designation, protected, and conserved.
- Continue prioritised programme of invasive species removal and control.





5.2.2 Wetlands, including reedbeds

This local priority habitat includes all wetlands with a mosaic of standing water, reedbed, and flood grazing marsh vegetation and are all important for wildlife.

The string of wetlands on the peninsula supports nationally important assemblages of species, including in particular breeding, passage, and over-wintering birds.

This **Floodplain Grazing Marsh** habitat, seen at Pagham Harbour and Medmerry, a mosaic of wet grassland and standing water, is important for breeding waders such as Lapwing, Redshank and Snipe, as well as overwintering wildfowl such as Wigeon and Teal.

The creation of extensive **Reedbeds** on Medmerry has attracted Bittern, Bearded Tit and Marsh Harrier to breed in the area, and other habitats with Fen vegetation also support wildlife. Much of the habitat has been created from previous farmland.



5.2.2.1 Priority habitats

The best examples of these local priority habitats are sites that support good populations or assemblages of species of conservation importance. This necessitates different management being employed to support different wildlife species.

Reedbeds, swamp, marsh, and fen - some priority species like Bittern depend on sizeable individual or groups of reedbeds. There are at least 5ha of reedbed in the combined areas of Medmerry and Pagham Harbour and the back of Chichester Harbour where a boardwalk helps people access the reed bed

They are some of the richest areas for dragon and damselflies and other invertebrates, amphibians, birds such as the nationally rare Bittern, and mammals such as Water Vole and Harvest Mouse.

Fen vegetation: rushes, sedges and reed grasses is found on wet and sometimes peaty soils in floodplains and around the margins of standing water and slow-moving water courses.

Wetland areas that are normally flooded throughout the year give rise to tall reed grasses such as Common Reed, Reedmace and Reed Canary Grass, emerging from the water. These reedbeds are significant locally for their distinctive range of breeding birds and a refuge area for water voles.

In areas not always flooded, other forms of fen vegetation develop. **Fen** can be found on **marshy grassland** on less water-logged, but still damp soils. Scrub encroaching on these habitats will lead in time to **wet woodland**.

Conservation. Wetland habitats such as reedbeds and other areas with fen vegetation are valuable for a range of wildlife species of conservation importance. They need to be managed, extended, and connected. They are a priority for conservation.





5.2.2.2 Factors causing loss or decline of wetland habitats

- Drying out, scrub encroachment, and succession to woodland.
- Reed may invade and smother mixed fen, marsh or wet grassland which have their own value for biodiversity.
- Lack of, or inappropriate, management.
- Water abstraction and drainage, and intensive agriculture.
- Siltation, pollution, and nutrient enrichment.



5.2.2.3 Good practice in management of wetland habitats

- Keep water levels of reedbeds, swamps and marshes at reasonably stable and appropriate seasonal levels.
- Scrub encroachment should be discouraged but scrub should be retained in some small areas.
- Maintain links with other wetland and nonwetland habitats.
- Flower-rich areas should be encouraged to provide pollen and nectar sources for adult insects.
- Storing cut reeds etc on-site should be avoided since it can cause nutrient enrichment, decreased plant diversity, and water quality.

Triangle pond before recovery

5.2.2.4 Regular management helps reedbed habitat

- Positive management requires winter cutting of reeds in rotation; [Cutting reed in different areas in a 4 - 7-year rotation prevents build-up of nutrients and dead plant material; and encourages new growth].
- Areas of open water, pools, and channels should be kept in reedbeds.
- Removal of plant / reed litter prevents or slows drying out of reed bed.
- However, some areas where reed is not cut regularly should also be left and allowed to form a deep litter layer. It is important to have some areas of litter that will be kept moist and not dry out completely.

5.2.2.5 Status

Conservation action across the country since the 1990s has been successful in restoring and creating large areas of reedbed.



5.2.2.6 Legal protection

Pagham Harbour and Chichester Harbour (and Medmerry) some sites are given legal protection by being in Local Nature Reserve – AONB – RAMSAR sites.

Specific wildlife species of reedbeds and other wetland habitats are protected under the Wildlife and Countryside Act including intentionally or recklessly disturbing birds at, on or near an 'active' nest.

Water vole, Florence pond, Sidlesham





5.2.3 Waterways (flowing water), running water, rifes*, and ditches.

This local priority habitat includes all rifes and ditches capable of supporting biodiversity and in particular waterway sections or streams with priority species present.

*Rife is a local term for a larger water flowing channel that the drainage ditches link to and which then discharges the water into the sea.

Rifes are significant enough in size to stay wet year-round. These rifes are larger channels that pick-up water from farm drainage and roadside highways ditches and are key to the water storage and movement capacity of the drainage system of the parishes. They are also key for environmental connectivity as they hold water for longer and have the potential to be hotspots for wetland biodiversity with good management.

Rifes are viewed as main river by the EA who manage these waterways for flood risk reduction with vegetation cuts and / or desilting when deemed necessary.

5.2.3.1 Running water species

There are many species adapted to flowing water and these are not only fish such as Bullhead, and Eel but also other wildlife such as Water Vole and Otter.

5.2.3.2 Human influence

Waterways have often been modified by human activity: dams, weirs and culverts, artificial channels, embanking and flood defences. Some wildlife utilise these manmade features, others, such as fish unable to get to spawning grounds, have suffered.

The waterways on the peninsula tend to be nutrientrich due to the land use of the immediate and wider area and have few fish species but the threatened European eel have been recorded at some sites.

The ditches and rifes total approximately 425 kilometres length of waterways across the peninsula and so makes up a significant habitat: The main river systems on the MP are listed below:

- Grange Rife
- Almodington Rife
- Earnley Rife
- Broad Rife
- Easton Rife
- Jolly Rife
- New unnamed section of rife (Earnley Flood channel)
- Keynor Rife
- Bremere Rife
- Pagham Rife
- Donnington Rife
- River Lavant (in Apuldram)

| Parish | Ditch length |
|-----------------------------------|--------------|
| West Wittering | 52.5 km |
| East Wittering and Bracklesham | 12.5 km |
| Hunston | 25.5 km |
| Donnington | 30.5 km |
| Selsey | 50 km |
| Sidlesham | 77 km |
| North Mundham and Runcton | 56 km |
| South Mundham | 18 km |
| Apuldram | 26 km |
| Earnley | 32 km |
| Birdham | 25 km |
| West Itchenor | 20 km |
| Total | 425 km |





5.2.3.3 Water quality

Over past years, the quality of the waterways on the MP has not been graded in terms of water quality. A study carried out of phosphate and nitrate levels in some ponds on the MP by Claire Lipop for Oxford University showed that most ponds and waterways had high nitrate and phosphate levels and that the larger the channel or water body, the higher the levels.

Significant issues include the impact of water company sewage discharges (Bardsley, L, et Al, 2020) into Chichester Harbour, Pagham Harbour (James, G.,et Al, (Mar 2022) run off from brown field land and agricultural including pollution from tyres, land, and physical modifications to the channel.

5.2.3.4 Running Water: Key objectives

- Raise awareness of importance of rivers
- and streams for biodiversity.
- Continue to collect and analyse records of water vole populations.
- Review the condition of the MPs water ways and promote:
 - measures to increase habitat for water voles
 - appropriate land management to prevent harm to waterways, preventing runoff of fertilisers; buffer zones; etc
- Monitor the extent of the spread of invasive species and promote the control or removal of invasive species.

5.2.3.5 Marking progress

- Extent of waterways in 'moderate or good ecological condition'.
- Extent of waterways supporting key priority species.
- Habitat improvement and flood plain connectivity on the MP.
- Number and populations of priority species increasing.
- Extent of invasive species / extent removed and controlled.

5.2.3.6 Roles

Environment Agency: has regulatory powers and responsibilities to maintain and improve main rivers, as well as a general duty to promote biodiversity

Landowners with land adjoining a water course have responsibilities set out in Environment Agency guidance and have regard to conserving biodiversity - '<u>Living on the Edge'</u> <u>Environment Agency</u>

Chichester District Council as a planning authority:

- sets conditions to protect water courses and their surroundings in relevant planning applications
- ensures that the biodiversity value of water courses and their surroundings are maintained and enhanced.
- ensures that biodiversity net gain requirements are met/exceeded.





Voluntary groups and volunteers

- help with conservation work on water courses and their surroundings.
- help provide information about the condition of our water courses and collect records of the wildlife seen there.

5.2.3.7 Proposed actions

- Every 3 5 years analysis of records of wildlife species in waterways and wetlands.
- Continue prioritised programme of invasive species removal /control.
- Habitat enhancement program with keys sites identified.
- Restoration of riparian vegetation on bare sections of riverbank.

5.2.3.8 What is being done

- Mink monitoring and removal across the MP.
- Identification of other invasive species and creation of a plan for removal.
- Continued management of water vole habitat at key sites



MWHG volunteers working to manage water vole habitat at Birdham village





5.2.4 Hedgerows

Hedgerows priority habitat has 80% or more of at least one native woody species of tree or shrub; the best being ancient &/or 'species rich' (at least four different native tree or shrub species).

Criss-crossing the landscape, marking historic field and parish boundaries, hedgerows are a key habitat for many species of conservation concern. Wildlife uses hedgerows for foraging, feeding, breeding, shelter, and a refuge from predators.

A high proportion of the hedgerows in the peninsula have a drainage ditch associated with them and therefore the hedgerow and the species that make it up are important. They often support a rich flora at their base, support invertebrates such as butterflies and moths, and act as wildlife corridors for many species, allowing movement between habitats. The best hedgerows on the peninsula for biodiversity are ancient and/or 'species-rich' hedgerows. These hedgerows will consist of several tree or shrub species, may contain veteran trees and deadwood, and may possibly have a rich basal flora of herbaceous plants. In some cases, they may be remnants of ancient woodland. On the MP hedgerows still act as wildlife corridors for many species including bats.

The UK BAP (2007) widened it to recognise all hedges with 80% or more of at least one native tree or shrub species as UK BAP priority habitat.

On the MP, during the FLOW project, hedgerows which were associated with ditches were surveyed and 1152, approx. 103 kilometres of important hedgerows, were identified from 8 parishes of the 11 assessed (FLOW Parish reports, 2016 – 2021).

Hedgerows are an important wildlife corridor for many species and water voles will use them as protective routeways for dispersing across the landscape, especially if waterways are compromised by drying out or filled in. Therefore, having a good network of hedgerows across the landscape, especially adjacent to ditches is invaluable. They provide protection, food, and shelter for a water vole while it is out of its primary preferred habitat.



The best hedgerow habitats include older trees; a number of woody species; and a broad grassy margin. Tall, overgrown hedgerows will lose their shrubby base vegetation, become gappy and turn into scrub or just a line of trees.







Thin, gappy and over managed hedgerow with little base cover, Earnley

5.2.4.1 Conservation of hedgerows

Hedgerows were removed in large numbers in the second half of the last century across the country to make bigger fields for food production and to make way for housing developments.

Although the Hedgerow Regulations, introduced in 1997, protect hedgerows against removal, neglect and a lack of positive management continues to slash the value of hedgerows and affect whether they survive. In addition, the threat of removal has not gone away.

5.2.4.2 Factors causing hedgerow loss or decline

- Removal of field boundary hedges to enlarge field systems, or for open cast mining or development, or replacement with fencing
- A lack of hedge-laying, shrub and tree replacement, and good general hedgerow maintenance
- Too frequent, badly-timed cutting; unsuitable mechanised methods; repeated cutting at the same level thinning the hedge base
- Too little maintenance leads to overgrown, tall hedgerows; these become scrub or a line of trees as the hedgerow base is shaded out
- Herbicides, pesticides, fertilisers and ploughing to hedgerow base
- Overstocking with livestock, resulting in browsing damage.

5.2.4.3 Good practice

Flailing and cutting hedgerows requires careful timing and method to provide a diverse hedgerow habitat and good hedgerow structure:

- Manage hedgerows if their setting allows so that they become large, thick, and dense; avoid excessive, too frequent trimming.
- Trim hedgerows no more than once every two or three years and cut slightly higher each time. Avoid annual cutting.
- Try not to cut all the hedgerows on a site or the whole length of a hedgerow in any one year.
- Protect existing older and veteran trees in hedgerows and leave other tree species in the hedgerow to mature.
- Hedgerows are best sustained by laying on an 8-15-year cycle, which produces new growth at the base.
- Maintain a hedge bank or grassy strip near the base of the hedgerow for native grasses and flowers to grow.
- Do not apply herbicides, pesticides, or fertilisers within 2m of a hedge or 6m of a waterway.





5.2.5 Other important habitats

As well as the more obvious wetland habitat, there are other environments that can be valuable for water voles and wetland species.

5.2.5.1 Scrub

Although not a national priority habitat, Scrub can support a range of wildlife species and is of value for biodiversity. When it is found on unmanaged open space, and along watercourses it can be a valuable asset to riparian species.

5.2.5.2 Wet woodland

Willow or alder carr is a notable form on the peninsula of the wet woodland priority habitat, the natural cover for wet soils. When waterways stop being managed their final succession can be wet woodland carr.

5.2.5.3 Arable field margins

Field margins designed to benefit key farmland species in arable areas. In-field measures like skylark plots and beetle banks are included in the local priority habitat. These can be useful food resources for water voles when adjacent to waterways.

5.2.5.4 Mixed deciduous woodland

The main woodland priority habitat on the peninsula, made up of very small mixed oakbirch and ash pockets of woodland, amounting to approx. 10 hectares, in small copses, 3 of which are considered ancient (Keynor, Hunston and Church Norton). These all have ditches running around their perimeter and through them.



Keynor copse ancient woodland, Sidlesham





5.2.5.5 Open mosaic on previously developed land

This is a national priority habitat found on sites where soils have been modified and one or more early successional communities have become established in a mosaic with bare substrate.

Other specialised habitats may be found where there is industrial spoil or limestone ballast affecting the soil: the types of vegetation found may be very different to those found elsewhere on the peninsula.

5.2.5.6 Urban areas

Built-up areas and gardens, buildings and their grounds, allotments, verges, and urban open spaces can provide a very significant resource for many common and vulnerable species. Their value should not be ignored. For this reason, a section has been added to the local biodiversity plan with descriptions of how to promote biodiversity in these settings.

Attenuation ponds or Sustainable Drainage Systems (SUDs) are a common solution for new developments but these areas are not useful wetland habitat for many species including water voles as the water is only stored temporarily. This maybe a missed opportunity to provide quality habitat and replace what has ben lost.



East Beach Walk, Selsey, attenuation pond on a new housing development





6.0 Communication and Publicity

An important aspect of this BAP is to get the message out there and to highlight the importance of species and habitat conservation work, especially for a protected and declining species such as the water vole. This is a great ambassador animal to act as a flagship for wetland conservation and all the less visible creatures that live in and make up the ecosystem.

To raise the profile of water vole conservation the following actions are necessary:

- Encourage the publication of research papers and features in popular press, magazines, and the broadcast media to raise the profile of the species.
- Through Social Media promote and publicize the useful work being carried out by all
 organisations in water vole conservation through data gathering, surveys, habitat
 management and research.
- Encourage the use of school educational resource material use within the curriculum that is already available through the MWHG website <u>https://www.mwhg.org.uk/guides</u>
- Raise the profile on the water vole and its importance nationally and locally through inschool visits, community events, parish talks, and guided walks.
- Continued recruitment of volunteers to train and enable to get out to gather data and monitor water vole sites.
- Through training events and workshops for landowners and managers on water vole habitat creation, recovery, and maintenance.
- Provide information and guidance on the website about water vole habitat management.
- To invite partner organisations to create a water vole forum for the Manhood Peninsula that meets six monthly or annually to share information, identify new sites for surveying, discusses areas of concern, update members on work being carried out etc. This would allow strategic planning across the whole peninsula to take place and grant applications to be made with all partners working together towards the single vision of safeguarding the long-term survival of water voles in west Sussex.
- Information is regularly sent to update the local community via the local press and media including the Chichester Observer, Selsey Life, TV South today etc.

In order to keep the spotlight on water vole conservation in the area and to galvanise volunteers, recruit new help, run training courses and to make the most of the resources available, the continued employment of a **Water Vole Project Officer** would be of huge benefit. This would allow a continued focus of attention on the endangered water vole and to be a first point of contact for other agencies, schools, and volunteers. Having a dedicated role that concentrates on this species will help to shine a spotlight on this flagship species in its increasingly threatened habitat.

An important part of the water vole project officer role would be American mink control across the peninsula to maintain the population of water voles. A single mink can have a devastating impact very quickly and having an expert with traps already in place at key access points is the key to success.





The development of a database or spreadsheet to track water vole habitat destruction, damage and any areas under threat would be important and to track any enforcement, communication with enforcement agencies and the outcomes. This way a record can be kept of areas at risk, any mitigation, amount of habitat destroyed etc. This documenting and evidence gathering could be useful for future enforcement.

Water vole talks, training and workshops to highlight water vole conservation locally, engage new volunteers and partnership organisations to increase surveying of sites and recording of water vole presence





© Jane Reeve





7.0 The Future for Water Voles

The future for water voles is by no means certain on the MP and with continued development, lack of management, over management and other threats, the water vole could easily quietly disappear from the area, as it has done so across the UK.

7.1 The long-term future - water voles and beavers – the intrinsic link

Over the last 10 years, across the UK, there have been numerous Eurasian beaver reintroductions. As a result, research carried out on their impact on habitats, other species, water quality, the water holding capacity of catchments etc has shown the biodiversity and flood risk reduction benefits (Campbell-Palmer et al 2016, and Nummi, P. et al. 2019, Wilson, K., et al 2020). There is also a significant positive outcome for water voles.

Beavers manage their habitat by removing bankside shading trees, encouraging new young growth in willow and alder especially, and by holding water back and therefore creating year-round wet conditions. This vegetation and consistent water level management results in ideal conditions for water voles. With large shading trees removed the light in the banks allows other plant species to colonise and with the grazing of these plants by the beavers and movements of the silt on the banks, the floral diversity increases. Beavers create ditches and connected smaller ponds and microclimates of scooped out scrapes and this variety is deal for water voles to exploit. This low level but frequent intervention by beavers in the wetland habitat is perfect for water voles and where beavers have been introduced, water vole numbers have been seen to increase and their distribution increase in parallel to the beavers.

While future reintroduction programmes for beavers could well also increase water vole population range, especially if other factors such as mink removal are addressed at the same time, this is unlikely to occur on the MP. With the grade A1 soil, intense arable farming, large international farming companies, the increased building and development, and the flat nature of the land, the peninsula would not be seen as a strong candidate for a beaver introduction project. This means that volunteers, communities, conservation organisations, landowners and land managers must carry out the management necessary to maintain good quality wetland and water vole habitat.

Within West Sussex there have been two beaver introductions with one at the Knepp Estate and the other on a National Trust site on the edge of the South Downs. Research has been carried out on the Isle of Wight for a potential introduction site and in Hampshire 2 beavers were recently released into Ewhurst Park near Basingstoke. To the east there is a well-established colony of beavers at Ham Fen in Kent which have been there since 2001. In the future, getting these individual colonies to join up for genetic mixing and to modify more habitat would be ideal as it would create more good quality water vole habitat. However, the south coastal area of England is under population and development pressure so any beaver population spread would be heavily managed.



Beaver adapted wetland habitat offers increased opportunities for water voles with clean water and good floral riparian diversity.





7.2 Future threats

7.2.1 Changes in protection and licensing

Threats have been discussed in previous sections but the most recent new and emerging threat is from the UK government itself. In September 2022 Natural England came up with an Overriding Public Interest (OPI) license.

Section 111 of the Environment Act 2021 introduces changes to the Wildlife and Countryside Act 1981 and the Conservation of Habitats and Species Regulations 2017. One of these changes will make it possible for Natural England to issue wildlife licences for 'Overriding Public Interest' (OPI) for animal and plant species listed on Schedules 5, 6, and 8 of the Wildlife and Countryside Act 1981.

Natural England must apply two statutory tests before issuing licences:

- that there is no other satisfactory solution; and
- that the grant of the licence is not detrimental to the survival of any population of the species of animal or plant to which the licence relates

In the absence of the suitable licensing purpose for development and mitigation, Natural England has issued licences for displacement or trapping and translocation of Schedule 5 species, such as water vole, under the purpose of conserving wild animals.

The introduction of the OPI purpose means Natural England will be able to licence development related activities affecting water vole.

7.2.2 Delay in ELMs

Defra have been developing farming schemes that rewards farmers and land managers for carrying out environmental protection action, enhancing biodiversity and habitats, and carbon capture. These have been delayed until at least 2024 and this means that many farmers maybe between payments as they come off the current stewardship schemes, experience volatility with global food markets due to the Ukraine situation and cannot plan future land management.

This may result in cost cutting, loss of buffer zones and previously considered low production areas that may now be put into food production. This may include areas around waterways and effect the value of connecting habitats with increased fragmentation.



Willow Glen, B2145, Sidlesham, water vole habitat created, next to a busy B road and intensely farmed arable land, with a buffering margin of at least 6 metres on one side





7.2.3 Lack of enforcement

Smaller scale habitat destruction, damage and removal are not actioned by the Police, the Environment Agency or local planning authorities. Habitats and water voles are protected by the Wildlife and Countryside Act but enforcement is not carried out. Therefore, developers, landowners and residents continue to damage and remove habitat with impunity.

There are a small number of examples nationally of prosecutions for destruction BUT only where the action is on a large scale, highly visible and there has been some previous interaction with an agency such as the EA – and where other factors come to bear like flood risk increase, interference with a main river channel etc.

Until the removal and damage of habitat is taken seriously water vole numbers will continue to decline.



Water vole habitat removed with no license, West Itchenor, contributing to fragmentation

7.2.4 Future study or missing information

A comprehensive look at water quality across the Manhood Peninsula would be valuable as all water from the ditches and rifes run into either Chichester Harbour, Medmerry or Pagham Harbour – all sensitive wildlife rich areas. By analysing the water in the rifes and ditches, the sources of pollution can be identified and targeted for improvement.

The Chichester Harbour Condition Review (2020) and the Pagham Harbour Condition Assessment Report (2022) cite gaps in data about some species distribution and habitats but overall, it is clear, that many wetland and marine habitats are becoming unfavourable and not meeting the statutory targets for their protected status and designations. This is in part due to water quality issues and a more cohesive and landscape scale approach to

understanding the problems, monitoring species, and engaging landowners, water companies, communities, and recreational users of these special places needs to be undertaken to reverse the decline.

Sparrow cottage pond, Earnley, water high in nitrates and phosphates with significant algal growth





8.0 References



Bardsley, L., Brooksbank, J., Giacomelli G., Marlow, A., and Webster E. 2020. Review of Chichester Harbour sites: intertidal, subtidal and bird features. Natural England Research Report, Number 090.

Buglife - Freshwater invertebrates https://www.buglife.org.uk/bugs/types-ofinvertebrates-by-habitat/freshwater-invertebrates/

Campbell-Palmer, R., D. Gow, R. Campbell, H. Dikinson, S. Girling, J. Gurnell, D. Halley, S. Jones, S. Lisle, H. Parker, G. Schwab and F. Rosell. (2016). The Eurasian Beaver Handbook: Ecology and management of *Castor fiber*. Pelagic Publishing.

Dasgupta Review (2021) https://www.gov.uk/government/publications/final-report-theeconomics-of-biodiversity-the-dasgupta-review

DEFRA Species Biodiversity Action Plan – Water Vole <u>http://adlib.everysite.co.uk/adlib/</u> <u>defra/content.aspx?</u> <u>id=000IL3890W.16NTC1EGJ1I2W6#:~:text=Description,watercourses%20with%</u> 20stable%20water%20levels

DEFRA 25 Year Environment Plan comprehensive plan for England's natural environment from the Department for Environment, Food & Rural Affairs (Defra).

EA publication - 'Living on the Edge' <u>https://www.gov.uk/guidance/owning-a-watercourse</u> <u>Freshwater Habitats Trust https://freshwaterhabitats.org.uk/</u>

Gow, D, 2022 BBC News https://www.bbc.co.uk/news/uk-england-devon-60764790.amp.

GOV.UK Water voles: advice for making planning decisions - <u>Standing Advice [surveys and mitigation]</u> <u>https://www.gov.uk/guidance/water-voles-advice-for-making-planning-decisions#what-you-must-not-do</u>

Standing Advice [water vole surveys and mitigation] https://www.gov.uk/guidance/water-voles-advice-for-making-planning-decisions#what-you-must-not-do

Gray, N. (2021) Fixing & Linking Our Wetlands (FLOW) Project: Supplementary Review of Mink Monitoring. <u>https://www.mwhg.org.uk/_files/ugd/</u> f8eba9_f352a12514f048ff84e71ac8462bf056.pdf?index=true

Halley, S. Jones, S. Lisle, H. Parker, G. Schwab and F. Rosell. (2016). The *Eurasian Beaver Handbook: Ecology and management of Castor fiber*. Pelagic Publishing.

James, G., Lightburn, M., Robards, M. (Mar 2022). Condition data review of Pagham Harbour designated sites, *Draft* Report, Natural England.

JNCC Phase 1 habitat surveys <u>https://hub.jncc.gov.uk/assets/9578d07b-e018-4c66-9c1b-47110f14df2a</u>

JNCC National Priority Habitat – Ponds - <u>https://data.jncc.gov.uk/data/dec49c52-a86c-</u> 4483-90f2-f43957e560bb/UKBAP-BAPHabitats-42-Ponds.pdf

JNCC National Vegetation Classification plant communities <u>https://jncc.gov.uk/our-work/</u><u>nvc/</u>

Lawton, Sir J, Making Space for Nature, a review of England's wildlife sites (2010) https://webarchive.nationalarchives.gov.uk/ukgwa/20130402151656/http:// archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf





Lipop. C., (2017). Water Vole (*Arvicola amphibious*) distribution and abundance in water courses and ponds within the Manhood Peninsula, West Sussex, and the effect of habitat quality. University of Oxford

Mammal Society information signs https://www.mammal.org.uk/species-hub/full-species-hub/discover-mammals/species-water-vole/

Mammal Society Red List for Britain's Mammals <u>https://www.mammal.org.uk/science-research/red-list/</u>

McGuire, C, . and Morse, A., (Nov 2020). National water vole database mapping project. Hampshire & Isle of Wight Wildlife Trust. <u>The National Water Vole Database & Mapping</u> <u>Project | The Wildlife Trusts</u>

Natural England, Integrating needs of priority species into habitat management (2010), Natural England <u>http://publications.naturalengland.org.uk/publication/30025</u>

Nummi, P., Liao, W. F., Heut, O., Scarpulla, E., & Sundell, J. 2019. The beaver facilitates species richness and abundance of terrestrial and semi aquatic mammals. Global Ecology & Conservation 20: e00701.

PTES information https://ptes.org/get-informed/facts-figures/water-vole/

Sustainable Farming Incentive, Local Nature Recovery, and Landscape Recovery <u>https://www.gov.uk/government/publications/environmental-land-management-scheme-overview</u>

Strachan, R., and Holmes-Ling, P. (2003). Restoring Water Voles and Other Biodiversity to the Wider Countryside. A Report on the Chichester Coastal Plain Sustainable Farming Partnership. FWAG & WildCRU.

Strachan, R., Moorhouse, T., Gelling, M. (2011), Water Vole Conservation Handbook Third Edition, Journal: WildCRU, University of Oxford.

The UK National Ecosystem Assessment, 2011, http://uknea.unep-wcmc.org/

United Nations (2015) #Envision2030: 17 goals to transform the world for persons with disabilities. <u>https://www.un.org/development/desa/disabilities/envision2030-goal15.html</u>

Wilson, K., Law, A., Gaywood, M., Ramsay, P., Willby, N., 2020. Beavers: the original engineers of Britain's fresh waters. *British Wildlife* 403 August 2020.

Further information about mink

http://www.gwct.org.uk/wildlife/research/mammals/american-mink/

https://en.wikipedia.org/wiki/Mink

http://www.britishwildlifecentre.co.uk/planyourvisit/animals/americanmink.html

https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-wildlife/the-rogues-gallery/mink





The Manhood Wildlife and Heritage Group

The Manhood Wildlife and Heritage Group (MWHG) has been a registered charity since 2011 and has worked to promote and protect the environment and history of the Manhood Peninsula in West Sussex, since its creation in 1997. After originally forming as the Selsey Parish Map Group, the name of the Group was changed in 2011 to MWHG, to reflect the increasing scope of conservation work undertaken.

The group have carried out a large range of projects since its formation including:

- Selsey Biodiversity Action Plan 2001
- Manor Green Park group- 2003
- East Beach Pond Group 2003
- Manhood Wildlife Officer 2004
- Medmerry Realignment 2005
- Water Vole Project 2012
- Sidlesham Heritage Project 2013
- Wetland Management Guide 2015
- Fixing and Linking our Wetlands (FLOW) 2016
- Mink Monitoring Project 2016
- Selsey Photo Archive Project 2018
- Community Conservation Partnership 2019
- West Wittering Tree Nursery Project 2021
- West Manhood Community Conservation Officer 2021
- Selsey Tree Nursery Project 2022

MWHG are grateful to the many grant giving bodies, partnership organisations, businesses, donating individuals, the management team, Trustees and volunteers, who give their time, for supporting the group and its aims. The Manhood Peninsula is a special place for people and nature and we continue to look after it.



mwhg.org.uk

