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Lakepromo
The UK Information Package

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LAKEPROMO UK INFORMATION PACKAGE

CONTENTS:

LIST OF FIGURES

1.0 Background

Wetland degradation and restoration are becoming increasingly prominent within the UK environmental agenda. Although an exhaustive list has not been produced, one must only look at the increasing number of books and articles contained within peer review journals, to see that wetland restoration/creation projects are becoming increasingly common. Within the UK there are a variety of reasons why it is deemed necessary to rehabilitate a wetland, see section 1.2, thus leading to varied restoration strategies/techniques. Due to constraints it is not possible to document all current wetland restoration schemes, and how they fit into the UK wide environmental strategy, so particular attention is paid to the UK Lakepromo pilot site, The Pevensey Levels, East Sussex. Other restoration projects are illustrated when they are of particular interest or aid in explanation.

Of the many drivers behind UK wetland loss/degradation diffuse agricultural pollution is one of the most significant. In March 2005, the Department for Environment Farming and Rural Affairs (DEFRA) introduced a major new agri-environmental scheme, Environmental Stewardship (ES) with the aim of significantly reducing both the amount of nutrients applied to areas of cultivation and their subsequent transportation to receiving waterbodies. As of 21/10/2005 there were approximately 8,400 ES agreements in place, covering over 933,000 hectares. Total applications to the scheme so far are around 58,000.

The control of point source pollution is also pivotal in reducing eutrophication within UK wetlands. In the UK this is primarily achieved by the introduction of nutrient stripping and the introduction of tertiary processes at Sewage Treatment Works (STWs). As will be discussed in sub-chapter 1.4, there is debate within the UK regarding the relative risks of point source of diffuse pollution.

1.1 The characteristics of wetlands suffering from eutrophication in the UK

As previously described, the primary driver behind wetland degradation within the UK is nutrient enrichment, primarily from diffuse agricultural pollution and point source STW pollution. However, it is also important to note that not only has the qualitative status of water within UK wetlands degraded; the quantitative status may also be of concern. The later is of particular importance in the south-east of England, where high population densities and lower levels of precipitation may lead to water supplies becoming stressed, possibly leading to over-abstraction and reduced nutrient dilution thus enhancing eutrophication, and ecological change.

For this study have used the trophic classification proposed by the Organisation of Economic Co-operation and Development (OECD), see Table 1.

Table 1. OECD classification of trophic state of freshwater.

Trophic status	**Total Phosphorus (mg/l)**
Ultra Oligotrophic	<0.004
Oligotrophic	<0.01
Mesotrophic	0.01 - 0.035
Eutrophic	0.035 - 0.1
Hyper-eutrophic	>0.1

1.2 Development of the condition of the wetlands

Eutrophication of wetlands within the UK is a result of diverse array of drivers which are largely dependant on local socio-economic, environmental, industrial and commercial factors. To summarise all causes and consequences would require exhaustive investigation/space, so to ensure clarity the most significant ones relating to the Pevensey Levels are summarised below.
Note: Although the Pevensey Levels are a coastal wet-grassland, they have little or no saline influence as the drainage system can be completely isolated by sluice gates. Therefore, the key limiting nutrient, as with most freshwater ecosystems, within the Pevensey Levels is phosphorus.

Table 2. Causes and consequences of practices which lead to eutrophication within the Pevensey Levels

Cause	Consequence
Agricultural intensification	Increased application of fertilisers, livestock manures, sludge etc. to fields thus increasing P storage in soils. Intensive farming techniques encourage soil erosion and subsequent transportation of stored nutrients
Improved agricultural drainage	Facilitates easier nutrient transportation
High livestock stocking rates	Compacts agricultural soils enhancing run-off and nutrient transportation. Also contributes more P to system.
Septic tank leakage	Direct discharge of untreated effluent, thus increasing nutrient levels within system.
Increased urbanisation	Increased run-off and higher sewage loads.
Over abstraction	Reducing 'clean' water available for nutrient dilution, particularly during times of high eutrophication risk, spring/summer.
Effluent from STWs	Direct discharge of nutrient enriched effluent.
Industrial effluent	Direct discharge of nutrients
Agricultural effluent	Direct discharge of nutrients
Avian sources	As yet unquantified for the Pevensey Levels, but may constitute a significant nutrient input

The Pevensey Levels are comprised of two distinct drainage systems (Appendix I, Figure 2, receiving significantly different nutrient loads; this is illustrated in table 3.

Table 3. Estimation of loads of N and P to the Pevensey Levels

Nitrogen (kg a-1)

	Land Use	%	STWs	%	Other discharges	%	Total
Pevensey Haven	124,694	56	94,361	43	1745	1	220,800
Wallers Haven	244,719	96	8,239	3	1256	1	254,214

Phosphorus (kg a-1)

	Land Use	%	STWs	%	Other discharges	%	Total
Pevensey Haven	5,653	14	35,275	85	718	1	41,646
Wallers Haven	9,783	73	3,080	23	584	4	13,447

(Modified from Atkins, 2004)

As is shown, the P budget of the Pevensey Haven is dominated by point source discharges from STWs, 85% of total P within system is derived in this manner. The two STWs of note within this drainage system are Hailsham North (PE 17,046) and Hailsham South (PE 26,447). Land use (i.e. diffuse agricultural pollution) is a less important contributor, around 14% of total P budget. The nutrient budget for the Wallers Haven is the opposite to that of the Pevensey Haven, with STWs and land use contributing approximately 23% and 73% respectively. There is only one STW of note with the Wallers Haven drainage system, Windmill Hill STW (PE 2,020).

Examination of the estimated N budgets shows that as with P, STWs are likely to contribute a higher proportion of total N within the Pevensey Haven drainage system, whereas diffuse agricultural pollution dominates the N budget of the Wallers Haven drainage system. Therefore any restoration strategy for the levels as a whole must acknowledge this vital difference. For comparison, the relative contributions of phosphorus to UK surface waters are presented in table 4. It is illustrated that both drainage systems receive disproportionate loads when compared to the UK average.

Table 4. Relative contributions of P to UK surface waters

Source	% of total
Agriculture	43
Human/household waste (i.e. via STW)	43
Industry	8
Background Sources	6

(Adapted from FWR, 2002)

Accurate source apportionment is vital to the success of any proposed redemptive measures. Although agriculturally derived P may contribute significantly to the overall P budget of the Pevensey Levels, it is thought that the ecological quality of the freshwater system is linked to Soluble Reactive Phosphorus (SRP) concentrations during periods of high eutrophication risk i.e. spring/summer low flows (Jarvie et al. 2005), whilst concentrations of Particulate Phosphorus (PP) during this period exert little influence. The majority of P released by STWs during the aforementioned periods of low flow will be SRP, which is readily bioavailable, it is likely to constitute a greater risk than agriculturally derived PP. It has been shown by Jarvie et al., 2005, that as flow increases, SRP concentrations decrease, as is expected due to dilution, whereas PP concentrations increase with flow, due to soil erosion and subsequent transportation. Therefore during the spring/summer low flows, SRP will be the form of P which is likely to determine levels of eutrophication within the pilot site. Hence, the control of STW discharges is pivotal in controlling eutrophication, with agriculturally derived nutrient being of lesser risk.

P stripping, by chemical precipitation, was installed in both of the major STWs which discharge into the eastern side of the Pevensey Levels, and this has significantly reduced SRP concentrations in this drainage system (Diston and Mitchell, 2005). However, should the Equilibrium Phosphorus Concentrations (EPC_0) of the overlying waterbody be greater than SRP concentrations within the water body, then net SRP release from the sediment is to the water body is likely (Jarvie et al., 2005). EPC_0's have yet to be determined for the Pevensey Levels to ascertain if certain areas are more likely to act as net sinks or sources of SRP.

1.3 History and current scope of national wetland restoration

Wetland restoration within the UK is comprised of many isolated projects and there is no UK programme for national wetland restoration as such. However, there are targets set relating to the state of Sites of Special Scientific Interest (SSSI), which many UK wetlands are designated; the UK Governments Public Service Agreement requires that 95% of SSSI areas must be classified by English Nature as being in either favourable or recovering condition by 2010. At present, national data is unavailable for the total amount of land failing to meet the 95% standard within the UK, but within the Pevensey Levels, only 61% of the SSSI is in the required state. As with many UK wetlands, there is no set restoration strategy for the Pevensey Levels, and most remediation work is carried out through the agri-environmental schemes discussed in sub-chapter 1.4. Examples of wetland restoration projects with set goals and targets are discussed in sub-chapter 6.3.

1.4 Current practices and methods available for wetland management and restoration

In order to combat the environmental impacts that eutrophication can have in wetlands, the Environment Agency has developed a holistic strategy for management; such an approach is essential due to the number of stakeholders involved and the potential for conflicts of interest. The EA acknowledges that catchment based action plans should be site-specific, with appropriate source apportionment (EN, accessed November 2005). In the UK at present there are common short-term and long-term methods of dealing with eutrophication:

Table 5. Methods of eutrophication control

Scale	Method	Description	Advantages	Disadvantages
Short term (ST)	Removal & corralling of algal scums	Biomass harvesting	Reduced internal nutrient loading	Time consuming
Short term	Biomanipulation	Altering fish communities	Good results	Time consuming and not applicable in all areas
Short term	Application of Barley Straw	Inhibits growth of nuisance algae	Low cost	Is only applicable to specific algae
Short term	Weed cutting/removal	Physical removal of biomass	Economical and simple procedure	Can lead to leaching if cuttings are not disposed of in

				appropriate manner
Short term	De-stratification	Aerating stratified water	Reduced internal nutrient loading, slowing down rate of eutrophication	Expensive to install equipment
Short term	Nutrient flushing	Flushing with water with a low nutrient concentration	Reduced internal nutrient loading	A very temporary solution
Long term	Reduction of point source	(See main text)	Permanent solution	Can be expensive
Long term	Reduction of diffuse	(See main text)	Permanent solution	Can be difficult to orchestrate
Long term	Suction dredging of nutrient rich sediments	Physical removal of material	Reduced internal nutrient loading	Expensive

As previously stated, the key in controlling eutrophication in the long term is to alter land management practices; the primary method of doing this within the UK is by adhering to agri-environmental schemes. Several national schemes exist including:

- Countryside Stewardship Schemes (CSS) and Section 15 agreements – CSS awards grants to farmers for the application of farming and land management practices that enhance conservation features and improve enjoyment, or access, to their land. Section 15 agreements are aimed at reducing the amount of pump drainage systems in operation within wetlands (thus curbing agricultural intensification) and forbidding certain management practices deemed to be damaging to the environment;
- Wildlife Enhancement Schemes (WES) - promotes environmentally sensitive traditional farming practices such as reductions in stocking rates, sensitive water level management/ditch management and reducing the applications of agro-chemicals;
- Water Level Management Plans (WLMP). The WLMP aims to promote seasonal variations in water levels to meet guidelines outlined in the WES and/or other conservation schemes.

There are also site-specific schemes which are aimed tailored for the Levels, these include:

- Sussex Wildlife Trust (SWT) management plan;
- National Nature Reserve (NNR) Management Plan - requires a rotational programme of ditch clearance and management for the NNR.

As of 1997, approximately 60 % of the Pevensey Levels Ramsar/SSSI area is subject to some manner of environmental management agreement (Atkins, 2004), the current figure is unknown. Atkins (2004) shows that these environmental agreements, which cover most of the SSSI, have been successful in reducing nutrient input from agriculture.

As briefly stated in sub-chapter 1.0, the WES and CSSs are currently being succeeded by the new nation wide agri-environmental scheme, the Environmental Stewardship scheme, which seeks to build upon existing agreements, whilst encouraging new participants. The specific prescriptions included within the ES scheme which aim to tackle water quality issues are

primarily focused on reducing external loading of diffuse pollution derived from agricultural sources. These include:

- **Formulation of Nutrient Management Plans**. Soils must be analysed and regularly monitored to determine current levels of pH, K, P and Mg. All inputs of manures and fertilisers must be logged and individual field nutrient requirements must be calculated before application;
- **Cessation/reduction of nutrient inputs.** Certain areas of farmland may be designated as either having low, or very low nutrient inputs;
- **Creation of fertiliser-free Buffer Strips.** These are installed between the edge of the agricultural field and the watercourses, thereby reducing transportation of manures, pesticides, herbicides, fertilisers etc from fields to the drainage system. A wide range of options are available dependant on land use, receiving watercourse typology and width of buffer strip;
- **Formulation of a Soil Management Plan** detailing areas which are deemed to be at risk of severe erosion. Various strategies can be employed to reduce soil erosion:
    - Beetle banks, areas of tussocky grass up to 2m wide, trap run-off and reduce soil transportation;
    - Not sowing root crops (potatoes or sugar beet) in areas which are classified as being "at risk" from soil erosion;
    - Leaving a rough stubble on land;
    - Introduction of infield grass strips in variety of locations including next to watercourses to trap eroded terrestrial sediments, grassing of natural drainage pathways in order to reduce channelling of run-off water and creation of angled grass strips which prevent aeolian erosion;
    - Reduction in stocking rates;
- **Arable reversion schemes.** Stakeholders will be rewarded to convert existing arable land into grassland with either little, or no fertiliser input.

Also included in the ES scheme are options relevant to the recreation of wet grassland habitats, thereby encouraging biodiversity. These include:

- **Sensitive ditch management**. Prohibits cultivation and application of fertilisers within 1m of the ditch banks. Also prohibits reprofiling and imposes stringent conditions upon clearance/dredging;
- **Maintenance/restoration/creation of wet-grassland for breeding waders.** Promotes higher water tables throughout spring and summer, requires reduced stocking rates in order to minimise nest trampling, maintaining a varied sword structure and restrictions on access. This management prescription is only recommended in areas where water can be sufficiently manipulated to required levels (due to the hydrological control structures, this would be applicable on the Pevensey Levels);
- **Maintenance/restoration/creation of wet-grassland for wintering waders/wildfowl.** Amongst others, it requires close control of the water table throughout the winter months and restriction on grazing practices during winter months;
- **Raised water levels supplement.** Encourages creation of ditch habitats for a variety of fauna and flora, and aids in attracting breeding and over-wintering bird populations;
- **Inundation grassland supplement.** Applicable in areas where flood defence mechanisms are in place.

There are a number of other prescriptions within the ES scheme which would be suitable for the Pevensey Levels, including:

- **Restoration of coastal saltmarsh.** Sites within the Levels which are currently being used for pastoral farming could be restored to coastal saltmarsh by traditional grazing management. Restoration measures will be specifically designed on a site specific basis;

- **Creation of inter-tidal and saline habitats on arable/grassland.** Creation of saline lagoons, saltmarshes and mudflats would be facilitated by managed breeching of existing sea defences, or in the case of saline lagoons, development of an inlet/outlet water delivery system. There is also the option to adopt a 'laissez faire' approach to coastal defence breeches, i.e. allowing natural tidal cycle to inundate land and to undertake no remediation methods;
- **Maintenance/creation of reed beds.** Reed beds have the potential to provide vital habitats for a wide range of flora and fauna, including insects, birds and small mammals. Land drainage and grassland improvement have resulted in the loss of this vital habitat from the Pevensey Levels. Sites should be >0.5 hectares and management prescriptions include, maintaining water control structures, retention of open water, controlling scrub cover, no chemical usage, rotational ditch clearance no more than once every five years. Suitable sites will have the mechanisms in place to have >30cm of water covering part of the site during the summer months.

2.0 Administrative structure and legislation

2.1 Administrative structure

The administrative structure of the UK will be illustrated by giving specific examples relating to the Pevensey Levels

Site of Special Scientific Interest (SSSI)
English Nature (EN) identifies and protects all designated SSSIs in England under the Wildlife and Countryside Act 1981 (amended by the Countryside and Rights of Way Act 2000). Land can be designated as an SSSI because of important:

- Flora and fauna;
- Geological features;
- Physiographical features.

EN are duty bound to notify the Local Planning Authority, Secretary for Environment, Food and Rural Affairs and specific public bodies including Internal Drainage Boards (IDBs), the Environment Agency and water and sewerage companies. An important point to note is that an SSSI is a registered land use change, which means that future owners/tenants must adhere to the associated laws. Confirmation of a notified SSSI is then decided by The Council of English Nature. This council is comprised of experts, who are independent of EN and the Executive Committee, appointed by the Secretary of State. De-notification of an SSSI is possible should interest features be lost, and there is no possible of restoration. 4,112 ha of the Pevensey Levels was awarded SSSI status in 1977, and was re-notified in 1990, when the amount of land in the SSSI was reduced to the current 3,501 ha (for full citation see Appendix I).

A list of operations which could result in degradation are given for each SSSI, and should landowners wish to carry out any of the stated activities, written permission from EN must be sought. If any prohibited activities are carried out without consent, investigations will be initiated, which may result in criminal proceedings against the guilty party. EN works directly with the landowners to realise effective management, in order to enhance and protect wildlife, financial assistance may be available. Should a voluntary management agreement not be reached with a landowner, more formal legal methods may be employed. This may include imposing management schemes and management notices. As a final measure, powers of compulsory purchase can be used when all other possibilities to maintain the interest features of the SSSI have failed.

http://www.english-nature.org.uk/special/sssi/report.cfm?category=C,CF

The Countryside and Rights of Way Bill places a duty on public bodies to 'further the conservation and enhancement' of Sites of Special Scientific Interest.

National Nature Reserves (NNR)
Areas are awarded National Nature Reserve status if they contain habitats which are one of the best national examples. NNRs are either owned or controlled by EN, or by an approved body (under section 35 of the Wildlife and Countryside Act 1981). The Pevensey Levels NNR is partly owned by The Sussex Wildlife Trust and EN (see Appendix I).

Ramsar (http://www.ramsar.org/),
The majority of the SSSI is also designated as a Ramsar site, ID RS#973 02/February/1999, with the exception of a very small area in the south. There are currently 163 Ramsar sites within the UK, with a total area of 880,281 hectares. This intergovernmental treaty awards the levels the Levels a certain level of protection and members of the convention are committed to ensuring the ecological character of the identified wetlands. However, sites which have been designated do not necessarily require protected area legal status. Developments within Ramsar sites are tightly controlled, requiring an Environmental Impact Assessment under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 as amended, and only allowed in exceptional circumstances. Any loss of wetland interest features have to be replaced by creating/restoring other areas.

As with SSSIs, EN is charged with the promotion of conservation within the Ramsar sites and has set a target of >95% of all Ramsar sites to be in a favourable or improving condition by 2010. All Ramsar sites within England are required to have a management plan (under resolution V.7 adopted by the Ramsar convention, 1993) focusing on conservation of the qualifying interest features.

Internal Drainage Boards (IDBs)
IDBs are independent bodies, empowered under the Land Drainage Act 1991, and are responsible for flood defence management in areas which have special drainage requirements. IDB membership is comprised of land owners, tenants and members nominated by local authorities. The IDBs are mostly funded by rates levied upon landowners and tenants within the IDB district.

2.2 Essential national legislation

The laws and decrees which govern water quality, thereby affecting wetland restoration/creation are presented in table 6.

Table 6. Relevant UK legislation regarding wetland restoration

Law/Legislation	Date of Introduction	Key Points
Land Drainage Act	1991 & 1994	Promotes the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest

Environmental Protection Act	1990	Prescribes protection measures regarding nature conservation.
The Water Resources Act	1991	Prohibits discharging of polluting matter (section 85), and gives powers of prosecution to the EA.
The Water Industry Act	1991	Prohibits water pollution from the water industry
The Environment Act	1995	Secures remediation of contaminated land affecting water quality and establishes integrated pollution control.
The Pollution Prevention and Control Act	1999	Regulates activities which may give result in water pollution.
The Water Act	2003	Regulates water abstractions and land drainage.
Waste Management Licensing Regulations	1994	Aimed at stopping wastes polluting water bodies.
Special Waste Regulations	1994	Disposal of hazardous agricultural materials
Nitrate Vulnerable Zones		Farmers within these areas face mandatory controls regarding fertiliser usage, no financial compensation is offered.
Surface Waters (Dangerous Substances) Regulations	1989, 1992, 1997 & 1998	Statutory standards for substances determined dangerous to aquatic life.

In conjunction with UK law and legislation, there are various strategies employed which aid in wetland restoration. One such strategy is the UK biodiversity action plan (UKBAP). UKBAP was formulated in response to the Rio Convention on Biological Diversity (1992). The UKBAP describes the biological resources within the UK and produces detailed plans for their conservation. At present there are 391 Species Action Plans, 162 Local Biodiversity Action Plans and 45 Habitat Action Plans, each of which set actions and targets. The UKBAP for East and West Sussex includes 12 Species Action Plans (one for the Fen raft spider (*Dolomedes plantarius*) and 13 Habitat action plans (including coastal floodplain and grazing marsh).

Codes of Good Agricultural Practice for the Protection of Water (The Water Code), 1998 is not law, but should it not be adhered to, could influence any legal proceedings. Gives advice on reducing/managing farm wastes and how to reduce nutrient losses to water courses.

Within the UK, the EA has formulated a series of Catchment Abstraction Management Strategy (CAMS), setting out how water resources are managed at a local scale. The underlying principles behind CAMS lie in the identification of how much water is available for abstraction and comparing this to how much is needed by the environment allowing the

formulation of a sustainable management/licensing policy. The CAMS relating to the Pevensey Levels has the following objectives:

- To develop a greater understanding of the water resources and water dependency of environments in the Cuckmere and Pevensey Levels CAMS area;
- To evaluate the sustainability of existing abstractions;
- To Assess the water resource availability in the CAMS area and the impact of surface water abstractions on low river flows;
- To investigate the impact of groundwater abstractions on river flows and the extent to which the major Chalk aquifer has already been exploited.

Table 7 illustrates the EU directives applicable to wetland restoration within the UK.

Table 7. EU directives applicable to UK wetland restoration

Directive	**Relevance**
Urban Waste Water Treatment Directive (91/271/EEC)	The Levels were designated as a Sensitive Area (eutrophic) in 1998. In the case of Pevensey Levels there are two STWs with a population equivalents (PE) >10,000, Hailsham North and Hailsham South STWs. These are subject to stringent legislations and are tightly controlled. However, there are four STWs with PE 395-2020 and three STWs which have PE 43-70. Although the point source contributions of nutrients are dominated by the two major STWs, localised degradation could be experienced if these smaller STWs are not properly controlled.
Nitrate Directive (91/676/EEC)	Required the UK to voluntary code of practice aimed at reducing nitrate pollution (sections 3, 4, 9 and 14 of UK Water Code).
The Water Framework Directive (2000/60/EC)	See sub-chapter 2.3.
Freshwater Fish Directive (78/659/EEC)	Many UK wetlands, including the Pevensey Levels, contain watercourses which have classified under this directive which sets standards for various chemical and physical determinands.

2.3 Current state of the national implementation of the Water Framework Directive (WFD)

In order to aid in the implementation of the WFD, a UK Technical Advisory Group (UKTAG) was established in 2001. Formation of such a group should ensure consistent approaches are adopted throughout the UK regions. The UK conforms to the Common Implementation Strategy (CIS) and participates in this programme through the Ribble Pilot River Basin project (North West River Basin District). Many of the powers required to transpose the WFD into UK legislation already exist. The principle pieces of legislation are:

- Environmental Protection Act;
- The Water Resources Act;
- The Water Industry Act;
- The Environment Act;
- The Pollution Prevention and Control Act;
- The Water Act.

Regulation required for the transposition of the WFD into national law had to be brought into force by 22/12/2003, as stated in Article 24(1).

In the UK The Water Environment (Water Framework Directive) England and Wales Regulations 2003, (Statutory Instrument 2003 No. 3242) came into force 02/01/2004 which will facilitate the adoption of the Water Framework Directive, for full text see: http://www.defra.gov.uk/environment/water/wfd/transposition.htm.

The WFD and The Pevensey Levels:

- The Pevensey Levels comprise part of the South East River Basin District (RBD), within which surface water bodies have been delineated. Once identified, reference conditions will be set relating to the composition of the ecosystem, likely to be present under "undisturbed conditions";
- The Nunningham stream is designated to be "at risk" of failing objectives set by the Freshwater Fish Directive (78/659/EEC), whereas the remaining watercourses within the Levels are classified as being "not at risk";
- Both the lower courses of the Pevensey/Wallers Haven are designated as of being "at risk" of point source pollution, whilst the majority of watercourses are designated as being "probably at risk" from diffuse pollution;
- The lower course of the Wallers Haven and the Langney Sewer (Pevensey Haven tributary) are deemed to be "probably at risk" from abstraction and flow regulation pressures;
- The majority of the Levels are judged to be at risk of alien species;
- All of the main watercourses are "at risk" of failing the directives environmental objectives;
- The PLs have been designated as having a small catchment area (10-100 km^2), low mean altitude <200 m with a predominantly siliceous geology (silicon dioxide, SiO_2). This means that they are categorised as River Type 1.

3.0 Actors

3.1 Tasks of Different Stakeholders and Networking

Table 8. Participants of the UK lakepromo project: organisation and roles

Organisation	**Level of participation**
University of Brighton	Lakepromo UK partner
Environment Agency	Sources of information/expertise and Local Action Group (LAG)
WS Atkins (consultant)	Member of LAG
Southern Water	Member of LAG
South East Water	Member of LAG
Mott MacDonald (consultant)	Member of LAG
English Nature	Sources of information/expertise and

	Local Action Group (LAG)
The Sussex Wildlife Trust	Member of LAG
East Sussex County Council	Member of LAG
University of Sussex	Member of LAG
Local stakeholders	Advisory capacity

3.2 Overview of Research and Education

Table 9. Institutions with a interest in wetland restoration

Organisation	Area of expertise	Web resource
University of Brighton	Investigation of nutrient cycling and eutrophication within heavily managed wet-grassland	http://www.brighton.ac.uk/environment/research/earth_systems/lakepromo/index.htm
Chartered Institute of Water and Environmental Managers (CIWEM)	Professional body for scientists, engineers and other environmental professionals committed to the sustainable management and development of water and the environment.	www.ciwem.org.uk/
The Wildfowl & Wetlands Trust	Charity and research network committed to conserving wetlands and their biodiversity.	http://www.wwt.org.uk/
RSPB	Charity and research network promoting wetland habitats suitable for birds.	http://www.rspb.org.uk/
Joint Nature Conservation (JNCC)	The JNCC is the UK Government's wildlife adviser, undertaking national and international conservation work.	http://www.jncc.gov.uk/
Wetland Research Unit (UCL)	Research group specialising in wetland hydrology and management of wetlands in the context of river basin management and sustainable development.	http://www.geog.ucl.ac.uk/%7ejthompso/wru/wru.htm
Center for Wetland Research, University of Exeter	Focusing on wetland archaeology.	http://www.sogaer.ex.ac.uk/wetlandresearch/
Centre for Ecology and Hydrology	CEH is the UK's Centre of Excellence for research in the land and freshwater environmental sciences. Research activities include the impacts of human activity on natural	http://www.ceh.ac.uk/

	environments. And the group aims to generate workable solutions to today's pressing environmental problems.	
WS Atkins	Atkins Water supports the water, wastewater and water-related environmental sectors. Key expertise includes managing assets, operating services, delivering schemes, programming investment, benchmarking services, balancing risks and developing effective technologies.	http://www.atkinsglobal.com/
ADAS	Private company specialising in environmental issues. Include various water related research projects and currently work on behalf of Defra to provide conservation advice to farmers.	http://www.adas.co.uk/home/
Coastal Management for Sustainability	Organises various conferences relating to water issues, including World Wetlands Day.	http://www.coastms.co.uk
Bangor University	Specialises on wetland biogeochemistry	http://biology.bangor.ac.uk/~bss113/

4.0 Sources of Funding for Restoration Projects

There is no specific funding available within the UK for wetland restoration. However there are various sources of money available for environmental restoration, enhancement and regeneration, these include:

Heritage Lottery Fund (HLF) – Landscape Partnerships (250K-£2 million)
There are various grants available through the HLF, who distribute significant amounts of money to environmental restoration projects. The Landscape Partnerships scheme enables interested parties to conduct several different projects within one big project, provided that the land is not owned by the lead of the project. The HLF often award funding to schemes which enhance the environmental heritage of the UK, this is applicable to The Pevensey Levels with regard to the 1066 Battle of Hastings.
The HLF also grants smaller amounts, £500-500K under the Awards for All scheme, which must be match funded by the project parteners.

*Criteria***:** The proposed project has to meet the four priorities of the HLF to ensure long-term social, economic and environmental benefits for rural areas. These are:

- Conserving or restoring the built and natural features that create the historic character of the landscape;
- Conserving and celebrating the cultural associations and activities of the landscape area;
- Encouraging more people to access, learn about, become involved in and make decisions on their landscape heritage;
- Improving understanding of local craft and other skills by proving training opportunities.

*Website***:**
http://www.hlf.org.uk/English/PublicationsAndInfo/AccessingPublications/Landscape+Partnerships.htm

SITA Trust
Projects need to be concerned with physical improvements at identified sites within ten miles of a licensed landfill site in England. Research and monitoring projects can also be funded where there is a clear intention that this work will lead to physical improvements. The main emphasis of the programme is on new projects; however, existing projects will be supported where they deliver significant benefits for biodiversity.

Grants:
Grants of up to £175,000 are awarded for large projects, whilst up to £25,000 is available for smaller projects.
These projects must help to achieve both national and regional biodiversity targets/actions for UK habitats and species. The Trust should be a major financial contributor to the proposed project.

The SITA Trust will also support smaller projects which aid in the achievement of national and regional biodiversity targets and actions, though more local priorities will also be considered and judged on a case by case basis.

Website: http://www.sitatrust.org.uk

Aggregate Levy Fund (LF) - English Nature
The ALF only funds only funds projects which are within a 10 mile radius of an aggregate levy site. The broad purpose of the Fund is to reduce the effects of aggregates extraction on the environment and local people. Grants are awarded in support of projects which involve, and will deliver clearly defined benefits in terms of one or more of the following general themes:

- Access;
- Biodiversity;
- Community;
- Education and Interpretation;
- Geodiversity;
- Informal Recreation;
- Landscape.

There is £4 million available for 2006-2007.

Website: http://www.english-nature.org.uk/about/alsf6.htm

Biodiversity Challenge 2006
Grantscape, an environmental grant-making charity, is inviting applications under its Biodiversity Challenge 2006 and will award approximately £2.5 million to projects aimed at creating, conserving or enhancing the biodiversity of England and Wales.

Criteria:
The scheme is funded under the Landfill Tax Credit scheme and projects must be within 10 miles of a Landfill site. The minimum grants available is £250,000 and the maximum grant is £750,000.

Website:
http://www.grantscape.org.uk/application_biodiversity06.asp

Defra
Defra will fund environmental improvements to agricultural land under their new environmental stewardship scheme, see sub-chapter 1.4. Only the landowner can obtain funding for enhancing biodiversity on their land, and the amount is dependent on the number and type of prescriptions subscribed to. Although it is not direct funding for wetlands regeneration it is a good way of working in partnership with landowners to carry out environmental management strategies.

There are three schemes under the new stewardship programme:
Entry Level Stewardship (ELS)
- Open to all farmers and landowners.
- Simple and effective land management.

Organic Entry Level Stewardship (OELS)
- Organic strand of ELS.
- Open to all farmers not receiving Organic Farming Scheme (OFS) aid.

Higher Level Stewardship (HLS)
- Targeted environmental management.

Capital grants for improvements to infrastructure are also available; landowners must first enter the Entry Level Scheme. There are no priority areas for funding which each site assessed on an individualistic basis by Defra.

Private Funding
Individual companies may be interested in providing some of the funding for instance; water companies, local businesses. Although the amounts are likely to be significantly smaller, they may be used as leverage for larger funds (i.e. used as match funding).

Future funding schemes:
- Community Open Spaces, funded by the Big Lottery Fund, is due to be begin March 2006. Applicant criteria, amounts and deadlines are not known at present. Website: http://www.biglotteryfund.org.uk/.

- Access to the Natural Environment, funded by the Big Lottery Fund. As with the Community Open Spaces project, this funding scheme has not yet been finalised.

5.0 Restoration Planning and Implementation Procedures

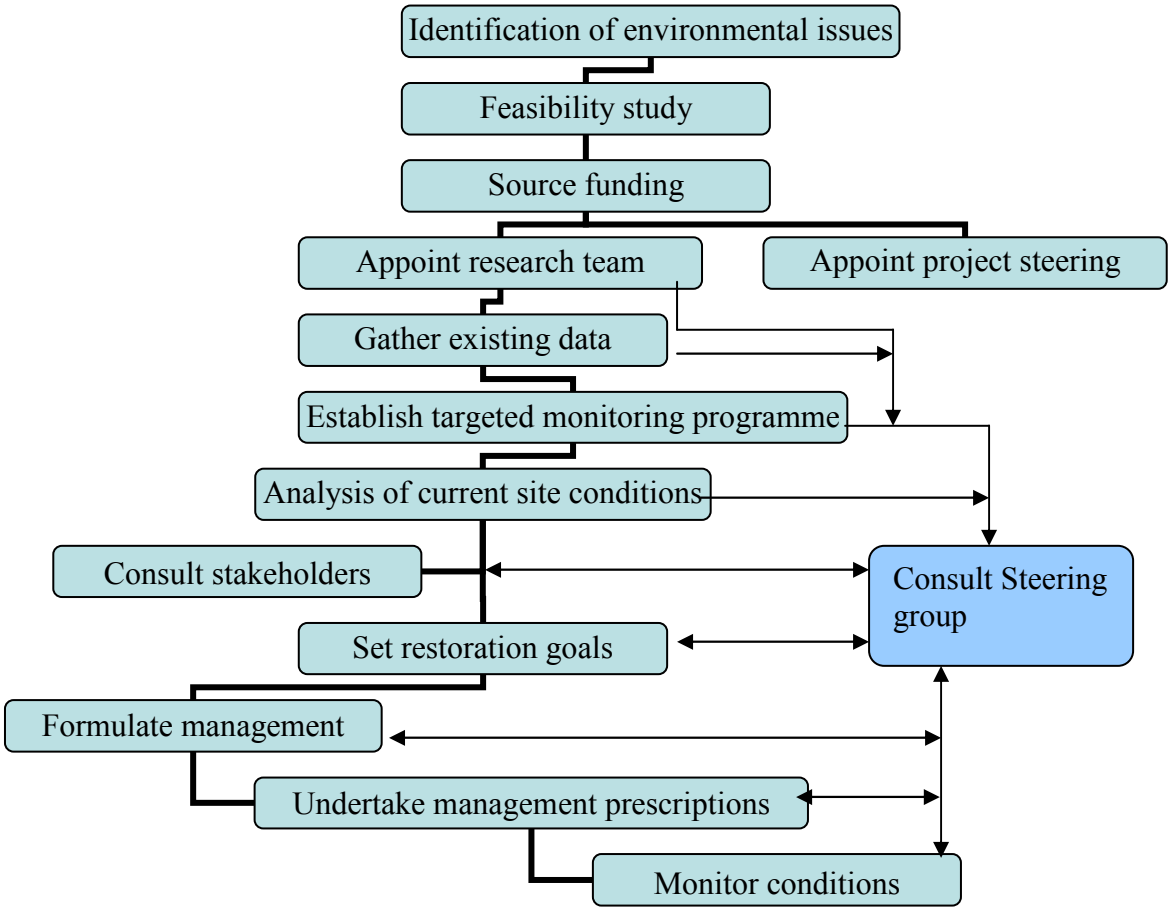

Figure 1. Wetland restoration planning and implementation procedures

Identification of environmental issues

- Pevensey Levels environmental issues were noted

Feasibility study

- Initial consultations with local steering group (EA, Southern Water, English Nature)

Source funding

- Interreg IIIC funding

Appoint research team

Appoint steering group

- The UK Lakepromo steering group was assembled by contacting various groups, institutions with either a practical or academic interest in the Pevensey Levels and inviting them to attend a local meeting. From this a core group was developed which meets approximately once every two months to aid in project progression. Government agencies, such as English Nature and the Environment Agency are core members of the project steering group.

Gather existing data

- The University of Brighton has sourced data from a variety of sources, public and private and collated data in a database for analysis.

Establish targeted monitoring programme

- A number of locations within the pilot study area were identified as of being of particular interest, and these are now monitored regularly. Extensions to the current monitoring scheme are due to be implemented in January 2006, focusing on source apportionment using microbiological techniques and other tracing methods.

Analysis of current site conditions

- Using data gathered from the aforementioned sources and other information, an assessment of current site conditions has been derived, details of which can be found in Diston and Mitchell, 2005.

Consult stakeholders

- To receive feedback on proposed project, increase awareness, increase local acceptance/enthusiasm for the project and gather information. It is very important to be seen as working with the local community, not against it.

Set restoration goals

- Restoration goals for each unit within the Pevensey Levels will be determined by English nature and individual landowners.

Formulate management

- Overseen by English Nature with assistance provided by the University of Brighton**.**

Undertake management prescriptions

- This will be done by the individual landowners/tenants.

Monitor conditions

- This will be done through Environment Agency statutory monitory requirements, English Nature condition assessments and the University of Brighton's monitoring programme.

Consult steering group

- Consultation of not only the key members of the steering group, but local stake holders is vital to the success and sustainability of the project. This will be done on a regular basis.

6.0 National Best Practises and Special Expertise in Methods and Projects

6.1 National Special Expertise

There are various UK research groups currently operating within the field of eutrophication and wetland restoration. Expertise of note includes:

- Point and diffuse pollution risk assessments. Notable authors include:
  - H.P. Jarvie, C. Neal and P.J.A. Withers.
- SRP release from sediments, undertaken by the CEH. Notable authors include:
  - B.E. Gainswin, W.A. House, B.S.C. Leadbeater, P.D. Armitage and J. Patten.
- Phosphorus interactions within river systems. Notable authors include:
  - C.P. Mainstone and W. Parr.

6.2 New Innovations

None identified

6.3 Examples of Completed Restoration Projects

The Nene Washes

(http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0030222)

Situated in Cambridgeshire, the Nene Washes were formed by extensive draining of the land, which started as early as 1700 (orchestrated by Dutch engineer Vermuyden). Aided by advances in pump drainage technology, the Washes had been dried sufficiently for arable agriculture. The lowering of the water table resulted in the oxidisation of the peat and shrinkage ensued, substantially lowering ground level (Jenman and Kitchin, 1998, In: Joyce and Wade, 1998). In the 1970's approximately 75% of the area which is now classified as a Nature Reserve was intensely cropped, resulting in a severe decrease in biodiversity and loss of habitats. Since late 1970's most of the arable land has been abandoned and has reverted back to grassland. As the Nene Washes provide vital habitats for a number of over wintering/breeding bird populations they have been designated as a Ramsar site, an SPA, a SSSI and a NNR.

The management targets of the Nene Washes are threefold:

1. Provision of refugee areas for wildfowl;
2. grassland management;
3. control of water levels.

Extensive winter flooding is required to attract large numbers of wildfowl. If this is allowed, a wide variety of habitats will be available, and therefore a diverse array of birds present. For example:

- *Anas penelop, A. strepera, A. crecca, A. acuta* and *A. clypeta* require shallow flooding (<30cm deep) to feed in;
- *Aythya ferina* (pochard) and *A. fuligula* (tufted duck) are attracted by deeper water for diving;
- *Cygnus columbianus bewickii* require open water for roosting whist the nearby arable land provides a source of food;
- Some wintering and passage waders require short grassland with shallow flooding for both safe roosting and feeding. These include *Vanellus vanellus* (lapwing)*, Pluvialis apricaria* (golden plover), *Limosa limosa* and *Philomachus pugnax* (ruff).

As with the Pevensey Levels, decreased winter flooding led to a decline in the importance of the Nene Washes for wintering wildfowl, but it is now possible to artificially flood over 100ha where the land has shrunk due to peat shrinkage. The flooding usually takes place between November and the end of February.

In order to increase the flood storage capacity, the ditch water levels are lowered during winter to the detriment of over-wintering bird populations, as is the case with the Wallers Haven on the Pevensey Levels. An important factor aiding the return of breeding birds was the Internal Drainage Board permitting raising water levels of particular areas of the NNR by 30cm in summer, Jenman and Kitchin, (1998), In: Joyce and Wade, (1998). The key to the long term solution to maintaining high water levels in the ditches is to allow hydrological isolation of all or parts of the reserve, independent of lower water levels set by other landowners.

As with the Pevensey Levels, the fields of the Nene Washes have a saucer shaped topography due to excavated ditch dredgings being dumped at the edge of the fields, and the oxidation of the field centres, therefore allowing the retention of winter floodwater well into spring.

There are 43km of ditches in the Nene Washes NR, considerably more than the 10km found in the Pevensey Levels, which support nationally important communities of both flora and fauna. Examples include:

- Yellow floating heart (*Nymphoides peltata*);
- Hair like pondweed (*Potamogeton trichoides*);
- Marsh dock (*Rumex palustris*);
- Withering lanceleaf water plantain (*Alisma lanceolatum*).

Since the outset of the reserve the ditches were mainly in a derelict condition, but have since been gradually restored; in 1993, 90% of ditches were found to have a diverse array of flora , Jenman and Kitchin (1998), In: Joyce and Wade (1998). The open water of the ditches and their edges are important for birds, which they use as a drinking source. Cattle that graze the fields and use the ditches as a source of drinking water, push in ditch edges which in turn create a margin of marsh and mud, providing excellent feeding sites for waders during summer. Ditch water levels also have to be kept at a reasonable depth in order to act effectively as wet fences to contain livestock. Recent dry summers and over abstraction by water companies of water for human consumption has exacerbated the problem of maintaining sufficiently high summer ditch water levels. Both the planned urban expansion of Hailsham and increasing demand for water in the south-east, could give rise to a similar situation on the Pevensey Levels.

In conjunction with ditch water level management, areas of grassland are also tightly managed in order to promote viable habitats. The aim on the Nature Reserve is to have produced a short sward (grassy turf) over 85% of the area by November as this is attractive to wintering wildfowl and subsequently to breeding birds for feeding. Grazing is mainly carried out by cattle in order to produce an uneven sward which promotes variety and quality in species composition. 10% of the area is covered by taller swamp community, which attracts wintering wildfowl, and when it is not flooded is used for roosting.
The vegetation is mown during the autumn in order to prevent woody plants from becoming established and to maintain the open nature of the reserve.

The key breeding bird species on the reserve are ground nesting, so the grazing season is delayed until mid-may to reduce trampling of eggs and young. The fields are grazed in order of dryness (as birds will inhabit wetter fields) and progressively grazed. This can mean that some fields which remain flooded throughout spring may not be grazed until June. The grazing season traditionally finishes around the end of October, but can be extended if need be. Cattle are preferred to sheep as they tolerate wetter ground and eat a range of grasses and sedges thereby producing a more varied sward structure.

The Somerset Levels and Moors

(http://somersetlevels.com/index.php)
The Somerset Levels and Moors (SLAM) are designated as an Environmentally Sensitive Area (ESA), contain various National Nature Reserves, host 13 biological SSSIs and have a RSPB reserve. The Levels and Moors contain the floodplains of 7 major rivers that drain westwards into the Bristol Channel. Much of the area is flooded in winter making it the largest freshwater wetland in SW England.

The Levels support a population of 25,000, and annual visitor numbers can reach 250,000, D. J., Galaves (1998): In Joyce and Wade, 1998). The Somerset Levels and Moors provide important habitats for many over-wintering and breeding birds. Like the Pevensey Levels they

attract populations of *Vanellus vanellus* (lapwing) *and Gallingo gallingo* (snipe). The ditches also support a diverse array of macrophytic vegetations and macroinvertebrates.

As with the Pevensey Levels, the SLAM have a complex land-drainage system, including embanked rivers and drains, tidal sluices, pumping stations and an intricate network of field ditches. Post 1970, agricultural intensification stressed the traditionally managed grassland and large-scale under field drainage was installed. Large areas were cultivated and resown, some were brought into arable production and nearly all were improved by the use of fertilisers and herbicides. Extensive pump drainage systems were installed where water levels are kept high during summer to allow for irrigation and the provision of wet fences, whereas in winter the levels are kept low to maximise flood storage. As is the case on the Pevensey Levels, achieving an acceptable balance between conservation needs and those of the farmers is a major challenge.

Environmental objectives within the SLAM are fourfold:
- To maintain the wildlife conservation quality and the landscape quality of grassland;
- To enhance he wildlife conservation value of the wet grassland, without detriment to landscape by maintaining higher water levels in the ditches;
- To maintain and enhance landscape quality through management of characteristic elements;
- To maintain and enhance archaeological and historic features.

The SLAM Environmentally Sensitive Area is a 'part farm' scheme, meaning that a landowner can enter the whole or part of their land. There are various tiers to which farmers can subscribe in reward for varying rates of compensation. Typical management prescriptions include:

Tier 1- Extensive grassland management with restrictions on cultivation, under-drainage and the use of inorganic fertiliser
Tier 2- Additional restrictions on stocking rates, winter sheep-grazing, cultivation, mowing dates and fertiliser use.
Tier 3- The creation of wet winter and spring conditions to further ecological interests.

In order to enhance promote biodiversity whilst maintaining the economic viability of farmers and other stakeholders, a number of project and strategies have been orchestrated, two of which are summarised below.

The Levels and Moors Strategy:
- Initiated in 1990 as a response to continuing conflicts between conservation and agriculture and comprise a series of management agreements with farmers co-ordinated by Government;
- Since 1992, there have been 13 raised water level areas, covering 1,217 ha at a capital cost to the EA of £367,000. Current cost of total incentive schemes is around £2.2m per annum (Jenkins, 1999);
- The ESA scheme is voluntary, and allows farmers to opt out after 10 years. This short term solution may allow some species, wintering birds, to adapt quickly, but does not provide for the development of complex botanical systems and populations of breeding waders;
- Recent research has shown that many landowners would opt out if compensation payments were insufficient, and a minority are committed to conservation goals (may not be viable in the long term).

Avalon Marshes Project:

- Based on acquisition of land rather than incentive payments. As of 1999, 625 ha of land has been bought by English Nature (some which has been leased to Somerset Wildlife Trust) and restored to reedbed, open water and marsh at a cost of around £0.5m;
- Large amounts of land are available for flooding therefore allowing increase in breeding and wintering bird populations;
- Greater emphasis on increasing public participation and awareness;
- Both schemes use similar techniques i.e. small-scale engineering schemes to maintain higher water levels on specific areas, while surrounding farmland is pump drained;
- As expected, populations of wintering birds increased soon after increased water levels, whereas breeding bird populations have been slower to recover;
- Botanical communities have not adapted well to the change in management practices. Sedges and Rushes have replaced many rarer species;
- Factors which have been fundamental in achieving restoration success:
  - Adequate finances. Combined costs for the Somerset projects are estimated to be around £2.5m per annum;
  - Co-ordination, co-operation and flexibility of stakeholders;
  - Overcoming resistance to change (residents, landowners etc.) and perception of flooding risk as a result of raised water levels.

Mineral Valleys Project, West Durham (2003 to 2008)
http://www.mvp.org.uk/
Led by English Nature and funded by the Heritage Lottery Fund (£2.8 million) in conjunction with 50 other organisations, this community led project aims to restore previously derelict areas into valuable wetland and woodland environments, totalling around 350 ha. Volunteers and community groups play a key role in the creation and maintenance of these new habitats and although not a wetland restoration, rather a landscape regeneration project, the Mineral Valleys project highlights the role of the community within environmental remediation schemes. The project comprises 14 diverse sub-projects of which two are specifically aimed at wetland restoration and creation. These are:

1. **Wild Wetlands project**. Environmental enhancement of existing nature reserve via wetland creation, new reed beds and meadow regeneration. On site recreational and educational facilities are also being improved.
2. **Accessing Wetlands and Beyond project**. This project aims to create a mosaic of habitats including, wet woodlands, wet meadows, ponds and reedbeds. It is hoped that the newly created habitats will help the area reach UK Biodiversity Action Plan (UKBAP) targets. The project will also improve recreational and educational facilities within the site.

The Severn and Avon Vales Wetlands Partnership (SAVWP) 2003-2006.
http://www.severnwetlands.org.uk/
Established in 2002, primarily as a response to increasing concern over loss of biodiversity and the disappearance of valuable flora and fauna, this project involves a plethora of partners from a range of environmental, agricultural and planning institutions. The themes/aims of the project summarised below:

- **Agriculture / Rural Land use & Economy**. To create and sustain, through viable farming partnerships, a mosaic of floodplain landscapes and wildlife;
- **Biodiversity and landscape**. To ensure the protection and enhancement of existing wetland habitats;

- **Floodplain and water resource management.** To fully integrate the objectives and benefits of wetland creation into floodplain and water resources management policies, strategies and practices;
- **Data collation and dissemination.** To monitor change and to collate and disseminate data in a readily accessible format to enable SAVWP to effectively plan, target and promote wetland creation, report on partnership success and contribute to floodplain and water resource policy development;
- **Communication and promotion**. To promote greater appreciation of the economical and environmental value of floodplains, through the provision of managed access and interpretation;
- **Funding.** To establish and maintain a diverse and stable funding resource to support the realisation of the Partnership's long-term vision and objectives.

The principle actors in this project are:
- The Environment Agency;
- English Nature;
- The Wildlife Trusts;
- Farming and Wildlife Advisory Groups (FWAG);
- Department of Food and Rural Affairs (Defra);
- National Farmers Union (NFU);
- Association of Drainage Authorities (ADA);
- County and Local Councils;
- Royal Society for the Protection of Birds (RSPB);
- Wildfowl and Wetlands Trust (W&WT);
- Severn Trent Water.

How SAVWP formulated recreation options for the River Severn/Avon floodplain wetlands

An independent team of external experts were commissioned by English Nature, the Environment Agency and the RSPB to evaluate the potential for UKBAP habitat restoration on 18 floodplain areas within the Severn/Avon Vales area. The subsequent findings were then used as a basis for the SAVWPs management plans and restoration targets.

The methodology of the study is briefly outlined below:

1. **Phase 1**- Areas of floodplain that had restoration potential were identified using a variety of criteria including current landuse, topography, water availability and general soil suitability. At this stage the areas identified were very general.
2. **Phase 2**- These areas were then examined in greater detail and 18 potential floodplain areas were determined (covering approximately 7,929 ha). Potential constraints of each potential restoration area was then assessed. These included:
    - Flood defences:
    - Developments;
    - Archaeological features;
    - High grade agricultural land.

    The areas were then evaluated further considering specific requirements. These included:
    - Soil type;
    - Water management/regime;
    - Existing habitats;

- Feasibility of creating new habitats

After this evaluative process, potential restoration sites were ranked, and the planning of remediation schemes started.

In the first two years of the SAVWP project (2000 & 2001) 327 ha of wet grassland was restored, primarily through Countryside Stewardship agreements, this represents approximately 54.5% of the UKBAP county target and 3.27% of the national target. These agreements will generate approximately £1.6 million in direct economic benefits in the next 10 years for the local economy. As this scheme aims to promote an increasingly 'natural' flooding regime, careful consideration must be paid to existing Environment Agency flood defence policies, with particular reference to the interests of third parties. Moreover, any restoration scheme must comply with all statutory planning policy, particularly important in order to protect archaeological remains. It is within this context that the SAVWP plans to work with a wide variety of interest groups in order to create a network of parties allowing the formulation of widely acceptable wetland restoration practices and goals. As is the case with the Pevensey Levels, a large amount of the traditional floodplain is situated on current farmland and to undertake the proposed habitat restoration requires firm commitments from farmers and other landowners. By encouraging affected farmers to join the Countryside Stewardship Scheme, SAVWP, in conjunction with local FWAGs, has significantly increased the amount of wet-grassland within the project sites.

The future of the SAVWP:
- The SAVWP plans to continue to work closely with the EA, any will play an important role in the development of future management plans;
- The SAVWP will continue to be an active consultant to Defra, aiding in the agri-environmental review process;
- In order to enable the SAVWP access to a wider variety of funding sources, it has established a legal status as an "unincorporated association";
- Continual development of existing policies;
- Increasing the SAVWPs pubic profile, both locally and nationally.

There are many other wetland/wet-grassland schemes which may be of interest to Lakepromo partners, including:
- East Midlands Strategic River Corridor Initiative;
- Green Grid Project in Thames Gateway;
- Norfolk Broads;
- North Kent Marshes;
- Romney Marsh;
- Ouse Washes.

7.0 Summary and needs for development

As there is no national infrastructure in UK wetland restoration, it is difficult to identify what the present needs are, but development needs for the Pevensey Levels are illustrated below:
- A greater understanding of the hydrological regime is needed;
- A detailed knowledge of flows within the Levels is required;
- Further source apportionment studies need to be undertaken;
- Land use needs to be identified at a higher resolution;

- Agricultural nutrient imports into the Pevensey Levels need quantification;
- Investigation of smaller STWs effluent is required.

SWOT analysis

- **Strengths**:
  - Good understanding of the extent and processes determining eutrophication within the Pevensey Levels:
  - Have good relationships with government agencies;
  - Have the required facilities to undertake present and future monitoring programmes;
  - Access to a diverse array of academics that can advise and offer information relating to ecological and botanical aspects of the pilot site. Also access to modelling specialists.
- **Weaknesses**:
  - Lack of information regarding agricultural activities within the Levels.
- **Opportunities**:
  - Current research regarding sediment uptake/release of P is particularly applicable to the pilot site. Recent techniques which have been developed may be employed by the University of Brighton to ascertain P fluxes between sediments and the overlying water column;
  - The introduction of the new agri-environmental scheme, Environmental Stewardship, will provide more information regarding agricultural practices.
- **Threats**:
  - Lack of hydrological data.

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