



CONTRACT WWB/02/07

NATURAL CAPITAL AUDIT

1: STAKEHOLDER ANALYSIS & PEMBROKESHIRE

Collation of summarised information on biodiversity and the wider environment to assist the farming community of this region in diversification of interests. This report is a synthesis of available information on all aspects of natural and cultural heritage.

Prepared for **Planed** on 29 February 2008
by

West Wales Biodiversity Information Centre

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With additional information supplied by:
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1. EXECUTIVE SUMMARY

OPPORTUNITIES, THREATS & RECOMMENDATIONS

NATURAL CAPITAL AUDIT WEST WALES		
	OPPORTUNITIES	THREATS
HABITATS	There is a wealth of semi-natural habitats in this part of Britain with good potential for contributing towards national and international conservation objectives, with good potential for attracting sustainable tourism, and with some potential for sustainable harvests. The presence of threatened habitats on a farm opens the door for Tir Gofal grant funding. Reedbeds in Pembrokeshire and Carmarthenshire need to be harvested as part of local conservation management and offer a resource for thatching industries. Peat may be encouraged and harvested sustainably in appropriate locations. Saltmarsh endows a sought-after flavour in lamb and this has been well marketed to outlets in France. Saltmarsh Lamb also requires fewer dosages for parasite control. Scrub and bush clearance is sometimes required by conservation management plans. This offers a harvestable resource which may be used and sold in charcoal manufacture. Grants and training are available for wood craft, hedge-laying, dry-stone walling, traditional fence making, basket weaving, wattling. Light to moderate grazing of	Vulnerable habitats may be damaged by enhanced use. Harvesting of reedbeds and peatbeds needs to be done sustainably to avoid over-exploitation and damaging the natural resource. Many habitats, if unused or over-used, become of low value to wildlife as well as to people. The challenge for every type of habitat is to find the right stocking regime and / or other level of use.

	lowland heathlands, preferably by indigenous cattle breeds or by horses and wild ponies, is ideal for preventing succession of that habitat type to scrub. The livestock in turn and the traditional farm management may be seen as drawcards for local sustainable tourism. Rare habitats in West Wales such as lowland heath have become highly fragmented. The expansion and connection of habitat patches ought to be encouraged by conservationists. As yet there is no provision within Tir Gofal to encourage the cooperation of neighbouring farmers but this is a conservation opportunity that farmers can work towards and that needs to be looked at for further resourcing by the authorities.	
SPECIES	Flagship species are good for building sustainable tourism operations. In Pembs and Carmarthen we have Red Kite, cetaceans, seabird islands, and good potential for re-introductions (Sea Eagles). Some of these species may be actively managed by landowners to promote tourism, e.g. Red Kite feeding stations. (Red Kite tourism generates £3m per annum in Mid-Wales). Surveillance cameras afford opportunities to enhance wildlife observation without disturbance. Beekeeping can help the restoration of local ecosystem processes (e.g. the re-establishment of wild meadows) by encouraging pollination and may also achieve conservation	Rare species that are vulnerable to disturbance. Some tourism activities may cause pollution and the carbon footprint of tourists in Wales is double that of residents. Certain activities such as the use of high-speed RIBS to view marine life, particularly in caves, need to be carefully regulated.

	objectives for the endemic and threatened black honeybee.	
SITES	Designation status denotes importance of local habitats and species and may be used as a big drawcard for attracting tourism.	Designation may prevent farmers from doing what they want with their land.
HISTORY	The blue stones from Preselis, castles, Roman road, Iron Age promontory forts around the coastline are obvious examples of heritage tourism opportunities.	All of these sites may be vulnerable to erosion and over-use.
GEOLOGY	The geology of the Pembs coast is an obvious attraction which serves as a drawcard to tourism. Certain landowners describe definite opportunities for tourism from geological features.	Natural erosion processes may be accelerated by increased use of footpaths etc
RECREATION / ACCESS	Small bird shoots do some habitat management e.g. cover crops and field borders, which is beneficial to certain wildlife. Many hunters are good conservationists and do much to 'keep' wildlife and wild areas. Tourists and hunters favour pet-friendly accommodation. There is great potential for inland recreational activity on farmland with private or public access. This may include quad biking, scrambling and 4x4 courses but cycling, horse-riding and walking are the least contentious and most in harmony with natural heritage. There are associated opportunities for the provision of livery for horses and accommodation for riders in bridleway areas e.g. the Preselis. Much can be done to promote and inform people about nature trails with interpretation. There is known potential for	Predator control by gamekeepers can be excessive, harming ecosystem processes, and some illegally affects protected species. There is a health and safety conflict between open recreational use and deer shooting in Carms forested areas. Large bird shooting developments are likely to be unsustainable and may harm local populations of woodcock etc. The biggest threat with increased recreation is increased disturbance of wildlife and wild places.

	freshwater fishing businesses above and below Llys y Fran Reservoir (many of the rivers are still unchartered by EAW for this).	
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- It is recommended that future programmes, following the workshops, provide systems for farmers to identify what is unique about their properties re. natural capital. Herein lies their potential competitive strengths which is what they would need to promote in finding the best and most rewarding ways of diversification. We have identified two approaches to helping farmers identify what is unique about their farms:
- A desktop study of what is currently known about their property. This would source existing data from WWBIC, Cambria Archaeology and other maintained databases. There are various options for how this information may then be conveyed to the enquiring farmer:
 - Paper report by post or pdf report by email
 - Large format map by post
 - A website interface where the farmer is provided with a password protected logon and where they may then query the data layers and print out their own small maps and lists of habitat, geological and cultural features within a specified buffer distance of their farm
- A site visit by ecologists, possibly voluntary recorders, who are skilled at identifying species, habitats, geology, archaeology on the farm, and the production by them of site-specific survey report. Other advantages of this approach will be the further additions of data to the regional databases. This may require more resourcing than the former approach but there is an army of voluntary recorders out there who are keen to know more about the distributions of their favoured taxa. The approach would be welcomed by CCW staff and others as a means of re-establishing the highly successful ‘Wildlife on your farm’ project.

2. ACKNOWLEDGEMENTS

Data: Cambria Archaeology, Carmarthenshire County Council Biodiversity Website, Countryside Council for Wales, Environment Agency Wales, Ordnance Survey, Sid Howells, Jon Hudson, Isabel Macho

Carmarthenshire County Recorders- Philip Jones, Neil Matthew, Derek Moore, Richard Pryce

Pembrokeshire County Recorders- Ron Elliott, David Harries, Annie Haycock, Bob Haycock, Graham Rees

Photograph credits:

Ron Elliott	Brown hairstreak
	Marsh fritillary
Derek Moore	Red kite
Mammal Society website	Dormouse
	Hare
	Hedgehog
	Pine marten
	Red squirrel
Carmarthenshire County Council website	Tree Sparrow
Pembrokeshire LBAP website	Hornet robber fly
RSPB website	Lapwing
School of Biological Sciences, Bristol University website	Greater horseshoe bat

3. INTRODUCTION AND BACKGROUND

Working with partners in Ireland, Sweden and Carmarthenshire (WWEC/CCC) the Harnessing Rural Capital Project aims to increase the confidence and knowledge of farming families to enable them to participate in economic and environmental activities that will contribute to sustainable development in Pembrokeshire and Carmarthenshire.

In order to equip Planed with a suitable ‘toolkit’ to run a series of workshops for the farming community on diversification of use of their agricultural land the West Wales Biodiversity Information Centre (WWBIC) was contracted to prepare this two volume report summarising our current state of knowledge, effectively an inventory or audit, of natural resources (capital) in this part of Wales.

In the report we draw attention to potential opportunities and threats that exist to the farming community in West Wales concerning the near and long-term future sustainable use of these natural resources. The report helps establish our knowledge base for what natural assets are of value in Pembrokeshire and Carmarthenshire: what needs to be carefully conserved for future generations to enjoy and what natural resources might be sensibly and sustainably used.

Farmers today are being encouraged to diversify how they use their land, and to move away from intensive agricultural practices which led to over-production of crops and harm to the environment. But they face a bewildering array of options and avenues for grant funding. This report also aims to recommend information tools which can help farmers identify the most sensible diversification options for their own land holdings.

The first of these volumes contains information on Pembrokeshire and a user requirements analysis conducted with representatives of the farming community and relevant conservation and agricultural agencies. The second volume contains information relating to Carmarthenshire and will hold supplementary detailed information in an Appendix. The report also includes six large format maps for use in the workshops. Farming communities are land-based so the emphasis in this report is on terrestrial and freshwater natural resources rather than marine. But important marine assets are mentioned and included on the maps where relevant.

West Wales Biodiversity Information Centre (WWBIC) is the fourth Local Records Centre (LRC) to be established in Wales, and became operational on 01 September 2007, following an eighteen month establishment phase. WWBIC operates as a not-for-profit organisation whose aims are to make appropriate local biodiversity information available to those who need it, to help ensure that decisions that may affect biodiversity are made in the light of best available knowledge and information. WWBIC provides a data clearing house for collating, sharing and utilising the wealth of biological data and knowledge that exists for Pembrokeshire, Ceredigion and Carmarthenshire. The Centre is primarily concerned with information on protected habitats, sites and species but for the purposes of this audit WWBIC subcontracted data collation to include geology and the historical landscape. We also incorporate existing data on forms of recreation that involve natural resources. In addition to data and information, the Centre offers software and mapping services which have been fully engaged in the preparation of this report.

4. METHODS

Protected Sites in West Wales were treated as per their designations; protected and priority habitats as defined in the UK BAP and LBAPs; important species of flora and fauna in the region were identified in consultation with relevant County Recorders and from the UK BAP and LBAPs.

Methods for assessing the importance of the historical and geological landscapes are handled in those respective sections.

ESRI ArcInfo was used in the preparation of the maps and in the analysis for the inventory of the priority habitats by county. This method was chosen due to it involving the best available software and data.

For the Stakeholder Analysis

For the Stakeholders' analysis we held 27+ consultations with representatives from the farming community and from public authorities, agricultural groups and conservation agencies and partnerships, mostly by site visits. Efforts were made to identify existing knowledge and resources, prevent duplication and derive practical and useful recommendations for future work in this important field. Many respondents indicated early on that a site-specific approach rather than a regional overview approach would be best so we geared some of our methods to establishing how a service might operate in the future as a recommendation in this report. The combination of a site-specific report (Map 1) with a site visit for surveying by biological recorders found support from nearly all quarters, notably representatives from CCW who had been involved in similar projects before. So we made an effort to factor in how these programmes might be instigated for the benefit of the farming community. Results of all interviews are considered in light of knowledge of the relevant sectors of the Unitary Development and Local Development Plans for the region.

Representatives of the Farming Community

Eighteen farmers were chosen throughout the region to complete the survey. It was decided that the interviews should be targeted at farmers fitting into the following groups in order to gauge the needs of a cross-section of farm types. The profiles of these farmers are given in detail in *Appendix 1*.

- Intensive dairy farmers (Farmers 1, 2 & C1)
- Arable Farmers (Farmer 3)
- Fairly extensive farmers (Farmers 4, 5, 6 & C2)
- Organic farmers (Farmers 7, 8 & 9)
- Farmers with a very high regard for the environment (Farmers 10 & 11)
- Farmers in the Preseli Mountains - open range, extensive with low stocking density (Farmer 12)
- Landowners that do not actively farm the land / semi-retired farmers renting out land / farmers that have already diversified so conventional farming is not the main income (Farmers 13, 14, 15 & 16)

In many cases these categories overlap, however, this provides a rough guideline to ensure that farmers across the board are covered in this survey, as it is important to not exclude any type of farmer from having access to information about their natural assets and how best to utilise them.

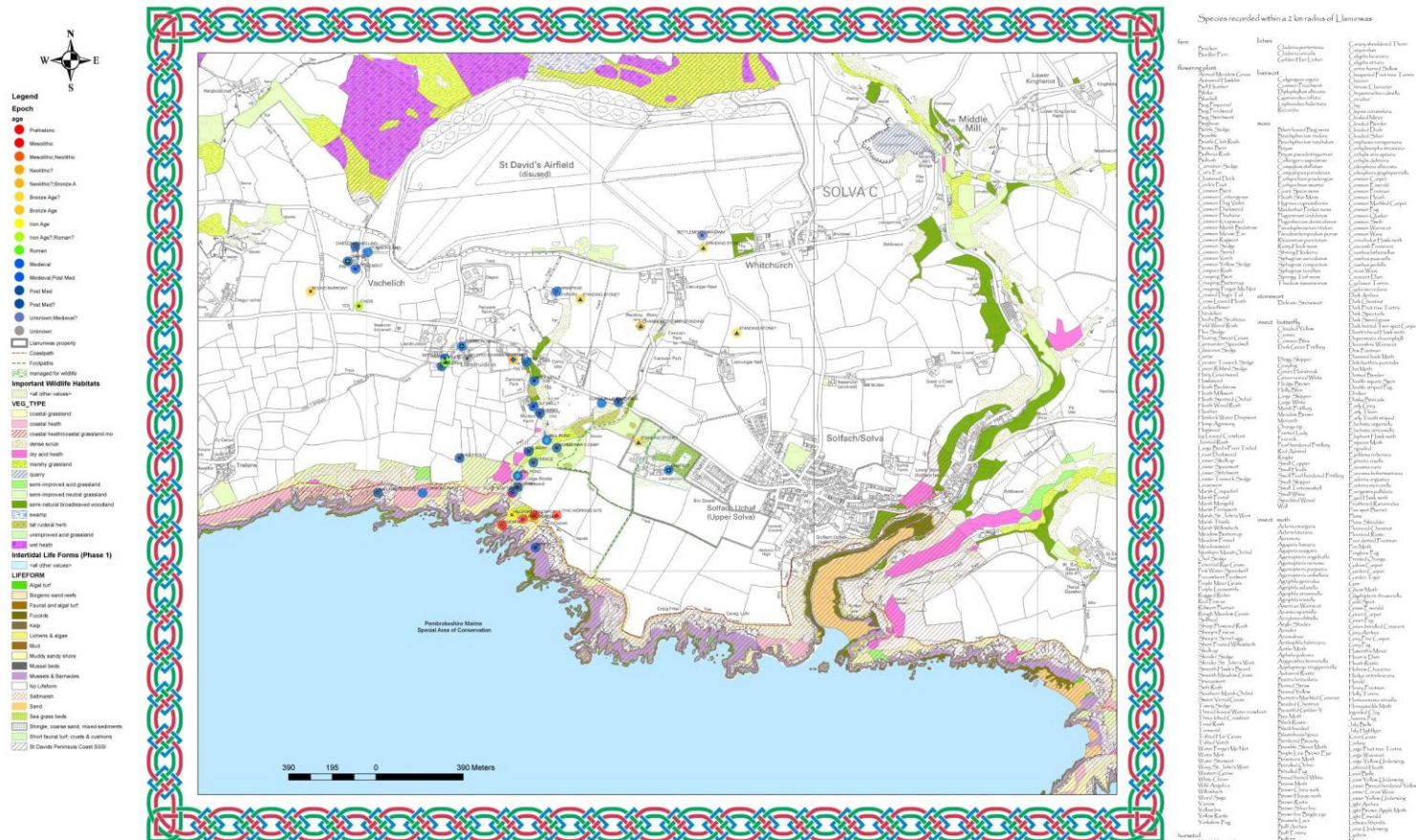
Interviews were conducted by Sarah Beynon (Consultant) around a questionnaire drawn up in consultation with other stakeholders. The questionnaire (*Appendix 2*) brought together important points raised in earlier meetings. The questionnaire covered current availability of information on natural assets and diversification; how the gaps in knowledge can be assessed; how best to liaise with farmers and how farmers feel about receiving site-specific reports or regional overviews, individual visits by ecologists and attending meetings and seminars on the subject. The possible conflict between farmers and ecologists and confidentiality issues of any data collected on farms was also discussed. Further to this, farmers were informed about existing biodiversity and natural resource information services and questioned how this information could be useful to them in terms of assisting in diversification and raising awareness of species, habitats and geology on their land.

A site-specific report (Map 1) of species, habitats, ancient sites, geology and information on interesting features such as hedgerows on an example farm (Llanunwas, Solva) was produced as an example, with a user-friendly key to habitats and ancient sites, as well as a species list of everything that has been recorded in 2km². This map was taken along with the questionnaire to each farmer in order to assess whether a site-specific desktop report (Map 1) like this could be of use to the farmers in helping them diversify their land use to incorporate the sustainable use of local natural resources.

In consultation with other stakeholders at earlier meetings it became apparent that individual farm visits by recorders producing a report of species, habitats and management suggestions on each farm may be useful. Stakeholders suggested that most farmers are generally not willing to attend meetings and workshops regarding the utilisation of the natural assets on their farm. Reasons for this included the fact that they may be suspicious of environmental red tape and are often too busy to actively make the effort to attend. It was therefore suggested that farmers should be asked how they would best like to receive information on the natural assets of their land and this was incorporated into the interviews with them.

Map 1. Pembrokeshire Natural Capital Audit - site-specific report

This map shows cultural and natural history sites in the vicinity of Llanunwas, Solva. Data provided by Cambria Archaeology, Countryside Council for Wales. Mapping and biological data by WWBIC. The following species have been recorded within 2km of Llanunwas.



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5. RESULTS OF THE STAKEHOLDER ANALYSIS

Representatives of the Farming Community

Sarah Beynon (Consultant) conducted a comprehensive evaluation of the views and responses of 16 farmers for this report. The results bring together a picture of what farmers in West Wales would like to receive in terms of information and help regarding natural assets and how they would prefer to receive it. The self-contained report prepared by Sarah is best presented in full at a later stage. Please consult *Appendices 1,2 & 3* for farmer profiles, the questionnaire used in the interviews, and for the full detail of the results. The following is a summary of the main findings:

- 56% of farmers do not think there is enough information available on the natural assets on their land.

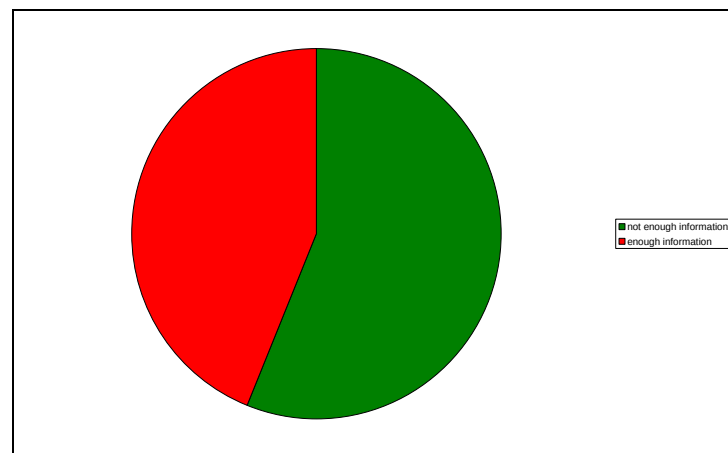


Figure 1: The percentage of farmers that do not think there is enough information available on the natural assets on their land

- Even if there is information available to farmers regarding natural assets and how best they can tap into them, this information is not available to everyone. Those who have received good information have generally received it from friends and private contacts.
- Farmers generally find it difficult knowing where to start when looking for information and find that most of the facts are hidden in jargon.

- 81% of farmers are aware that they have natural assets on their land that they could utilise in terms of diversification.

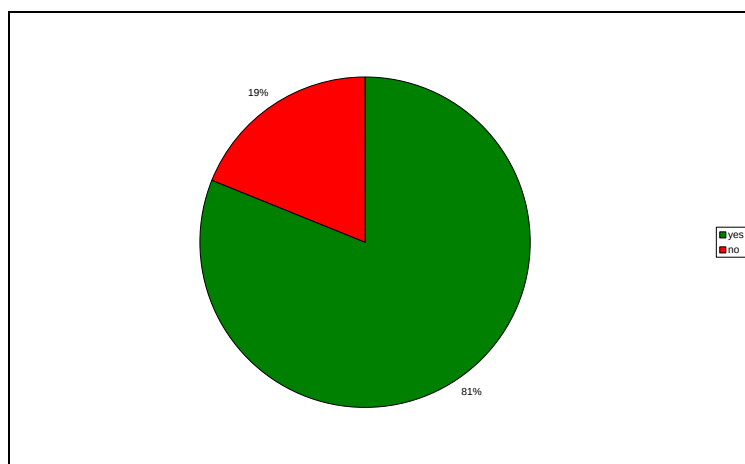


Figure 1: The percentage of farmers that think they have natural assets that they could utilise for diversification

- 94% of farmers would like to learn more about the natural assets on their land and agree that they need more information in order to tap-into them.

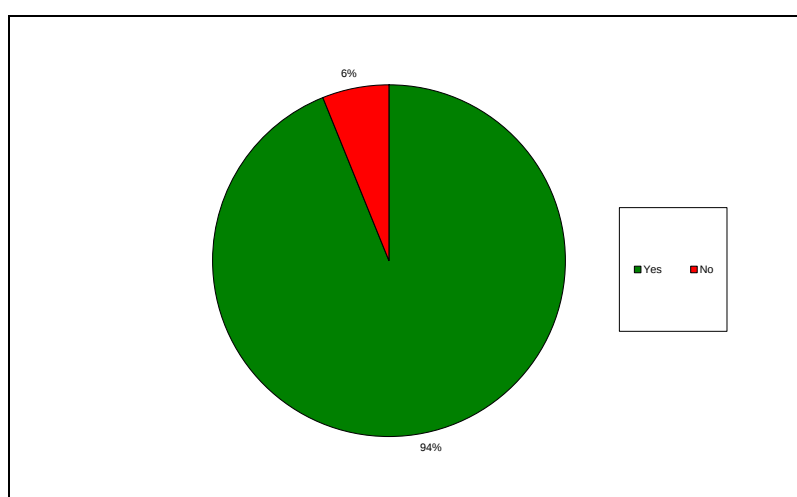


Figure 2: The percentage of farmers that would like to learn more about the natural assets on their land

- 100% of farmers wanting information on natural assets believe that a site-specific report of their farm is the best method of providing them with it.
- 100% of farmers interested in receiving information would like a survey of their farm by recorders as a follow-up to the map in order to personalise the information to the individual farm.
- 69% of farmers would like to include a full species list from the surrounding 2km² on a map, whilst 31% of farmers believe a full species list is not necessary.

- All farmers agree that information on species needs to be made more user-friendly, with priority and rare species highlighted, and perhaps the information linked back to an online key.
- 100% of farmers wanting to receive a survey would like to have information on ancient site and geology included.
- 100% of farmers would like there to be an organisation in West Wales that acted as a hub of information regarding natural assets, channelling it where it is needed.
- 75% of farmers may be willing to pay for a service such as a site-specific report followed by a survey, but only if it could actively help them in terms of increasing production, reducing production costs, joining agri-environment schemes or getting access to funding. 25% of farmers however would not pay for this service.

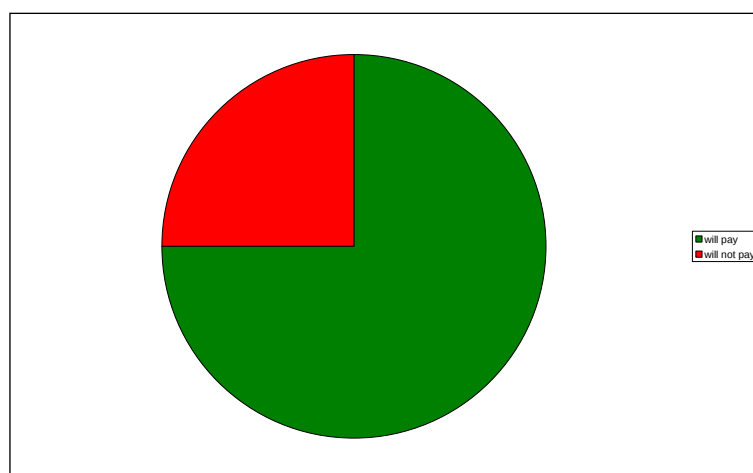


Figure 3: The percentage of farmers willing to pay for site-specific information

- 88% of farmers believe that a site-specific report should include all public-domain information on the farm and the surrounding area, whilst 12% believe that information should be included about the farm in question only.
- 50% of farmers believe that showing even information in the public domain for neighbouring farms on a report may cause conflict between neighbours, but the majority agree that this should not prevent providing this service.
- 94% of farmers are happy for their neighbours to be given a site-specific report showing the habitat, geological and historical information on their land, whereas 31% of farmers think that it is a good idea to show on a site-specific report only sites that are viewable from public rights of way. 63% of farmers believe that this is not necessary. (Farmer 1, the remaining 6%, would not like a site-specific report to be distributed in any form).
- 100% of farmers interested in receiving information on natural assets agree that by giving scientists access to their land, they should be given the choice as to what happens to the data collected. Even individual farmers who are happy for information

to be released into the public domain believe that this would gain the trust and respect of the farmer.

- 56% of farmers worry about ecologists and biologists visiting their land, finding rare species and making them change their farming regime by protecting a site. 44% of farmers do not worry about this.

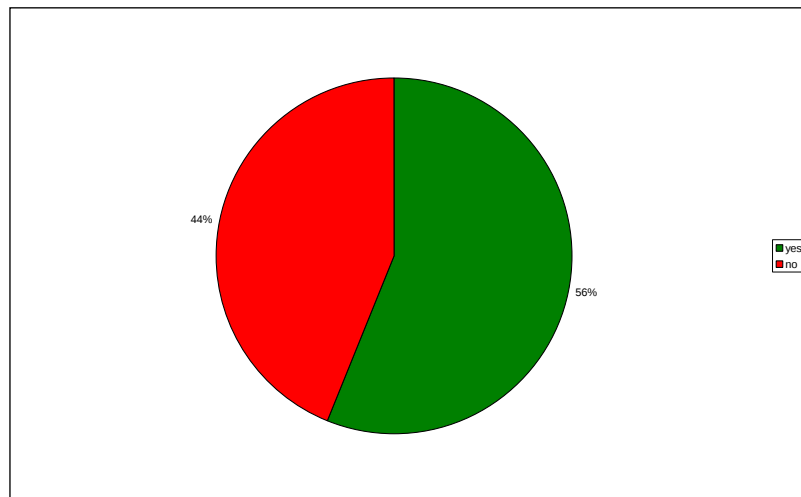


Figure 4: The percentage of farmers that are cautious about allowing conservationists onto their land

- The majority of farmers agree that only a certain type of farmer will attend workshops to find out how to use natural assets on their land, as many do not have the time or are sceptical of how useful workshops would be. However, small on-farm workshops would be of interest.
- 100% of farmers with holiday accommodation would put a large format map (see map 1) up in the accommodation to show guests what natural assets are on the farm and in the surrounding area.
- 100% of farmers with tourist accommodation would use information on priority and rare species, priority habitats and ancient as well as geological sites in order to market their business.
- 100% of farmers with tourist accommodation would like to be provided with more information (in the form of leaflets and booklets) on the natural assets in their area, especially if a central body could bring this together and distribute it. This information would then be made available to guests.
- 50% of farmers believe that this service would not be overlapping with any other organisations. The 50% that do see a slight overlap all agree that the information provided by a site-specific report and follow-up survey would clarify other schemes, bringing together information in a way that no other organisation does. A number of farmers do suggest that close contact must be kept with FWAG in order to prevent overlap.

The full details from this survey are found in *Appendix 3*.

Other Stakeholder Agencies

We held consultations with the following agencies and representatives. The majority favoured the provision of site-specific reporting to farmers as a means of assisting diversification rather than provision of regional overview information.

Carmarthenshire County Council & Carmarthenshire LBAP

Isabel Macho, 8 January 2008, Landsker Business Centre

Biodiversity Officer Tel: 01267 224653 Email: imacho@carmarthenshire.gov.uk

Rosie Carmichael, date to be announced

Rural Conservation Officer Tel: 01267 224653

Email: racarmichael@carmarthenshire.gov.uk

Isabel expressed interest in the audit and conveying information to the farming community. She offered the service of the Biodiversity Partnership in this regard. We explained who the contacts in Carmarthenshire are for the project.

Countryside Council for Wales (CCW)

Matt Sutton, 8 January 2008, Landsker Business Centre

Senior Conservation Officer Tel: 01646 624000 Email: m.sutton@ccw.gov.uk

Bob Haycock, 29 January 2008, Landsker Business Centre

Senior Reserves Manager Tel: 01646 661368 Email: b.haycock@ccw.gov.uk

Matt felt that the focus of the audit was not properly defined but was positive in terms of the long term aim of producing localised site-specific reports for individual farms. It was suggested that similar work to 'Wildlife on Your Farm' could be put into action, whereby if farms were interested, once maps and desk based reports had been received, further field surveys could be done on the farms. A concern for the use of localised maps was the possibility of farmers not liking their neighbour knowing information about what is on their own land. The combination of a desktop report from WWBIC with site visits by recorders and management recommendations from the CCW conservation officer held great potential and if we could find the means for re-instigating a farm survey approach it would be welcomed by Matt. Bob Haycock advised us on important bird species in Pembrokeshire and alerted us to unwise hunting of certain species.

Pembrokeshire Coast National Park Authority

Mike Howe, 25 January 2008, Landsker Business Centre

Conservation Officer, Tel: 0845 3457275 Email: mikeh@pembrokeshirecoast.org.uk

Geraint Jones, 25 January 2008, Landsker Business Centre

Mike expressed support for the audit and was glad to see the records centre being used in this way. Geraint liaises closely with farmers and land-owners in the park and we discussed all manner of information services, including the mapping of Welsh field names as part of the cultural record.

Pembrokeshire County Council

Trevor Theobald, 8 January 2008, Landsker Business Centre

Planning Assistant Ecologist Tel: 01437 776246

Email: trevor.theobald@pembrokeshire.gov.uk

Trevor endorsed the audit and the role of the LRC with supplying the data. He explained to other stakeholders present the benefits of everyone using the LRC in projects such as these as a toolkit for conservation.

National Trust

Richard Ellis, 23 January 2008, Craig y Borian

Tel: 01646 661359 Email: richard.ellis@nationaltrust.org.uk

Richard provided background on National Trust tenancy arrangements and data on NT properties in the region. He is of the opinion that the ways in which farms work is influenced mainly by Tir Gofal. He thinks there are two main uses of this report; diversification into tourism and land use practices/ management.

Pembrokeshire Biodiversity Partnership

Bethan Cox, 15 January 2008, Stackpole

Biodiversity Officer Tel: 07901 541728 Email: bethan.cox@pembrokeshire.gov.uk

The audit was mentioned and explained in a presentation to members of the LBAP. Future liaison with the LBAP on the audit to be arranged.

Ecological Consultants

Richard Pryce & Associates 1 February 2008

Ecologist Tel: 01554 775847 Email: pryceeco@aol.com

Sarah Beynon, 8 January 2008, Landsker Business Centre

Ecologist Tel: 07966 956357 Email: sarah.beynon@hotmail.co.uk

Sarah has worked closely with FWAG, with organic farmers and has conducted beetle research on and off Tir Gofal properties so she is well qualified to conduct the farmer interviews as part of this audit. Sarah explained to other stakeholders present in a meeting how farmers may perceive conservationists and we discussed access issues.

Tir Gofal

Alistair Sibley, 21 January 2008, Landsker Business Centre

Tir Gofal Officer Tel: 01646 624008 Email: alistair.sibley@wales.gsi.gov.uk

Alistair reiterated the opinion that the regional maps will not be of great use to the individual farmer. Were the farmers to have a map showing their own farm and the location of vulnerable habitats and species, it is much more likely to create interest in the farmer and therefore more likelihood of the farmer protecting the habitat that supports the particular species. If the farmers know the reason of why they are managing a habitat in a particular way, they will be more enthused to preserve it. Individual farm maps could also be of use for 'Education Access'. As part of Tir Gofal, farmers receive payment for allowing access to school field trips. Alistair confirmed that TG is the most obvious way in which interested farmers may diversify their land-use for sustainable use of natural resources but also provided information on other more common agri-environment schemes. For data protection reasons they are unable to allow us to include the farm boundaries on a map of protected sites. Alistair confirmed that farmers need to know the protected or priority habitats that occur on their farms in order to qualify for TG and he confirmed that currently farmers have no ready access to this information. A clear opportunity exists for providing this information with site-specific reports. Alistair also

informed us that farmers currently have no easily accessible advisory service for the basic environmental information on growing season, precipitation etc for their farms so an opportunity exists to include these data on the maps. But there was research on this topic at Aberystwyth University which we hope to uncover. (WWBIC will be holding this information from the MetOffice).

Farming and Wildlife Advisory Group (FWAG)

Huw Thomas, 16 January, Landsker Business Centre

Farm Conservation Adviser Tel: 01656 722270 Email: huw.thomas@fwag.org.uk

Huw suggested that in order to protect biodiversity, farmers have to see an incentive. By knowing what natural assets are on their farm, interest will be created and if there are diversification opportunities the incentive will be there. A spin-off of this interview was the discovery that FWAG hold a dataset (not current) of species records encountered on site visits which they are prepared to share with the records centres. Huw agreed that the provision of a site-specific report on species, habitats and sites for a given farm would be exceptionally useful to him in his work, especially if received before a site visit.

Farmers' Union of Wales

Rebecca Williams 19 February 2008, FUW Office Haverfordwest

Pembrokeshire Executive Officer Tel: 01437 762913

Rebecca does not agree that agri-environment schemes are a form of diversification. These schemes come under the normal farming unit. Diversification is using methods that are completely different from those that are already in place. Rebecca suggested “educational access” as a means of diversifying for those farms that do not qualify for Tir Gofal, such as an intensive dairy farm. (This is available for Tir Gofal farms as mentioned by Alistair Sibley) Rebecca thought that many farmers do not know what is on their farms, in terms of biodiversity, and therefore surveys and localised maps would be of benefit. Access must be made clear otherwise this could become an issue between neighbouring farmers. In terms of opportunities for diversifying, many farmers will be interested if money can be made or if there are opportunities to save money.

National Farmers Union

Dylan Morgan 25 February 2008, Landsker Business Centre

Farm Policy Adviser Tel: 01982 554200

In terms of diversification, Dylan favoured capitalising those natural resources that are already found on the farm. He was of the opinion that more research should be undertaken that looks into ways of utilising energy on farms. Firstly this could save the farmer money on their own farm and in the future the method could be marketed to a wider audience. Information regarding this form of diversification needs to be more readily available. Dylan mentioned a project that is in place within Carmarthenshire-Tywi Afon yr Oesoedd. This is a farming and community based project designed to encourage people to carry out work that will be of benefit to the valley environment. Grants are available for the work, such as hedge planting. Dylan expressed an interest in working more closely with WWBIC on future projects to strengthen the partnership between farming and conservation.

British Association for Shooting and Conservation (BASC)

Meurig Rees (Wales), 25 January 2008, Landsker Business Centre
Country Officer Tel: 07917 489097 Email: Meurig.rees@basc.org.uk
Michael Sherman (Pembs), 25 January 2008, Landsker Business Centre
Council Member Tel: 07774 862304 Email: mike@deer.co.uk

Both expressed interest in the audit and a willingness to share data in the future but only after publication of game bag data. Meurig provided the background to BASC across Wales and contact details for sources of information. Michael is Chairman of various hunting interests in Pembs and was able to provide the local detail on exactly what is shot. They were reluctant to provide data on exact shoot locations because of feared antagonism from campaigners. For detailed information resulting from this interview please read the section on hunting under recreation.

Environment Agency Wales

Teg Jones, Hilary Foster, 17 January 2008, Landsker Business Centre
teg.jones / hilary.foster@environment-agency.wales.gov.uk
Teg and Hilary were interested in the audit and agreed that EAW could help supply information relating to natural resources associated with freshwater bodies. Matt Strickland kindly provided river stretch fishing potential data for the recreation section separately.

Cambria Archaeology

Louise Austin and Marion Page, 14 January 2008, Llandeilo
Head of Heritage Management Tel: 01558 823121 Email: louise@cambria.org.uk

WWBIC and Cambria Archaeology are working together on a number of projects at the moment and we held an interesting meeting on how we can make our data holdings available to the farming community. CA showed us samples of the work they do for Tir Gofal applications. We discussed the provision of site-specific reports and combining our information on large format maps. Consequently they have contributed a significant section of this report – see Historical Landscape. Louise felt that there may be some overlap between the audit and ‘Farming Connect’.

Geology

Sid Howells, CCW, 8 January 2008, Landsker Business Centre
Earth Scientist Email: sid.howells@virgin.net

Sid suggested that good interpretation is needed in terms of geological information. The coastal areas are quite well known for the different geology; however the inland areas need more coverage. Care needs to be taken when flagging up small sites. There is the possibility that the sites could become vulnerable as a result of visitors. If there is a conflict in providing site-specific info relating to neighbours’ properties Sid made the pragmatic suggestions that we could filter only data within a certain distance of public access.

6. IMPORTANT HABITATS WITHIN PEMBROKESHIRE

Protected and Priority Habitats

Agricultural intensification in Britain has seen the displacement of wild habitats by improved pasture, arable fields and afforestation. Habitat loss is seen as one of the gravest threats affecting biodiversity conservation worldwide. The UK is now a signatory to the Convention on Biological Diversity and part of this commitment involves the protection and restoration of wild or 'semi-natural' priority habitats. This is implemented through the UK Biodiversity Action Plan. Loss of these habitats on a farm represents a threat both to the UK in meeting its conservation obligations and also to the farmer if the site is designated and management activities are not permitted. But the presence of these habitats also represents an opportunity to the land-owner. Currently the most widely used implement for diversification of land-use using natural resources by farmers is the Tir Gofal Agri-Environment Scheme. As part of their qualification to this scheme, farmers must demonstrate that semi-natural habitats occur on their farm and the financial rewards are then aimed at restoring or improving the condition of these habitats. Farmers need good site-specific information about what is special on their piece of land so that they can plan an effective and appropriate diversification strategy. The section that follows is an inventory of the type, extent and condition of semi-natural habitats that occur across Pembrokeshire.

Semi-natural habitats are defined here as a habitat which has been modified to a limited extent by man and those areas of a farm that are non-productive, i.e. areas with no intentional inputs of pesticides or nutrients and remaining effectively undisturbed.

		Code	Area (ha)	%	Count	Mean
WOODLAND & SCRUB	semi-natural broadleaved woodland	A.1.1.1	6969	4.43	3892	1.8
	planted broadleaved woodland	A.1.1.2	344	0.22	297	1.2
	planted coniferous woodland	A.1.2.2	2834	1.80	590	4.8
	semi-natural mixed woodland	A.1.3.1	19	0.01	9	2.1
	planted mixed woodland	A.1.3.2	533	0.34	190	2.8
	dense scrub	A.2.1	4109	2.61	5437	0.8
	felled broadleaved woodland	A.4.1	11	0.01	16	0.7
	felled coniferous woodland	A.4.2	144	0.09	38	3.8
GRASSLAND & MARSH	unimproved acid grassland	B.1.1	374	0.24	180	2.1
	semi-improved acid grassland	B.1.2	592	0.38	284	2.1
	semi-improved neutral grassland	B.2.2	3746	2.38	3350	1.1
	unimproved calcareous grassland	B.3.1	9	0.01	21	0.4

		Code	Area (ha)	%	Count	Mean
	semi-improved calcareous grassland	B.3.2	7	0.00	7	1.0
	improved grassland	B.4	100861	64.08	4944	20.4
	marshy grassland	B.5	3258	2.07	2813	1.2
	marshy grassland <i>Juncus</i> dominated	B.5.1	2	0.00	1	1.5
	marshy grassland <i>Molinia</i> dominated	B.5.2	3	0.00	1	2.7
TALL HERB & FERN	bracken	C.1.1	2243	1.43	2630	0.9
	tall ruderal herb	C.3.1	138	0.09	572	0.2
	non-ruderal herb and fern	C.3.2	0	0.00	1	0.2
HEATHLANDS	dry acid heath	D.1.1	1546	0.98	437	3.5
	dry basic heath	D.1.2	1	0.00	1	0.7
	wet heath	D.2	1664	1.06	322	5.2
	dry heath/acid grassland mosaic	D.5	1181	0.75	68	17.4
	wet heath/acid grassland mosaic	D.6	120	0.08	31	3.9
MIRE	raised bog	E.1.6.2	3	0.00	1	3.5
	wet modified bog	E.1.7	86	0.05	7	12.3
	dry modified bog	E.1.8	3	0.00	4	0.8
	acid/neutral flush	E.2.1	253	0.16	121	2.1
	basic flush	E.2.2	7	0.00	10	0.7
	fen	E.3	7	0.00	10	0.7
	valley mire	E.3.1	31	0.02	10	3.1
	modified valley mire	E.3.1.1	26	0.02	9	2.9
	basin mire	E.3.2	0	0.00	2	0.1
	flood-plain mire	E.3.3	0	0.00	1	0.4
	bare peat	E.4	3	0.00	1	2.7
SWAMP, INUNDATION	swamp	F.1	305	0.19	388	0.8
	inundation vegetation	F.2.2	3	0.00	6	0.4
OPEN WATER	standing water	G.1	327	0.21	1180	0.3
	running water	G.2	117	0.07	105	1.1
COASTLAND	intertidal mud/sand	H.1.1	130	0.08	195	0.7
	intertidal cobbles/shingle	H.1.2	134	0.09	488	0.3
	intertidal rocks/boulders	H.1.3	183	0.12	1155	0.2
	salt marsh	H.2.6	137	0.09	148	0.9
	mud/sand above mhw	H.3.1	25	0.02	110	0.2
	shingle/gravel above mhw	H.3.2	41	0.03	115	0.4
	rocks/boulders above mhw	H.4	44	0.03	271	0.2
	dune slack	H.6.4	15	0.01	18	0.8
	dune grassland	H.6.5	275	0.17	49	5.6

	Code	Area (ha)	%	Count	Mean
dune scrub	H.6.7	24	0.02	23	1.1
open dune	H.6.8	245	0.16	59	4.2
hard cliff	H.8.1	364	0.23	507	0.7
soft cliff	H.8.2	8	0.01	27	0.3
coastal grassland	H.8.4	594	0.38	444	1.3
coastal heath	H.8.5	388	0.25	341	1.1
coastal heath/coastal grassland mosaic	H.8.6	10	0.01	6	1.6
ROCK EXPOSURE & WASTE					
acid/neutral inland cliff	I.1.1.1	1	0.00	5	0.1
basic inland cliff	I.1.1.2	0	0.00	1	0.1
acid/neutral scree	I.1.2.1	0	0.00	1	0.1
acid/neutral rock	I.1.4.1	4	0.00	20	0.2
basic rock	I.1.4.2	4	0.00	6	0.7
quarry	I.2.1	158	0.10	100	1.6
spoil	I.2.2	5	0.00	10	0.5
refuse-tip	I.2.4	41	0.03	25	1.6
MISCELLANEOUS					
arable	J.1.1	14868	9.45	2074	7.2
amenity grassland	J.1.2	571	0.36	391	1.5
ephemeral/short perennial	J.1.3	18	0.01	41	0.4
introduced scrub	J.1.4	1	0.00	4	0.2
gardens	J.1.5	165	0.10	463	0.4
caravan site	J.3.4	362	0.23	184	2.0
sea-wall	J.3.5	4	0.00	9	0.4
buildings	J.3.6	5522	3.51	7275	0.8
track (not comprehensively digitised)	J.3.7	190	0.12	619	0.3
bare ground	J.4	173	0.11	313	0.6
not accessed land	NA	823	0.52	885	0.9
TOTAL		157405	100.00	44369	3.5

Lowland Heath

Heather habitats are classed as *moorland* if they occur above 300m in the UK and *heathland* if they occur below this altitude. Heathland or lowland heath is one of the most threatened habitats in Europe and as much as 80% of the UK total has been destroyed since 1850.

On account of its importance as a priority habitat for the region we have carried out a separate GIS analysis of its extent (this analysis excludes coastal heath): Pembrokeshire hosts a total of 4,516 hectares of heather habitats scattered in 859 identifiable patches. The mean patch size is 5.3 ha. Approximately 34% of Pembrokeshire heather occurs above 300 m altitude. There are 38 identifiable patches of moorland spanning a total of 1,550 ha. The remaining 66% can be classed as lowland heath and is distributed across 821 identifiable patches spanning 2,966 ha. The heathland patches are far more dispersed

and smaller (mean patch size 3.6 ha) than the moorland patches (mean patch size 40.8 ha). Opportunities to connect these fragmented patches are highly welcomed by conservationists.

Pembrokeshire contains more lowland heath than any other region in Wales and it is also very different from that found on the sandy soils in other parts of the UK. Pembrokeshire heaths rest on impervious soils and one third are classed as wet heaths which are exceptionally rich in sedges and mosses. All heather habitats are arrested from succeeding into woodland either by natural forces such as salt spray on the coastal strip or by management such as burning. In Pembrokeshire lowland heath was maintained in the past by grazing, notably by farm horses which grazed heavily on the purple moor grass element during early summer when it was growing. Heaths provide very useful grazing on relatively infertile acid soils because heather has a wide growing season extending into the winter months.

Pembrokeshire heaths are most threatened by neglect. Fifty seven percent occur on common land and may be prone to poor management. Overgrazing by sheep is especially damaging to young heather and leads to heather being displaced by grasses. Fortunately the grazing of heather in Pembrokeshire by sheep is restricted and occurs mainly in the Preselis where there is more resilient moorland. There are opportunities to achieve worthwhile conservation objectives by light grazing with Welsh mountain ponies or Welsh black beef. These management programmes are rewarded under the agri-environment schemes.

Trees and Hedgerows

WWBIC holds a database on veteran trees compiled by Jon Hudson. There are some 500 trees mapped in Pembrokeshire, mostly in the Cleddau Estuary part of the PCNP. The project has recently been extended with training to tree recorders in Carmarthenshire. In time this may be combined with the Local Planning Authorities Tree Preservation Order holdings and there will be a major data holding for the region that may be queried or added to. These data would become available to farmers on site-specific reports by the records centre. WWBIC is also embarking on a project to map hedgerows from aerial photographs. We are awaiting some data on field boundaries from Rural Payments Agency which will enable accounting and inventory of these linear features and also farm and field unit size for future elements of the Natural Capital Audit.

Intertidal Habitats

A full account of all intertidal biotopes recorded along the Pembrokeshire Coast is provided in *Appendix 4*.

This is a summary of the extent of the intertidal life forms found in Pembrokeshire.

Life Form	Frequency	Area (ha)	Percent Area	Mean patch size (ha)
Algal turf	1733	89.42	2.18	0.05
Biogenic sand reefs	14	0.26	0.01	0.02
Faunal and algal turf	18	0.05	0.00	0.00
Fucoids	4113	618.02	15.10	0.15

Kelp	1622	154.66	3.78	0.10
Lichens & algae	2667	336.92	8.23	0.13
Mud	234	895.07	21.87	3.83
Muddy sandy shore	33	121.14	2.96	3.67
Mussel beds	57	39.64	0.97	0.70
Mussels & Barnacles	3787	536.34	13.10	0.14
No Lifeform	29	1.51	0.04	0.05
Saltmarsh	205	229.46	5.61	1.12
Sand	457	780.71	19.07	1.71
Sea grass beds	7	71.22	1.74	10.17
Shingle, coarse sand, mixed sediments	726	217.38	5.31	0.30
Short faunal turf; crusts & cushions	390	1.15	0.03	0.00
Grand Total	16092	4092.93	100.00	0.25

Other important marine habitats around Pembrokeshire include sheltered muddy gravels, sublittoral sands and gravels, saline lagoons, tidal rapids.

Opportunities for the Sustainable Use of Habitats

Woodlands

Woodlands may be harvested in a sustainable way to provide materials for a number of different outcomes. Selective coppicing, a useful management technique and a traditional practice, can enhance the structure and variety within woods. The coppiced wood can be used for crafts such as basket weaving, wattling and furniture production. Care needs to be taken that coppicing is only carried out in areas where it can be sustained.

A significant amount of woodland is currently under-managed. The sale of wood fuel could offer a new source of income to woodland owners. Wood fuel technologies to provide heat and power are well developed in many European countries. Automated wood-fired central heating systems use wood pellets or chips. If managed sustainably, wood is a renewable fuel that can be replenished continuously from local woodlands.

Scrub Clearance and Charcoal Production

Charcoal production is a useful process for adding value to the management of derelict coppices or other neglected woodland. However, profits are low for small-scale operators. Small or medium scale operators are only likely to be commercially viable if it is tied in with other woodland management enterprises. It should be noted that planning permission may be needed to site the kiln.

Oak gives the best return by weight, however a higher value may be found for its use elsewhere. Good quality charcoal for barbeque use can be resourced from:

- Ash
- Sycamore (quick and easy to convert to charcoal)
- Beech
- Hornbeam
- Elm

Reasonable charcoal can be sourced from:

- Birch
- Hazel

For more information on charcoal production courses contact:

Woodland Skills Centre

Rod Waterfield

The Warren

Bodfari

Denbigh

LL16 4DT

Tel: 01745 710626

Email: enquiries@woodlandskillscentre.co.uk

BTCV organise training courses for different skills that are used within the countryside. They also publish handbooks on the different skills used within the countryside. (www2.btcv.org.uk)

Hedge-laying and Drystone-walling

As part of the Tir Gofal agri-environment scheme, payments can be paid in support of hedge-laying.

- National Hedge Laying Society
- BTCV (British Trust for Conservation Volunteers) organise courses throughout the UK (see website- address below)
- In association with the Dry Stone Walling Association of Great Britain, Lantra run courses.
- Two levels of qualification.
- Price for the courses range from £85 - £110.

(Lantra Awards specialises in qualifications and training for people in the land-based sector through a network of local approved centre and training providers.)

- South Wales Branch of the Dry Stone Walling Association- organise training courses for complete beginners.
 - Ken Young
Caewern
Cwmalsie Lane
Pontllan Fraith
Blackwood
Gwent NP2 2LX
Tel: 01495 226276

Reedbeds and Thatching / Peat

The distribution of swamp, marginal and inundation vegetation habitat classes are shown on Map 2 and these reflect reedbeds most closely (area details to be supplied in later version). Mire habitats offer potential for peat harvesting and are also shown on Map 2.

Reedbeds within this region require harvesting as part of local conservation management. As a result, this habitat offers a resource for thatching industries. The harvesting of reedbeds and peatbeds must be done sustainably to avoid over-exploitation and damaging the natural resource.

For information on either of these natural resources please contact Matt Sutton (Senior Conservation Officer) at the Countryside Council for Wales (CCW):
Tel: 01646 624000
Email: m.sutton@ccw.gov.uk

7. IMPORTANT SPECIES WITHIN PEMBROKESHIRE

Pembrokeshire has a rich diversity of flora and fauna. Several priority and protected species occur within Pembrokeshire's varied habitats and landscape. These species act as important indicators and reflect the status of the Pembrokeshire countryside; many occur on the Pembrokeshire Local Biodiversity Action Plan (LBAP) (*Appendix 5*). These represent important elements of our biodiversity that need (by law) to be safeguarded. We also mention in this section some species that may offer economic opportunities.

Mammals

Riparian Mammals

The water vole (*Arvicloa terrestris*), is a species suffering long term decline in Great Britain. Water voles inhabit well vegetated, slow running, waterways. In Pembrokeshire the water vole has been sparsely recorded in recent years; they are most likely to occur in the north of the county.

Otter (*Lutra lutra*) are widespread in Pembrokeshire, otter signs can be identified on almost any waterway in the county from coastal regions to small inland ditches. Otters are sensitive to habitat destruction and pollution and their presence is a good indicator of clean rivers and streams.

Terrestrial Mammals

The bank vole (*Clethrionomys glareolus*) and field vole (*Microtus agrestis*) are common throughout Pembrokeshire. The dormouse (*Muscardinus avellanarius*) is a rarely seen, nocturnal mammal. Normally found in deciduous woodland, in Pembrokeshire its distribution is very localised. Dormice have only been recorded in Pengelli Forest; however, it may also occur in the Nevern Valley.



Dormouse

The harvest mouse (*Micromys minutes*) is also very scarce in the county but the wood mouse (*Apodemus sylvaticus*) and house mouse (*Mus musculus*) are both widespread.

The stoat (*Mustela nivalis*), weasel (*Mustela erminea*), polecat (*Mustela putorius*) American mink (*Mustela vison*) and badger (*Meles meles*), all members of the mustelid family, are widely distributed throughout the county as is the red fox (*Vulpes vulpes*).

Sightings of the brown hare (*Lepus europaeus*) in Pembrokeshire are quite rare; a recent sighting in St David's and the discovery of a community in the east of the county indicate a localised distribution. Rabbits are a common sight in Pembrokeshire.



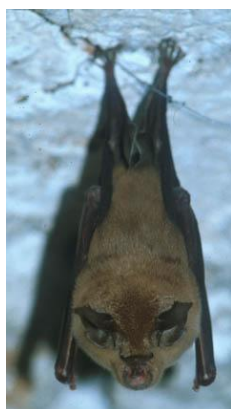
Brown hare



European hedgehog

The European mole (*Talpa europaea*) and hedgehog (*Erinaceus europaeus*) are widespread but declining in the county.

The grey squirrel (*Sciurus carolinensis*) common (Sorex araneus), pygmy (Sorex minutus) and water shrew (*Neomys fodiens*) are all widely distributed. Red deer (*Cervus elaphus*) and sika deer (*Cervus nipon*) occur along the Teifi valley and fallow deer (*Dama dama*) and muntjac (*Muntiacus reevesi*) are occasionally recorded.



Lesser horseshoe bats (*Rhinolophus hipposideros*) are widespread in the county, with hibernation sites scattered throughout. There are ten known roosts in the south of the county. The greater horseshoe bat (*Rhinolophus ferrumequinum*) has three known maternity roosts in the county and a few hibernation sites. Both species use hedgerows and wooded areas as flight routes with greater horseshoe bats travelling 15km in a night. Both species are likely to be losing potential roosting locations through building renovations and barn conversions.

Greater horseshoe bat

Soprano pipistrelle bats (*Pipistrellus pigmaeus*) are widespread in Pembrokeshire; they often forage around freshwater habitats and tend to avoid open habitats. Other bat species found in Pembrokeshire are: natterer's bat (*Myotis nattereri*); Daubenton's bat (*Myotis daubentonii*); whiskered bat (*Myotis mystacinus*); Brandt's bat (*Myotis brandtii*); serotine bat (*Eptesicus serotinus*); noctule bat (*Nyctalus noctula*); common pipistrelle (*Pipistrellus pipistrellus*); barbastelle (*Barbastella barbastellus*) and brown long-eared bat (*Plecotus auritus*).

Marine Mammals

Grey seals (*Halichoerus grypus*) can be seen almost anywhere on the Pembrokeshire coast and occasionally up the Cleddau estuary. Ramsey Island holds the largest population of grey seals in southern Britain. Common dolphin (*Delphinus delphis*), bottle-nosed dolphin (*Tursiops truncatus*), harbour porpoise (*Phocoena phocoena*) and Risso's dolphin (*Grampus griseus*) are regularly seen around the coast. All these provide

very important attractors for tourism operations in the form of boat rides. There is concern about harm done by high speed RIBs to the animals and their environment especially around some of the sites on Ramsey but this must be balanced against benefits in the form of promoting awareness, education and some economic benefits to the locality.

Amphibians and Reptiles

The palmate newt (*Triturus helveticus*), common toad (*Bufo bufo*) and common frog (*Rana temporaria*) are amphibian species that occur in Pembrokeshire and are widespread. They are most commonly seen in spring in and around fresh water streams and pools where they return to breed.

The common lizard (*Zootoca vivipara*), slow worm (*Anguis fragilis*), grass snake (*Natrix natrix*) and adder (*Vipera berus*) are all reptile species that occur in the county and are widely distributed.

Grassland Fungi

The pink waxcap (*Hygrocybe calyptriformis*) is an ideal flagship species for the waxcap grassland habitat. There are records for this species from 42 sites in Pembrokeshire. Pink waxcaps grow on unimproved or semi-improved neutral grassland throughout Pembrokeshire. The date-coloured waxcap (*Hygrocybe spadicea*) is found at three sites in Pembrokeshire; two in the north and one in the south, all on grazed land.

The olive earth-tongue (*Microglossum olivaceum*) can be found at nine sites in Pembrokeshire, most in lowland areas with two in the north of the county. All nine sites are on very short neutral grassland. Bloxam's blue pink-gill (*Entoloma bloxamii*) has been recorded at five sites in Pembrokeshire, all in the south of the county.

Birds

Barn owls (*Tyto alba*) are a predominantly farmland species that feed on small mammals. They hunt rough, tussocky grassland, field edges and roadside verges. Locally distributed throughout Pembrokeshire, they are associated with river valleys and the limestone coast. The short-eared owl (*Asio flammeus*) is only occasionally seen on the Pembrokeshire mainland; however, it breeds successfully on Skomer Island.

Pembrokeshire has a healthy population of raptors. The buzzard, the most common bird of prey in the UK, has a widespread distribution in the county. The sparrow hawk (*Accipiter nisus*) is fairly widespread in the county although numbers are declining slightly; this may be due to competition with goshawks (*Accipiter gentiles*). These birds are associated with forests and woodlands where they prey on songbirds. Goshawks are locally distributed in Pembrokeshire near large forest blocks and because of this are more likely to occur in the east of the county rather than the west.

The red kite (*Milvus milvus*), once a rare site in this part of Wales, is becoming increasingly common and breeding successfully in the north of the county. A satellite accounting study by Griffiths demonstrated that this single attraction was responsible for bringing in £3m to the rural economy of Central Wales each year. This is a prime

example of a flagship species that may be used as an opportunity in West Wales. Furthermore, red kites may be managed to visit feeding stations, thereby further promoting viewing opportunities and enhancing the economic opportunities for B&Bs etc.



Red kite

Sea eagles are being reintroduced all around Britain now and are re-establishing well. They used to frequent West Wales but the last one was shot near Whitechurch in North Pembrokeshire in the very early 1900s. This species represents a magnificent opportunity for re-establishment around the Welsh Coast and the viewing opportunities around the Pembrokeshire coast path could, one day, represent the finest in Britain. A recent feasibility study on eagle reintroductions to Wales contracted by CCW gave the green light to sea eagles but reintroduction projects are long-term and require a lot of resources and PR.

The kestrel (*Falco tinnunculus*) is less widespread now but is present in the county particularly around St David's Peninsula, the Preselis and Castle Martin range. WWBIC and the Pembrokeshire LBAP are using the kestrel as an opportunity indicator species to measure the success of the Tir Gofal Agri-environment scheme and have been putting up nestboxes on selected farms.

Peregrine falcons (*Falco peregrinus*) are evenly spaced out around the coast of Pembrokeshire. They can be seen nesting in some of the industrial sites around the coast and are spreading inland. They have been found poisoned in South Pembrokeshire and still need active conservation measures to protect them from pigeon fanatics.

The hen harrier (*Circus cyaneus*) is a European protected species that visits West Wales to communal roost sites when they come down from the uplands in winter. The main sites are Dowrog Common, St David's Airfield and Plumbstone Mountain with some smaller roosts in South Pems and inland. Unlike England where they are persecuted almost to extinction on grouse moors, our populations in Wales are good but they probably only survive because of conducive habitat management either in their breeding areas in the Berwyn and Snowdonia or at their winter roosts in West Wales. Their selected roost at St David's Airfield was the only tiny patch of habitat that was not being routinely grazed.

Farmland is important to ground nesting birds. Long pastures and hay meadows are important nesting sites for the lapwing (*Vanellus vanellus*) and skylark (*Alauda arvensis*). However, neither species is as common on farmland in Pembrokeshire as they used to be. The lapwing is seen regularly on Ramsey and the Angle Peninsula and occasionally on the Preselis. The skylark used to be common around the coast and on the Preselis. The corn crake (*Crex crex*) no longer breeds in Pembrokeshire but can occasionally be seen passing through.

Once extremely common in the county, yellowhammer (*Emberiza citrinella*) numbers are now in decline in Pembrokeshire. Yellowhammer like low, well maintained hedgerows and arable crops that contain weedy patches. They are an important indicator species for farmland in Pembrokeshire. The song thrush (*Turdus philomelos*), a common garden visitor and often found in hedgerows and woodlands, is widespread in Pembrokeshire. The linnet (*Carduelis cannabina*) and bullfinch (*Pyrrhula pyrrhula*) are widespread but locally distributed in Pembrokeshire.

The stonechat (*Saxicola torquata*) is widely distributed through the county and can be seen on lowland heaths and heath coastlines. The whinchat (*Saxicola rubetra*) was once distributed across the north of the county but now its distribution is more fragmented; it is localised to the bracken/heath edges of the Preselis.

Green woodpecker (*Picus viridis*) numbers are declining in Pembrokeshire and their distribution appears to be moving north. They feed primarily on ants and it is thought loss of suitable habitat for ant hills may be a factor in their decline. Curlew (*Numenius arquata*) numbers are declining in Wales and Pembrokeshire. It breeds successfully on Skomer and used to be found on the Preselis but recently there have been no known inland nests. The inland waterways of Pembrokeshire have a healthy population of ducks, swans and geese (*Anatidae*), divers (*Gaviidae*), dippers (*Cinclidae*) and grebes (*Podicipedidae*).

The stock dove (*Columba oenas*) is most commonly seen in winter time in small flocks feeding on stubble crops across farmland in Pembrokeshire. However, numbers are in decline in the county. More widespread is the wood pigeon (*Columba palumbus*) it can also be seen on farmland during winter months but is more commonly associated with woodland. Two species of snipe are present in the county. The jack snipe (*Limnocryptes minimus*) is thought to be in decline, it is a secretive, well camouflaged wading bird. It's distribution is difficult to assess as reedbed edges, shallow lagoons and muddy ditches are areas not frequently recorded in. The common snipe (*Gallinago gallinago*) used to breed in the Preseli hills but no nesting sites have been identified recently. This wading bird is associated with wet marshes and is in decline in the county. The woodcock (*Scolopax rusticola*) is a winter visitor to the county. It is largely nocturnal, spending most the day under dense cover and is often found in woodlands. The golden plover (*Pluvialis apricaria*) is a winter visitor to Pembrokeshire. They utilise the lowland pasture for food. The best place to see them in the county is the Castle Martin range and Western Cleddau. These species are popular game birds in Pembrokeshire.

The rocky coastline of Pembrokeshire and its islands accommodate numerous species of seabirds. Species of auk (*Alcidae*), boobies and gannets (*Sulidae*), cormorants and shags (*Phalacrocoracidae*), gulls (*Laridae*), oystercatchers (*Haematopodidae*), petrels and

shearwaters (*Procellariidae*) all colonise and breed on the coast of Pembrokeshire. Skuas (*Stercorariidae*) can be seen from the Pembrokeshire coast as passage migrants.

Invertebrates

Invertebrates are as diverse as they are numerous; far too many invertebrate species occur within Pembrokeshire to list here. The distribution and occurrence of a few are mentioned below.

The high brown fritillary (*Argynnis adippe*), a large butterfly, once widespread in Wales, has suffered a decline in the last fifty years. It is mainly found in bracken dominated habitats and occurs in localised communities. It was last recorded in Pembrokeshire around Cilgwyn. The pearl bordered fritillary (*Boloria euphrosyne*), often seen in woodland clearings and bracken dominated habitats, is another butterfly species that is declining in numbers. This species has been recorded in Pembrokeshire in the St David's area and around Cilgwyn. Both species feed on the common dog-violet (*Viola riviniana*) or the heath dog-violet (*Viola canina*).



Brown hairstreak



Marsh fritillary

The marsh fritillary (*Euphydryas aurinia*), is a butterfly that breeds on open, damp, tussocky, grassland habitats where it's main food, the plant devil's-bit scabious (*Succisa pratensis*) occurs. Colonies of this species are more common in the north of the county and the St David's area, although more recently, a large colony has been discovered on the calcareous grassland of the Castle Martin range.

The silver studded blue (*Plebejus argus*), is a butterfly that occurs in coastal and heathland habitats. It feeds on various plants typical of these habitats such as gorse (*Ulex spp*) and heather (*Calluna vulgaris*). In Pembrokeshire the distribution of this species is extremely localised mainly occurring in the southern most part of the county.

The small blue (*Cupido minimus*) is our smallest resident butterfly. It feeds solely on the kidney vetch (*Anthyllis vulneraria*) and breeds in dry grassland habitats where this species occurs. In Pembrokeshire it occurs around the coast with greater numbers around Tenby and Strumble Head.

The brown hairstreak (*Thecla betulae*) breeds on blackthorn (*Prunus spinosa*) and occurs where this plant species is abundant. The brown hairstreak can be found as an adult in the tree canopy, but in the egg or larval stages it is found during autumn and winter on blackthorn. The distribution of this species is localised in Pembrokeshire to an area near Clynderwyn and around Martletwy.

The grayling (*Hipparchia semele*) is predominately distributed around the coastal areas of Pembrokeshire on dunes, saltmarsh, undercliffs and clifftops. Its food plant include fescues (*Festuca spp*) and occasionally marram (*Ammophila arenaria*) There are occasional inland sightings. Its range has been declining and it has recently been designated as a BAP species for Wales.

The thrift clearwing (*Synansphecchia muscaeformis*) is a moth found mainly around coastal regions and sea cliffs where thrift (*Armeria maritima*), its main food plant, grows. This species can be seen at several locations on the west coast of Pembrokeshire.



Hornet robber fly

The hornet robber fly (*Asilus crabroniformis*) is found on unimproved or old grassland and heath. It is a large, predatory fly that breeds in dung. This species is in decline and only occurs in a couple of sites in Pembrokeshire; near Crosswell and Dinas Cross in the north of the county; near Sardis in the south and a single fly seen on St David's Head.

The southern damselfly (*Coenagrion mercuriale*) is the only British damselfly to receive protection in both UK and European law. Once thought to be widespread in Pembrokeshire it is now only found in the north of the county, mainly around the Preseli hills. It requires slow flowing vegetated streams, heathland flushes and open peaty pools in order to breed. It's thought that the loss of this habitat has caused the decline in number of this species in the county.

Beekeeping

Opportunities exist in West Wales to make money from honey and to conserve the Welsh black honey bee at the same time. This opportunity may have further benefits if coupled with efforts to re-establish wild meadows. Where these new meadows exist in isolation in large areas of intensive agriculture, pollinators may be in short supply, so bee-keeping is a very good exercise for restoring natural processes.

For information contact:

Pembrokeshire Beekeepers' Association

Tel: 01437 563392 Tom Pegg (Chairman) or 01437 891892 John Dudman (Secretary)

Email: secretary@pbka.info

Plants

A list of vascular plants which occur in Pembrokeshire can be viewed via the website of the Botanical Society of the British Isles (www.bsbi.org.uk) in the Vice-County Census Catalogue of the database section.

8. PROTECTED SITES WITHIN PEMBROKESHIRE

International Designations

Ramsar Sites

None within Pembrokeshire

Biosphere

None within Pembrokeshire

Special Protection Areas

Special Protection Areas (SPAs) are strictly protected sites which have been classified in accordance with the EC Directive on the conservation of wild birds, also known as the Birds Directive which came into force in April 1979. They are classified for rare and vulnerable birds (listed in Annexe 1 of the Birds Directive) and for regularly occurring migratory species. Areas designated are deemed most suitable for these species. These sites automatically become part of the Natura 2000 Network.

Within Pembrokeshire, there are four SPAs. These are:

- Castle Martin Coast
- Grassholm
- Ramsey and St. David's Peninsula Coast
- Skokholm and Skomer

Reasons for designation as a Special Protection Area

Castle Martin Coast

The Castle Martin Coast holds 3.5% (recorded 1998) of the national population of wintering and breeding chough (*Pyrrhocorax pyrrhocorax*). They depend on the diverse mix of habitats that are present within the area and the continued low intensity agricultural management. This site qualifies as an SPA due to the chough having European importance as it is listed on Annexe 1 of the Birds Directive.

Grassholm

Grassholm is an important breeding site for the gannet (*Morus bassanus*). This island holds 33,000 pairs or 12.5% of the breeding North Atlantic population (1994/5). This site qualifies as an SPA due to the gannet being a migratory species that is of European Importance.

Ramsey and St. David's Peninsula

Ramsey and St. David's Peninsula holds 3.2% of the national population of wintering and breeding chough (*Pyrrhocorax pyrrhocorax*). This site qualifies as an SPA due to the chough being listed on Annexe 1 (rare and vulnerable birds) in the Birds Directive and is of European importance.

Skomer and Skokholm

During the breeding season, Skomer and Skokholm holds 4.1% (1998) or 3,500 pairs of the national population of storm petrels (*Hydrobates pelagicus*); 1.2% of the national population, or 4 pairs, of chough (*Pyrrhocorax pyrrhocorax*) and 0.6%, or 6 pairs of short eared owl (*Asio flammeus*). These three species are one reason that the site qualifies as an SPA due to them being listed on Annexe 1 of the Birds Directive.

A second reason for the site qualifying as an SPA is due to the presence of migratory species that are of European importance. The site holds more than 56.9% (late 1990s) of the breeding population (150,968 pairs) of manx shearwater (*Puffinus puffinus*). Skomer and Skokholm is also an important site for lesser black-backed gulls (*Larus fuscus*). The site holds 16.4% (20,300 pairs) of the breeding Western Europe/ Mediterranean/ Western Africa population. Puffins (*Fratercula arctica*) on Skomer and Skokholm represent at least 1.1% (9,500 pairs) of the breeding population.

The third reason for this site qualifying is the assemblage of sea birds that are of international importance. These birds are:

- Guillemot (*Uria aalge*)
- Kittiwake (*Rissa tridactyla*)
- Lesser black-backed gull (*Larus fuscus*)
- Manx shearwater (*Puffinus puffinus*)
- Puffin (*Fratercula arctica*)
- Razorbill (*Alca torda*)
- Storm petrel (*Hydrobates pelagicus*)

Special Areas of Conservation

Special Areas of Conservation (SACs) are strictly protected sites designated under the EC Habitats Directive. The habitat types within the SACs are considered to be most in need of conservation at a European level. These sites form part of the Natura 2000 Network.

Within Pembrokeshire, there are ten SACs. These are:

- Cleddau Rivers
- Gweunydd Blaencleddau
- Limestone Coast of South West Wales
- North Pembrokeshire Woodland
- North West Pembrokeshire Commons
- Pembrokeshire Bat Sites and Bosherton Commons
- Pembrokeshire Marine
- Preseli

- St David's
- Yerboston Tops

Reasons for designation as a Special Area of Conservation

Cleddau Rivers

The substrates within the Cleddau Rivers provide an excellent mosaic for lamprey (*Lampetra spp.*) spawning and nursery habitat. Bullhead (*Cottus gobio*) are widespread throughout the Cleddau catchment and represent a lowland population. These slow flowing rivers show a diversity of bank side habitats and good water quality ensures a good stock of otter prey species.

Gweunydd Blaencleddau

This mixture of wet heath and damp grassland at the head of the Eastern Cleddau contains the most extensive habitat network for marsh fritillary (*Euphydryas aurinia*) in Pembrokeshire and, in conjunction with the nearby population at Waun Isaf (Preseli SAC), supports the strongest metapopulation of the species in this area.

Limestone Coast of South West Wales

This site represents hard calcareous cliffs. The nature of the rocks and the warm south facing slopes has resulted on the occurrence of a sequence of important species-rich plant communities. The heathlands support a rich assortment of rare species. These include: the yellow whitlowgrass (*Draba aizoides*), a Mediterranean species restricted in the UK to south Wales; small restharrow (*Ononis reclinata*); early gentian (*Gentianella anglica*); goldilocks aster (*Aster linosyris*) and the endemic rock sea-lavenders (*Limonium parvum*, *L. transwallianum* and *L. procerum ssp. cambrense*).

This site contains the main hibernation site for the population associated with Pembrokeshire Bat Sites SAC. It may be used by up to 5.5% of the UK population of greater horseshoe bat (*Rhinolophus ferrumequinum*). The dunes and coastal grasslands at Stackpole support the only known population of early gentian in Wales.

North Pembrokeshire Woodland

North Pembrokeshire Woodland is an example of old sessile oak wood in the south-west of the habitat's range in Wales, and at the extreme west of its UK range at this latitude. The site is a complex of diverse woodland units, which range from strongly acidic upland oak wood to areas transitional to lowland oak wood; important fragments of floodplain woodland occur in the valley bottoms. A variety of management treatments are in place, with minimum intervention, managed high forest, active coppice, and well-established wood-pasture all represented. The woods have an exceptional diversity of rare epiphytic (bark inhabiting) lichens. Barbastelle bats (*Barbastella barbastellus*) inhabit this site.

North West Pembrokeshire Commons

North West Pembrokeshire Commons support an important area of European dry heath which consists predominantly of humid H4 *Ulex gallii* - *Agrostis curtisii* heath but also with smaller amounts of dry H8 *Calluna vulgaris* - *Ulex gallii* heath. This is the westernmost example of this vegetation type in Wales. The heath forms part of a set of excellent transitions between dry and humid heath to wet heath, various forms of fen meadow vegetation and other habitats. Notable species associated with the heath include pale dog-violet (*Viola lactea*) and yellow centaury (*Cicendia filiformis*). This site is also important for transition mires and quaking bogs. Floating water-plantain (*Luronium natans*) in Pembrokeshire is relatively isolated from its central and north Wales population centres and it occupies a distinctive and now highly relict habitat here, in heathland pools. The species was recorded at Dowrog in the early 19th century but it has only recently been rediscovered, following extensive remedial management. Here, in shallow rain-fed pools, it flowers and sets seed prolifically, almost certainly enabling colonisation of transient habitat elsewhere.

Pembrokeshire Bat Sites and Bosherton Commons

Bosherton Lakes are an outstanding shallow marl lake system created at intervals in the late 18th and mid 19th centuries by damming a limestone river valley. They are fed in part by a series of calcium-rich springs and are isolated from the sea by a small sand dune ridge. Charophytes are represented by bristly stonewort (*Chara hispida*) which forms dense beds up to 1m high, with individual plants up to 3.5 m long and by variable quantities of *C. globularis*, *C. virgata* and *C. vulgaris*. Extensive white water lily (*Nymphaea alba*) beds also occur, mainly in the western and central arms. In contrast, the eastern arm is characterised by variably dense stands of curled pondweed (*Potamogeton crispus*), fennel pondweed (*Potamogeton pectinatus*), spiked water-milfoil (*Myriophyllum spicatum*) and Canadian waterweed (*Elodea Canadensis*). Emergent vegetation fringe parts of the system, mostly common reed (*Phragmites australis*), bulrush (*Typha latifolia*), common spike-rush (*Eleocharis palustris*) and branched bur-reed (*Sparganium erectum*).

This site in south-west Wales supports approximately 9.5% of the UK greater horseshoe bat (*Rhinolophus ferrumequinum*) population. It represents the species at the north-western extremity of its range. The site contains a mixture of maternity, transitory and hibernation sites and so demonstrates good conservation of features required for survival.

Pembrokeshire Marine

Pembrokeshire Marine includes the Daugleddau estuary, a ria estuary in south-west Wales, formed in the upper reaches of one of the best examples of a ria in the UK. Associated with the wide range of environmental conditions, particularly seabed substrates, tidal streams and salinity gradients, there is a wide diversity of communities and species. Tide-swept sponge communities on shell/cobble substrates and bedrock in the upper reaches of the Daugleddau are exceptional in their diversity. The site also includes smaller estuaries entering the Daugleddau and Milford Haven and wide intertidal mudflats with rich and productive invertebrate annelid and mollusc communities, occurring in 'pills' (creeks).

Pembrokeshire Marine includes Milford Haven (another exceptional example of a ria in the UK) and the wide, shallow, predominantly sandy embayment of St Bride's Bay. The wide range of environmental conditions, particularly seabed substrates, tidal streams and salinity gradients, supports high community and species diversity. The species-richness of sediment communities throughout Milford Haven is particularly high, with intertidal sandy/muddy areas supporting extensive beds of narrow-leaved eelgrass (*Zostera angustifolia*). High-salinity water and rocky substrates penetrate far upstream and communities characteristic of fully saline conditions occur.

A wide range of subtidal and intertidal rocky habitats are present, from rocky reefs and boulders to rich underboulders, crevices, overhangs and pools. Reefs in this site are largely composed of igneous rock but include areas of more friable old red sandstone and some limestone. Extensive areas of sublittoral rocky reef stretch offshore from the west Pembrokeshire coast and between the Pembrokeshire islands and many small rocky islets. Limestone reefs occur in the south of the site. Reefs also extend through Milford Haven and into the variable salinity conditions of the Daugleddau estuary. Reefs within the site are subject to an exceptional variation in strength of tidal streams and wave exposure. Many of the reefs extend onto the shore and provide examples of both the most exposed and the most sheltered intertidal rock communities in southern Britain. Reef habitat diversity is increased by caves, tunnels and surge gullies in both subtidal and intertidal zones. The wide variation in exposure to water movement, the range of rock type, slope, aspect and topography and the high water quality, together with local exposure to abrasion from adjacent sediments and reduced salinity in the Daugleddau, are reflected in the wide diversity and species abundance of biological communities.

Offshore there are particularly extensive areas of tide-swept kelp and species-rich red algal populations and across the large areas of deeper rock reef, a wide range and abundance of invertebrate animal communities, with hydroid, bryozoan, soft coral and anemone species. More sheltered reefs, including those in lowered salinity and higher turbidity, typically support diverse and species-rich sponge and ascidian (sea squirts) dominated communities.

Pembrokeshire is representative of grey seal (*Halichoerus grypus*) colonies in the south-western part of the breeding range in the UK. It is the largest breeding colony on the west coast south of the Solway Firth, representing over 2% of annual UK pup production.

Preseli

Preseli holds one of the strongest populations of the southern damselfly (*Coenagrion mercuriale*) in the UK. Numbers of adults are estimated to be in the thousands. Conditions on the site, created by its current management, appear to be optimal for this species. The 33 ha common of Waun Isaf within Preseli SAC supports one of the largest populations of marsh fritillary (*Euphydryas aurinia*) in west Wales. The populations at Waun Isaf and the adjacent Gweunydd Blaenleddau SAC together form the most important marsh fritillary metapopulation in Pembrokeshire. Preseli is representative of slender green feather-moss (*Drepanocladus vernicosus*) in south-west Wales. It grows here in upland flushes and seepages amidst wet heathland habitat.

St. David's

St. David's SAC represents hard acidic cliffs on the west coast of the UK. It provides the most extensive examples of the typical west coast transition on acidic rocks from maritime crevice vegetation through maritime grassland into maritime heathland with heather (*Calluna vulgaris*) and western gorse (*Ulex gallii*). This site is also important for a number of rare and local species, such as hairy greenweed (*Genista pilosa*) (a Red Data Book species) and an endemic sea-lavender (*Limonium paradoxum*). There are good populations of the lichen (*Teloschistes flavians*). The heathland occurs as part of a mosaic of maritime grassland, wind-pruned blackthorn (*Prunus spinosa*) scrub and gorse (*Ulex europaeus*) scrub. The heathland supports populations of the nationally scarce chives (*Allium schoenoprasum*) and pale dog-violet (*Viola lactea*).

The two larger pools and one tiny satellite (on Ramsey Island) are an internationally significant site for floating water-plantain (*Luronium natans*), providing ideal habitat for the species in its flowering, near-annual form. Rain-fed lowland pools, usually in heaths, are now an exceptionally rare habitat and the population here is maintained by a combination of excellent management, favourable topography and clean rain.

Yerbeston Tops

Yerbeston Tops SAC supports over 1500 adult marsh fritillaries (*Euphydryas aurinia*) and as an isolated metapopulation in southern Pembrokeshire, is an important outlier for the conservation of the species in west Wales.

National Designations

National Trust

The National Trust is a major land owner within Pembrokeshire, especially within the coastal regions. Within the county, they have 104 properties. These cover an area of approximately 3586 hectares or 2.2% of Pembrokeshire.

National Park

The role of the National Park Authorities throughout the UK is to conserve and enhance the natural beauty, wildlife and cultural heritage; promote opportunities for the understanding and enjoyment of the special qualities of National Parks by the public and also seek to foster the economic and social well-being of local communities within the National Park.

Pembrokeshire Coast National Park is the only coastal national park within the UK. It covers an area of 62159.71 hectares (38.4% of Pembrokeshire) and 258 miles of coastline. The Park includes seven National Nature Reserves and Wales' only Marine Nature Reserve.

National Nature Reserves

The definition of a National Nature Reserve (NNR) is, “an area that is among the best examples of a particular habitat and is of national importance”. The aim of this designation is: to secure the protection and appropriate management of the particular habitat; provide a resource for scientific research and to play a public role.

NNRs have the highest level of conservation protection under UK legislation and therefore, the sites have to be managed appropriately to maintain its status.

There are seven NNRs within Pembrokeshire. These are:

- Corsydd Llangloffan
- Grassholm
- Pengelli Forest
- Ramsey Island
- Skomer
- Stackpole
- Ty Canol

The designations of NNRs are based on the SSSI (Sites of Special Scientific Interest) features. Further reasons for notification are due to some of the NNRs having the potential for access, education and research.

Sites of Special Scientific Interest

Sites of Special Scientific Interest (SSSIs) are notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000. SSSIs can be owned by anyone and a site's designation identifies it as an area of preservation and provides a level of protection.

Within Pembrokeshire, there are 74 SSSIs. These are:

- Aber Mawr
- Aberarth - Carreg Wylan
- Abereiddi Coast
- Allt Pontfaen - Coed Gelli-fawr
- Angle Peninsula Coast
- Beech Cottage, Waterwynch
- Blaencleddau Pastures
- Broomhill Burrows
- Bryn Bank Quarry
- Carew Castle
- Carn Ingli Common
- Castlemartin Cliffs and Dunes
- Castlemartin Corse
- Corsydd Llangloffan
- Cwm Bach, Sychpant
- Dale and South Marloes Coast

- Dowrog Common
- Dwrhyd Pit
- Dyffryn Gwaun
- Esgyrn Bottom
- Felin Llwyngwair
- Fishguard Cliffs
- Freshwater East Clifs to Skrinkle Haven
- Gallt Llanerch - Coed Gelli-deg
- Garn Wood Kilkiffeth Wood and Dan-Deri-Cwm Felin-Ban
- Gas Works Lane Section (Haverfordwest)
- Grassholm
- Hendre Eynon Pastures
- Hook Wood
- Jeffreyston Pastures
- Little Hoyle and Hoyle's Mouth Caves and Woodlands
- Lydstep Head to Tenby Burrows
- Marloes Mere
- Milford Haven Waterway
 - Angle Bay
 - Carew and Cresswell River
 - Cosheston
 - Dale Point to Musslewick Point (including Gann Estuary)
 - Daugleddau (including Slebech reed bed and carr)
 - Lawrenny Wood
 - Littlewick Point- Brunel Quay
 - Milford Haven South
 - Musselwick Point to Littlewick Point
 - Pembroke River
 - Sandy Haven
- Minwear Wood
- Mountain Meadows
- Mynydd Preseli
- Newgale to Little Haven Coast
- Newport Cliffs
- Offshore Islets of Pembrokeshire
- Orielson Stable Block and Cellars
- Park House Outbuildings, Stackpole
- Penally Marsh
- Pengelli Forest and Pant-teg Wood
- Portheiddy Moor
- Ramsey Island
- Ritec Fen
- Robeston Wathen Quarries
- Saundersfoot - Telpyn Coast
- Shoalhook Railway Cutting and Pit
- Skokholm Island
- Skomer Island and Middleholm
- Slebech Stable Yard Loft, Cellars and Tunnels

- St. Bride's Bay South
- St David's Airfield Heaths
- St David's Peninsula Coast
 - Porth Clais- Solva Cliffs
 - Porth Clais- Whitesands Bay Cliffs
 - Solva Harbour
 - Solva- Cwmbach Cliffs
 - St. David's Head
- St. Margaret's Island
- Stackpole
- Stackpole Courtyard Flats and Walled Garden
- Stackpole Quay - Trewent Point
- Strumble Head - Llechdafad Cliffs
- Tenby Cliffs and St Catherine's Island
- Tre- Rhos Common
- Trefeiddan Moor
- Treffgarne Bridge Quarry
- Treffgarne Gorge and Tors
- Tretio Common
- Ty Canol Wood
- Wallis Moor
- Waterwynch Bay to Saundersfoot Harbour
- Waun Fawr, Puncheston
- Waun Fawr, Ty Ddewi
- Wyndrush Pastures
- Yerboston Moors

The reasons for the notification of these sites are listed in *Appendix 6*.

Heritage Coast

Heritage Coasts are designated by CCW to protect coastlines from insensitive developments. Although their status carries no legal protection, planning authorities must take the designation into account when making decisions on development. Heritage Coasts are managed to protect the natural beauty and improve accessibility for visitors.

Pembrokeshire Heritage Coast is made up of six sections:

- Dinas Head
- Marloes and Dale
- South Pembrokeshire
- St. Brides Bay
- St. David's Peninsula
- St. Dogmaels and Moylgrove

Agri-Environment Schemes

Agri-environment schemes were established in the UK in the late 1980s to encourage farmers to manage their land in a more environmentally friendly way. Within Wales there are a number of different schemes for farmers to join whereby a sustainable approach to farming is promoted as well as protecting and improving the wildlife and the environment.

Single Payment Scheme

The Single Payment Scheme (SPS) came into force on 1st January 2005. The payment is made to farmers for keeping their land in good environmental order. This scheme replaced most of the individual Common Agricultural Policy (CAP) subsidy payments previously made to farmers.

In order for farmers to receive the payment, they must

- Be actively farming and/ or maintaining the land in good agricultural and environmental condition.
- Have land at their disposal for at least ten continuous months of the year.
- Retain and maintain up-to-date farm records.
- Ensure that there are no breaches of the cross compliance and Good Agricultural Environmental Condition requirements.

Tir Gofal

Tir Gofal is the Welsh Assembly Government's flagship agri-environment scheme. This scheme rewards farmers for caring for the environmental, historical and cultural features on their land. It is designed to support the farming community in protecting the rich heritage of rural Wales.

Entry to this scheme is only via an application window process. Once an application has been chosen, the farmer will receive a visit from a Tir Gofal Project Officer. This visit will enable the Project Officer to map all habitats and negotiate voluntary options, habitat enhancement prescriptions and capital works. A threshold points score is required in order to be accepted into the scheme. This will comprise points for a range of habitats, environmental features and farm characteristics. Further points may be gained through habitat improvement, permissive access and capital works options. Tir Gofal agreements apply to the whole farm and last for ten years with a break clause after five years.

Payments will be made for:

- The whole farm section. This includes the preparation of a whole farm Resource Management Plan.
- Management of existing habitats and environmental features.
- Establishment and management of new habitats and features.
- New permissive access for use by the public.
- One off payments for capital works such as fencing and hedge-laying.

Tir Cynnal

Tir Cynnal was introduced in 2005 and is the new entry level agri-environment scheme run by the Welsh Assembly Government. The scheme gives farmers more opportunities to protect areas and features of environmental importance on their land in return for payment. Tir Cynnal requires a greater level of environmental protection when compared to the Single Payment Scheme, yet is not as demanding as Tir Gofal.

The aims of Tir Cynnal are to:

- Prevent the loss of biodiversity by protecting wildlife habitats.
- Protect important landscape features on farmland.
- Safeguard archaeological and historic sites.
- Protect and improve the quality of water, soil and air.

Organic Farming Scheme

The Organic Farming Scheme offers payments to farmers to aid them in converting to organic farming and maintaining the organic status thereafter. The Scheme seeks to increase the area of land devoted to organic farming in Wales. It will play a valuable role in helping to protect and enhance the rural environment, as well as assisting producers to meet consumer demand for organic produce.

The Organic Farming Scheme is compatible with other agri-environment schemes, such as Tir Gofal. Each field that is entered into the scheme will be eligible for five years of payments. Higher payments will be received for fields that are claimed as in conversion; this is to compensate for the cost of converting to organic.

Local Designations

Wildlife Trust Reserves

Within Pembrokeshire, there are sixteen Wildlife Trust reserves. These are:

- Cemaes Head
- Coed Pont Bren
- Dowrog Common
- Garne Turn Rocks
- Goodwick Moor
- Llangloffan Fen
- Llannerch Alder Carr
- Pembroke Upper Mill Pond
- Pengelli Forest
- Penralltfach
- St. Margaret's Island
- Skokholm Island
- Skomer Island
- Temple Barr Carr

- West Williamston
- Westfield Pill

Local Nature Reserves

Local Nature Reserves (LNRs) are designated after consultation between the local authority and CCW under the National Parks and Access to the Countryside Act 1949. LNRs are declared and managed for nature conservation and provide opportunities for research and education, as well as just simply enjoying and having contact with nature.

Within Pembrokeshire, there are two LNRs. These are:

- Pembroke Mill Pond
- Freshwater East Burrows

Non-designated Wildlife Sites

There are no currently recognised but non-designated Wildlife Sites or Sites of Interest to Nature Conservation (SINCs) in Pembrokeshire at present. An opportunity exists for biodiversity conservation to promote the recognition of such sites.

A list of designated protected sites and areas covered can be found in *Appendix 6*.

9. GEOLOGY AND SCENERY WITHIN PEMBROKESHIRE

This section of the report is contributed by Sid Howells. All photographs and text are the copyright of Sid Howells. This part of the overall report must only be used for the purpose of the Natural Capital Audit.

Pembrokeshire has a greater variety of rocks and scenery than any equivalent-sized area in Britain. A very wide range of sedimentary (for example, sandstone and shale) and igneous (for example, micro-granite and basalt) rock types are found within the county. Slate, which underlies much of north Pembrokeshire, is a type of metamorphic rock (transformed from mudstone by intense pressure).



Sedimentary rock - conglomerate

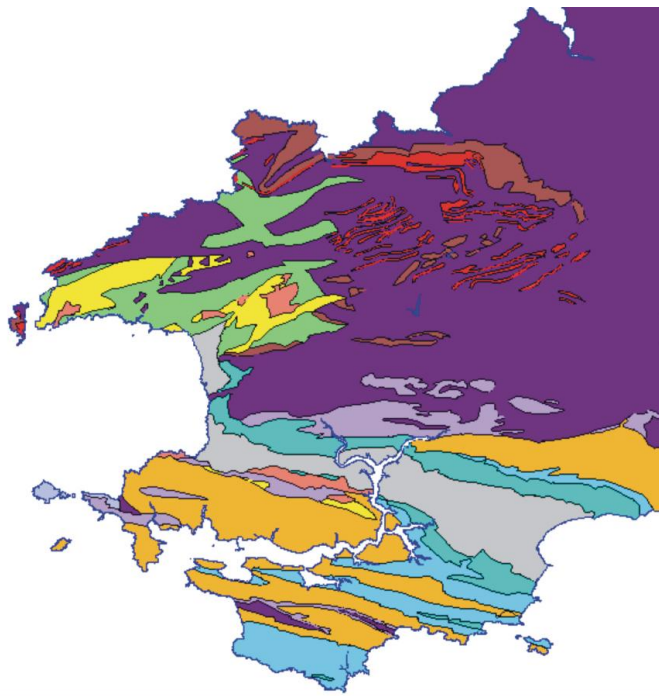


Igneous rock - diorite

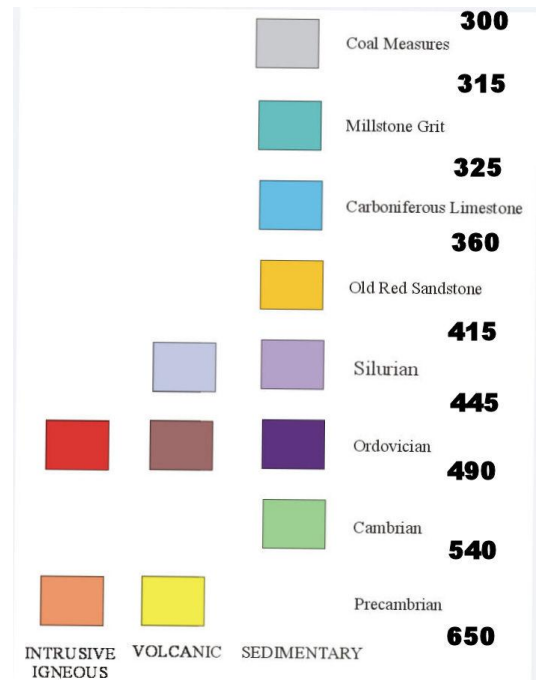


Metamorphic rock - slate

The rocks are from 650 to 300 million years old and almost all of them were formed south of the equator (some as far south as the present location of the Antarctic Peninsula, beyond the southern tip of South America). They have been moved to their present position through the process known as ‘continental drift’ (movements of the plates that make up the Earth’s crust). ‘Collision’ of continents has caused tight folding and faulting which is evident as repetition and displacement of outcrops (shown as coloured areas on geological maps).



Geological map of Pembrokeshire



Rock types & age in millions of years

The outcrops show the distribution of rocks of different ages or types beneath the surface cover of soil and other loose materials but in inland areas the rocks are generally only exposed in a few places such as stream beds, banks and crags.



Rock exposure in river bed



Natural rock crag

Rocks may also be exposed in sunken lanes and excavations such as road and railway cuttings (including disused railways), or in quarries.



Exposure in overgrown railway cutting



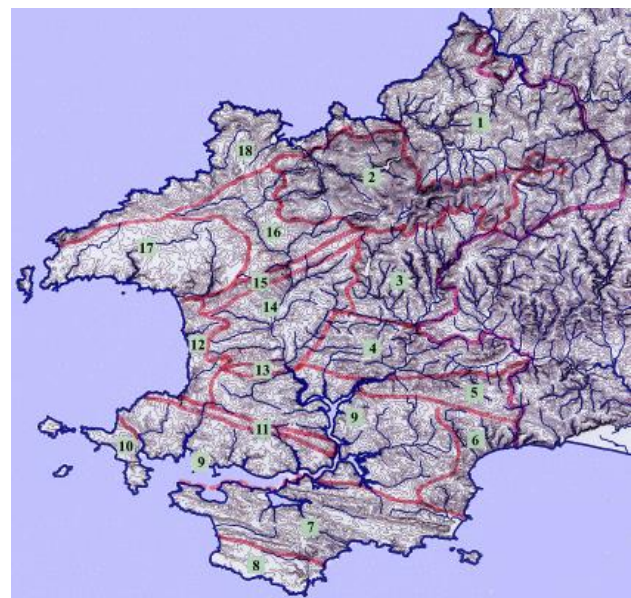
Disused quarry

It is geological diversity that gives the county its spectacular coastal scenery, an important factor in its designation as a national park. Many inland areas also display great beauty, and these parts of the county are generally less well known and consequently have far fewer visitors.

In terms of topography Pembrokeshire may conveniently be subdivided into 19 different regions, as shown below (*see Appendix 7 for a sample detailed report*). These subdivisions are easily recognisable but other more complex means of subdividing the natural landscape have also been devised (see LANDMAP).



Topographic map of Pembrokeshire



Areas of different landscape

In some of these areas there is a close relationship with underlying geology (for example, hard rocks generally form ridges or other areas of high ground whereas softer ones have been eroded to form valleys) but in other areas physical processes (such as actions of rivers) have been more important in shaping the landscape that we see today, so that over much of the county there is no obvious relationship between geology and scenery.



Ridge & vale scenery – central Pembrokeshire

The effects of processes that were acting long ago are of great significance. Around 70 million years ago much of what is now Pembrokeshire lay beneath the sea, with present areas of high ground standing out as islands. Sea level was globally high because polar and continental ice sheets did not exist. Sea level then fell and there was also physical uplift causing the present greater area of Pembrokeshire and Carmarthenshire to be revealed. At various stages, the sea cut a series of marine erosion surfaces (similar to but much more extensive than modern wave-cut platforms) that now stand out as plateau surfaces.



Plateau landscape - St David's Peninsula

This emergence, completed by about 50 million years ago, marks the beginning of the development of the scenery that we see today. The sea began to shape the present coastline and rivers cut down through the plateau surfaces. During the Ice Age, which lasted from about 2 million to 10 thousand years ago, there was another very significant phase of landscape development. Snow accumulated in some upland areas, gradually forming ice which then flowed out of the mountains as glaciers. Glacier ice carved out the Tywi and Teifi valleys, deepening the courses of earlier rivers. Meanwhile, in the west, an ice sheet, fed by glaciers flowing out of mountainous areas along the west part of mainland Britain and the east coast of Ireland, passed more gently over Pembrokeshire. When the ice melted, vast volumes of water further modified the landscape.



Glacial meltwater channels at Solva

The melting ice left a covering of ground-up rock and boulders (known as till or boulder clay) and meltwater redistributed much of this material to form sand and gravel deposits. Because of extreme climatic fluctuations during the Ice Age these effects were repeated several times. The most recent glacial maximum occurred only 18,500 years ago. On this occasion much of Pembrokeshire, with the exception of the north and western parts, remained free of ice but was still subject to cold climate processes such as slumping of thawed soil over a subsurface layer of frozen ground.



Typical appearance of 'Ice Age' deposits

All of this may appear to be of academic interest but the geological resources of Pembrokeshire were once much more widely exploited than today. All over the county there is evidence of small scale stone quarrying and mining for coal. Although some building materials such as sand, crushed stone and cement blocks are still sourced within the county, many are transported large distances. In the past it was the poor road networks and availability of transport that limited movement of materials but today's rapidly rising transport costs may soon necessitate a return to local supply.



Natural building stone and brick

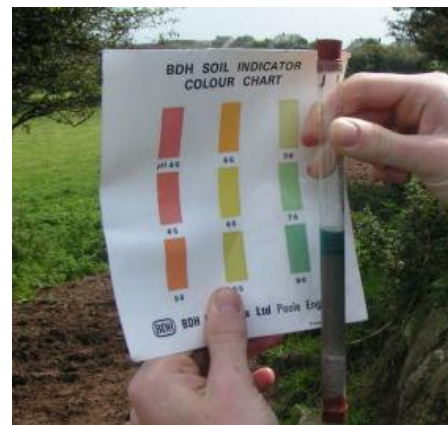


Reworking of an old quarry

Knowledge of geology is also important for determining which areas may be unsuitable for building and if they are likely to be subject to natural hazards such as landslides. Water supply and quality may also be closely linked to underlying geology, which may also influence soil type and agricultural land-use.



Groundwater well



Soil testing

Many people would like to know more about geology but availability of suitable literature is limited and they may be put off by scientific terminology. It is not a difficult subject but it does cover a huge range of topics.

Probably the best way to 'fast track' learning and concentrate on which ever aspect is important to you is to call in an experienced geologist. Slide show presentations and site visits/guided walks may also be arranged for landowners and users of holiday accommodation. Air and ground-based photography is also available as a service. Written explanations may also be produced for specified areas.

Grants to cover part or all of the costs of such work may be available through Aggregate Levy or community project funding, and opportunities for geological conservation may also be included in applications for Tir Gofal agri-environment grants.

Geological conservation: background and opportunities

Pembrokeshire's rich diversity of geological features is highlighted by the number and extent of them that are protected by Site of Special Scientific Interest (SSSI) designation.

Of the 400 or so Geological Conservation Review (GCR) sites in Wales that were identified as being of greatest significance to geological science (that is, all are of at least UK national importance whilst many are of international significance) there are 60 in Pembrokeshire. These are generally large coastal sites but there are also some smaller inland sites. An evaluation and review of the remainder of the geological heritage has just commenced and is leading towards the identification of Regionally Important Geological Sites (RIGS).

Together these sites form an essential scientific and educational resource. Their geological features frequently cause curiosity or wonder in the casual observer as well. This may provide some opportunities for landowners to offer accommodation (or link up with accommodation providers) and local tours that combine study of geology with other components of the natural environment (for example, plants, lichens) or archaeology, or with walking holidays.

There has been a significant growth in geotourism; most recently associated with the Geoparks initiative, but the interest is likely to continue to be small in comparison to other things that are currently much more popular (for example, 'bird spotting').

10. THE HISTORIC ENVIRONMENT IN PEMBROKESHIRE

This section of the report is contributed by Marion Page, of Cambria Archaeology. All photographs and text are the copyright of Cambria Archaeology. This part of the overall report, and the digital HER data that has been supplied with it, must only be used for the purpose of the Natural Capital Audit.

Introduction

Pembrokeshire has an extremely rich historic environment, which is a valuable part of the county's environmental resource. The Historic Environment Record for Pembrokeshire contains information on over 13,000 archaeological sites, almost five hundred of which are designated as nationally important Scheduled Ancient Monuments. This resource represents at least twelve thousand years of human activity in the county dating from the earliest human habitation in caves to Second World War features. The record therefore includes a great variety of site 'types' from many diverse and different periods of time. More sites are recorded from some periods than from others with, generally, more sites surviving from later periods. There may be many reasons for this and while the age of a site may be the cause this is not always the case; other factors such as continuing use (or not), construction method and materials will also influence survival. Often the single most important factor influencing the level of survival of an archaeological site is its location. Medieval and later settlement is less common in upland areas, hence the continuing survival of prehistoric features in these areas. However, medieval and post-medieval agricultural activity will have affected the survival of earlier archaeological features in many of these rural areas. Conversely, although many medieval sites would have existed in and around modern settlements, where later development and expansion may have removed *above ground* evidence for the medieval activity, the potential for archaeological features to exist below ground in these locations is extremely high. It is therefore vital to bear in mind that there will be many archaeological sites that have not yet been discovered or brought to the attention of Cambria Archaeology.

The extent of archaeological survival

Information on almost eleven and a half thousand known sites has been provided in the form of shape files that display the information as point data for GIS. Of these, eight thousand two hundred and eighty-four are recorded as upstanding monuments surviving as buildings, earthworks or other built structures (such as lime kilns/chambered tombs) in reasonable condition that might provide tourism opportunities as part of diversification projects.

Form of monument	Number recorded
Building	3660
Other built structure	2335
Earthwork	2289

Landscapes of Outstanding Historic Interest

The Register of Landscapes of Outstanding Historic Interest (Register of Landscapes of Outstanding Historic Interest in Wales. Cadw/ICOMOS UK. 1998) recognises that historic landscapes are one of Wales' most valuable cultural assets being a special, often fragile and irreplaceable part of our heritage. These are large areas which retain physical evidence of the past, from the agricultural and ritual landscapes of prehistory to 19th century industrial landscapes. Four of these Registered Landscapes lie within Pembrokeshire.



West Angle to Freshwater West Coastal Strip: part of the Milford Haven waterway registered landscape

Milford Haven Waterway

Described as a '*highly articulate and distinctive land and seascape*', with special mention given to the many Iron Age coastal promontory forts, early medieval and Viking place-names and medieval castle boroughs as well as the more recent history of the ship building and fishing industries at the planned towns of Milford Haven and Pembroke Dock.

St David's peninsula and Ramsey Island

The landscape around St David's contains evidence of land use, ritual and religious activity from the prehistoric period onwards, continuing into the medieval period as the centre of the cult of St David. It is described in the Register as '*one of the most culturally significant and esteemed landscapes in Wales today*'



Ramsey Island



Skomer, The Neck and Midland Isle

Skomer Island

This Registered Landscape comprises Skomer, along with The Neck and Midland Isle. Skomer itself contains extensive remains of prehistoric field systems and associated settlements evidenced by hut circles, while an Iron Age promontory fort survives on the Neck.

Preseli

The open, unimproved upland of this area contains a rich palimpsest of prehistoric relict landscapes with monuments, many of them upstanding, from the Neolithic, Iron Age and Romano-British periods. In addition it has the internationally important historic association of being the source of the Stonehenge bluestones. The post-Roman period saw the focus of settlement shift to the valleys, where a number of Early Christian ecclesiastical sites survive. The sequences of enclosure and chronology of the dispersed settlement pattern of small farms in the foothills are important for understanding how the uplands were, and are, used by farmers on the margins, where a mixture of medieval and later Parliamentary enclosures exist. The ancient routeways of the Brynberian Pass and Fleming's Way are another important landscape feature.



The Preselis

Landscapes of Special Historic Interest

As well as the areas above, Registered Landscapes in Wales include some that are designated as being of Special Historic Interest. They are generally smaller in area and the difference “is one of degree, and not quality of historic interests.”* Five of these areas lie within Pembrokeshire.



Garn Fawr

Pen Caer: Garn Fawr and Strumble Head

A landscape that has, in all likelihood, been settled since the later prehistoric period and which contains evidence for the archaeology of the early church. Surviving monuments include Neolithic funerary monuments; Iron Age hillforts and field systems; early Christian sites and monuments and medieval settlements. This area did not undergo landscape reorganisation in the Norman period and remains “*wholly Welsh in character*”.

Stackpole Warren

A variety of prehistoric sites exist in this area, along with a related buried archaeological landscape that is excellently preserved beneath layers of wind-blown sand. Deposits here survive from the Mesolithic through to the Iron Age/Romano-British periods.



Stackpole Warren



Manorbier strip fields

Manorbier

An area of medieval settlement (the home of Gerald of Wales) including rare survival of associated medieval open strip fields, their boundaries preserved by later hedges. The area also contains Mesolithic coastal sites, a section of the Ridgeway – an ancient routeway with associated Bronze Age ritual and funerary monuments – and Iron Age promontory forts.

* Register of Landscapes of Special Historic Interest in Wales. Cadw/ICOMOS UK. 2001.

Lower Teifi Valley

A small part of this area lies within the county. The area as a whole contains evidence for continuity of land-use since the Bronze Age. Archaeological remains include Bronze Age ritual and funerary monuments; early medieval and medieval ecclesiastical and secular sites (St Dogmaels Abbey and Cilgerran Castle); gentry houses and early industrial sites.



Part of the Poppit to Newport coastal strip within the Lower Teifi Valley registered landscape



Carn Ingli

Newport and Carningli

A wealth of archaeological remains survives in this area including prehistoric funerary and ritual monuments, defensive sites, settlements and field systems. Newport castle, town and borough form the core of the Anglo-Norman landscape created by the Fitzmartin lords of Cemais.

Overview of the archaeological resource

Prehistoric Pembrokeshire (c. 225,000 BC – AD43)

The earliest evidence for human activity in Pembrokeshire dates to the Palaeolithic (Old Stone Age - c.225,000 – 10,000 BC) and consists of flint tools and animal bones, some of which are from animals that are now extinct. Most of these artefacts have come from cave sites such as Nanna's cave and Holyle's Mouth.

The Mesolithic (Middle Stone Age - 10,000 – 4,400BC) period is well represented in the county and again comprises numerous individual flint tools and larger collections. Over 91 find sites indicate the locations of Mesolithic seasonal settlements and other sites, such as those at Nab Head and Stackpole Warren.

The majority of prehistoric archaeological sites and monuments surviving in Pembrokeshire are Neolithic (New Stone Age - 4,400 – 2,300 BC) and Bronze Age (2,300 – 700 BC) funerary and ritual monuments, in the form of chambered tombs such

as Pentre Ifan and Carreg Coetan Arthur, standing stones and burial mounds (barrows). Evidence of Iron Age (700 BC – AD43) occupation is principally in the form of hillforts, such as that at Castell Henllys, and other banked and ditched enclosures, numerous instances of which survive throughout the county. Previously unknown prehistoric sites are continuously being discovered.

Roman Pembrokeshire (AD43 – 410)

The physical evidence for Romano-British activity in the county consists of the remains of a road that ran west from Carmarthen and crossed the modern border with Pembrokeshire a little to the northwest of Whitland. The line of the road can be seen on aerial photographs and several sections have been investigated through excavation. Beyond Wiston its course is unknown, but it probably extended to the coast and the sea routes to Europe. Other than this, sherds of pottery and numerous coins, from single finds and from hoards, represent the majority of the evidence for this period. While most of the coins span the second to the fourth centuries AD one coin of Otho (AD69) was recovered in Nevern parish. With the exception of a farmstead at Amroth and a possible villa site near Wolfscastle, little is known regarding the locations of settlement in this period although continuing use of Iron Age sites is suggested by the discovery of Roman period pottery and other finds in these locations.

Early Medieval Pembrokeshire (410 – 1066)

The long period of time between the end of Roman rule in Britain and the beginnings of the Norman Conquest of Wales is important in terms of cultural heritage, and in laying the foundations for later medieval settlement and land-use. Archaeology has produced evidence of early Christian cemeteries, but the most visible remains from the period are carved stone monuments. There are two main types, those inscribed in Ogham or Latin or with a bilingual inscription and those that are decorated with simple crosses. The latter are more numerous and are mostly associated with known church and cemetery sites. As yet little is known of settlements of this date at any social level. The most common probable Early Medieval remains are church sites that are believed to lie beneath some of the medieval churches with “Celtic” dedications. St David’s monastery and bishop-house are believed to have been in existence by the 7th century. The present large, rectangular walled enclosure dates from the 13th and 14th centuries, but at least part of its course may reflect an earlier enclosure.

Medieval (1087 – 1485) and Post-Medieval Pembrokeshire (1486 – 1899)

During this period, the county was sharply split in two. The north of the county largely retained native Welsh customs, whilst the south of the county was much more influenced by the Normans. Carew Castle is a spectacular example of medieval architecture, and is set in a landscape that preserves other medieval elements, such as the strip fields around Manorbier. The Cathedral at St David’s was still an important component and influence on the medieval landscape. Parliamentary enclosure has also had a dramatic effect on the landscape of Pembrokeshire over the past two to two-and-a-half centuries.

The principal medieval towns in Pembrokeshire are Haverfordwest and Pembroke. These towns grew and developed alongside the original timber castles that protected the civilian settlement. The pre-eminence of these towns stems in part from their access to the sea.

Important medieval settlements that did not develop to the same level during later periods include Newport, Carew, Manorbier and Narberth.

Other types of historic settlements include farmstead sites, many of which are still occupied. Pembrokeshire has been farmed for thousands of years and the landscape contains evidence of it in the form of the prehistoric field systems of the first farmers, the remains of medieval strip fields and ‘ridge and furrow’ ploughing and the later enclosure boundaries. Deserted rural settlements represent the homes of farmers, agricultural labourers, shepherds, lime workers and miners and it is evident that there are very few areas of the county that have not been settled at some time. Traditional farm buildings are irreplaceable assets that can tell us much about farming practices in the past. Ironically, changing farming practices mean that today these buildings are very vulnerable.

Modern Pembrokeshire (1900 – present)

Modern day Pembrokeshire was founded on three main industries: shipbuilding, coal and lime. Other industries, like stone quarrying and fishing also played a critical part in Pembrokeshire's economy. Traces of all of these industries can be found throughout the county, and at sites like Porthgain and Abereiddy, the remains of the industrial past are particularly spectacular.

The strategic importance of the Pembrokeshire coastline and waterways – especially the Haven – has long been recognised, and it has been defended and fortified across the centuries. Remains of WWI and WWII buildings, airfields and other structures are an important part of the archaeological landscape, and are a clear link to our more recent past.

Period	Number of records
Prehistoric (used when the specific period of prehistory is not known)	373
Palaeolithic	16
Mesolithic	220
Neolithic	167
Bronze Age	542
Iron Age	442
Roman	71
Early medieval	61
Medieval	1366
Post-medieval	6187
Modern	1096

Breakdown of records by period.

It is possible to record uncertainty about the period of a site using a question mark, e.g. Medieval? Those sites that have been entered in this way have been included in the above table. Uncertainty about the period of a site can also be recorded using double entry e.g., Medieval?;Post Medieval?. When querying the dataset such entries are counted once for the medieval period and once for the post-medieval, thus slightly skewing the above statistics.

Pembrokeshire's Historic Environment: opportunities and threats

The wealth of Pembrokeshire's archaeological resource is a valuable asset that has the benefit of existing across all areas of the county. Understanding and appreciation of archaeological sites and historic landscapes can help to ensure their future conservation and survival through careful farming practices and enable their recognition as assets whose promotion increases the economic potential of rural areas.

The importance of the historic environment for our understanding of the past and of the processes that have created Wales as it exists today cannot be underestimated. This is emphasized by the fact that almost five-hundred of the recorded sites have statutory status as nationally important Scheduled Ancient Monuments. Archaeology offers an opportunity for farmers with knowledge of the archaeological sites on their land to link up with local tourism businesses but it is vital to remember that the surviving monuments, protected or otherwise, are a finite resource. Great care must be taken to ensure that neither the creation of access to monuments nor any subsequent increase in visitor numbers results in damage to them.

11. RECREATION & ACCESS

Previous sections of this report have provided an account of what natural resources exist in Pembrokeshire; this section outlines some of the principle ways in which they may be used. Any advocated use may be consumptive (hunting and fishing) provided this is sustainable and acceptable, or non-consumptive (bird-watching, photography, tourism). Some of the major wildlife attractions or resources for recreational enjoyment are presented on Map 6.

(WWBIC has been granted permission by Pembrokeshire Coastal Forum to use recreation data from their Coastal Recreation Audit in this report. The sea angling data on Map 6 are an example of these data. However, because the emphasis of this report is primarily terrestrial and freshwater and because the geographic nature of the reaudit data is not yet well defined we will leave this until further feedback from Planed.)

Bird-watching

There is no study of the contribution of bird-watching to the Welsh economy but on the basis of the red kite example, the hundreds of ‘twitchers’ who flock to a sighting of a rare bird, the incidence of these rare sightings in West Wales and the beautiful surrounds for a bird-watching holiday, the reality and the potential opportunity for the region must be highly significant. It is through the accommodation and the restaurants and cafes that most economic benefits from bird-watching would be realised so farmers considering opening B&Bs would do well to market this local natural resource. A bird list for species likely to be encountered could be included with proposed site-specific reports. A selection of the top bird watching sites in Pembrokeshire is shown on Map 6.

Rock-pooling

Rockpooling can be a very enjoyable way of spending time while relaxing on holiday. A few sample rock-pooling and intertidal sites are shown on Map 6 and here are some favourites in West Wales:

Llangrannog Beach

A small, sheltered cove of sands and Rock pools faces Cardigan Bay where there is a good chance of seeing bottle-nosed dolphins or grey seals. Llangrannog Beach is a good spot for rock pooling or just relaxing.

Marros Sands

The beach is an extensive stretch of sand with some rock pools backed by shingle and boulders. Inland heathland covers the coastal slopes. There are extensive views across Carmarthen Bay and to the Gower and to the North Devon coast.

Pendine Sands

A huge expanse of sandy beach with dunes and rock pools. This is a perfect spot to look for sand dune plants and also a great place for children to search for a variety of crabs, molluscs and rock pool fish. Worth a visit in winter too for the huge flocks of common scoters that are often seen in Carmarthen Bay.

Watwick Bay

A quiet, sheltered sandy beach just a short walk from the historic Dale Fort and only accessible from the coastal path. Watwick bay has rocks densely covered with seaweed, plenty of interesting rock pools and a small sandy beach. The bay is backed by woodland with some lovely walks.

Manorbier

The ruins of the magnificent Manorbier Castle overlook the small bay. The sandy beach is backed by sand dunes and there are rock pools and a stream running across the beach. Crabs, molluscs and rock pool fish are all to be found and the adjacent cliffs have a host of wildflowers.

Angle Point

Not a beach for swimming and sunbathing, Angle Bay is a wide sweep of mud and sand flats in the Milford Haven estuary. Dense seaweed growths cover large parts of the site and there is a rich array of shellfish, molluscs, anemones etc. to be found.

Cycling and Walking

There are wonderful opportunities for visitors and residents to enjoy the region's landscape and natural history on foot or on bike. Here are a few top sites in West Wales:

(This section can be expanded after we receive data on public access)

The Preseli Ridge

A walk along the Preseli ridge gives spectacular views across Ceredigion, Pembrokeshire and to the sea at Cardigan Bay. This walk across the open moorland follows a route that dates back to the Neolithic period, 5,000 years ago. The jagged Preseli tors that outcrop all along the ridge are the result of many thousands of years of erosion by harsh weather on the dolerite or bluestone rock, the source of the stones used to build the inner ring of Stonehenge.

Plynlimon

The highest point of this huge hill range is Pen Plynlimon Fawr at 752 metres above sea level. A number of other summits in the range also approach this height. From any of these peaks most of the mountains of Wales, from the Brecon Beacons in the south to Snowdon in the north can be seen. There are also views of the broad sweep of Cardigan Bay, from Strumble Head to Bardsey Island.

Monk's Trod

A magnificent upland walk that follows the medieval "Monk's Trod" from Strata Florida over to the Elan Valley. The walk takes in valley oak woods, rocky tors and wild heath and moorlands all in an area of unspoilt natural beauty and stunning mountain scenery. This is an excellent place to see rarities such as Red Kites, Peregrines, Pied Flycatchers and Redstarts.

Fan Foel - Bannau Sir Gaer - Llyn y Fan Fach

Bannau Sir Gaer is part of the "Carmarthen Fans", a westerly extension of the famous Brecon Beacons. There is plenty of good walking in this area particularly where foot

paths cross the northern escarpment of Bannau Sir Gaer, offering fine views of its horizontal strata of old red sandstone and millstone grits. At Fan Foel there is a prehistoric stone circle and views of the lake of Llyn y Fan Fawr and the scarp slope of Fan Brycheiniog.

Carreg Cennen

A picturesque upland walk runs from Carreg Cennen Castle up to Trap and over the Black Mountain. Highlights along the way include the ruins of Carreg Cennen Castle, the rugged limestone uplands, prehistoric stone cairns, blanket bogs and moorland.

Fishing

A detailed appraisal of fishing and other recreational activities relating to freshwater rivers and lakes has been carried out for all the major water bodies in Wales by Environment Agency Wales. They may be consulted for detailed information relating to a specific location or stretch of river. For the purposes of the audit we have included on Map 6 graphical representation of the potential for fishing on major river stretches. This means the extent to which a particular stretch is already being used (red areas indicate fully occupied stretches where there is already competition). Unfortunately many sites still have no data (shown in grey) so perhaps EAW may be contacted by farmers near these locations. Nevertheless, some opportunities for fishing are identified above and below Llys y Fran Reservoir.

Hunting/ Shooting

In Wales, the shooting industry has been valued at £73m per annum (British Association for Shooting and Conservation or BASC). Shooting within Pembrokeshire remains a popular past time. It is estimated by BASC that 90% of the county is shot over for rabbits (*Oryctolagus cuniculus*), ring-neck pheasants and woodcock (*Scolopax rusticola*). These shoots could range from one single person with their dog, to a large organised syndicate that takes place on estates. Most release sites put down a few hundred birds each year but there are a few large enterprises who put down many more and 10% of sites include red-legged partridge in addition to ring-neck pheasants. Other wader species shot include: common snipe (*Gallinago gallinago*), golden plover (*Pluvialis apricaria*) (shoots of this species on Castlemartin estate by MOD personnel are perhaps harming numbers). Shoots take place on private land or within the Crown Estate.

The Pembrokeshire Wildfowlers Association operates on specific lengths of the Milford Haven estuary complex (see Map 6) for very restricted periods of the year. Here hunters concentrate on waterfowl species such as mallard (*Anas platyrhynchos*), teal (*Anas crecca*), wigeon (*Anas penelope*), golden-eye (*Bucephala clangula*), Canada geese (*Branta Canadensis*), pochard (*Aythya farina*), gadwall (*Anas strepera*), tufted (*Aythya fuligula*). A very small minority of these hunters still employ the old punt gunning method.

In terms of opportunities for diversification, the opinion of BASC is that within Pembrokeshire there is no money to be made in shooting. It is mainly local people who take part in the shoots. The very large shooting syndicates take place further east and

within England. BASC are keen to promote shooting opportunities to farmers in the region but cautioned that farmers could not expect big earnings from this and that if there were big earnings, the use would be unsustainable.

The Shooting clubs have moratoria in place on hunting for greylag and white-fronted geese and jack snipe to ensure numbers recover.

BASC feel that there is or ought to be a great incentive for farmers to cooperate in conservancies. Efforts were made with Game Conservancy Trust to establish a greylegged partridge release site on a large part of the Marloes peninsula. For a variety of reasons (including habitat use and suitability) this did not take place, nevertheless the BASC representatives still feel there is a major opportunity for these sort of cooperative conservation and sustainable use efforts to be made.

BASC is a membership based organisation rather than an advisory service. There is no readily available information service to farmers wanting to establish shoots unless they are prepared to pay a large sum of money for a Game Conservancy Trust assessment. As yet the potential rewards do not justify these sorts of costs. A recent example of a farmer diversifying with a large scale shoot on his farm near Brawdy has not been financially successful and this farmer was not interested in driven woodcock shoots which would quickly deplete local numbers and do damage to the habitats. Low intensity shooting seems to be the favoured option in West Wales and much of this is done as recreational enjoyment on the basis of a 'bottle of whisky' for shooting rights rather than serious economic endeavours. There is a more obvious economic benefit to B&Bs accommodating people on shoots nearby (satellite accounting would link these) especially if these B&Bs permit dogs.

A problem exists in forested areas (more relevant to Carmarthenshire) where opening up access to the public is closing down the economic opportunities for deer hunting for health and safety reasons

Further information can be obtained from BASC:

Marford Mill

Rossett

Wrexham LL12 0HL

Tel: 01244 573000

Website: www.basc.org.uk

The Game and Wildlife Conservation Trust can advise on practical game management, such as game bird rearing and releasing, and shoot cost analysis.

The Game and Wildlife Conservation Trust

Fordingbridge

Hampshire

SP6 1EF

Tel: 01425 652381

Website: www.gct.org.uk

Access

(To be completed when access data is received, for the moment we are only able to show the location of the coast path on Map 6)

12. Networks, Links, References & Resources

Species Information & Advice

<http://www.butterfly-conservation.org/> - moth and butterfly i.d. guidance
<http://www.abdn.ac.uk/mammal/facts.shtml> - mammal factsheets
<http://www.froglife.org/info.htm> - info/advice on amphibians & reptiles
<http://www.barnowltrust.org.uk/>
<http://www.floralocale.org/> - flora locale run schemes for planting wild plants for wildlife
<http://www.buglife.org.uk/conservation/habitats/Managingfarmlandforinvertebrates.htm> - info on managing farmland for inverts
<http://www.plantlife.org.uk/uk/plantlife-saving-species.html> - plantlife, saving species &
<http://www.rspb.org.uk/ourwork/farming/advice/birdsonfarms/wales.asp> - managing farmland for birds info

General Information & Advice

<http://www.busesseye.org.uk/> - impartial, free business advice
<http://www.defra.gov.uk/funding/who/farm.htm#all> – rural funding schemes for farmers
<http://new.wales.gov.uk/topics/environmentcountryside/farmingandcountryside/?lang=en>
farming & countryside pages of WAG website
<http://wales.gov.uk/topics/environmentcountryside/farmingconnect/?lang=en>
<http://www.menterabusnes.com/english/3/home.html;jsessionid=4168285EAF42B6B3395D57B564DE6F7A> – business advice with ‘agricultural projects’ section
<http://www.gct.org.uk/conservationguides.asp?PageId=13> – conservation guides from Game & Wildlife Conservation Trust
http://www.tfcg.co.uk/content.home_tfcg/0/0/TFCG/Home/Home%20Page.msp – The Farmers Conservation Group
<http://forum.fwag.org/pubselect.phtml?c1i=13> – FWAG information sheets
<http://www.leafuk.org/leaf/default.asp#> - LEAF, linking environment and farming

13. MAPS

- MAP 1. Pembrokeshire Natural Capital Audit: example of a site-specific report
- MAP 2. Pembrokeshire Natural Capital Audit: semi-natural and priority habitats
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- MAP 7. Carmarthenshire Natural Capital Audit: semi-natural and priority habitats
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