Natural England Commissioned Report NECR142

Geomorphic and Ecohydrological Monitoring and Prioritisation Report

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The New Forest contains significant areas of habitats that are now rare and fragmented across lowland Western Europe, including lowland heath, valley and seepage step mire or fen, and ancient pasture woodland, including riparian and bog woodland. It is also important for its stream network, that drains the mire habitats, which form an unusual community due to the combination of nutrient-poor, acid waters and outcrops of neutral, enriched soils.

The damage caused by historical drainage activities and contemporary engineering/ management of the mire systems and modification of rivers and streams is frequently cited as a reason for unfavourable condition of the New Forest SSSI units. Natural England aims to restore these to favourable condition and to do this needs to understand the physical habitat and ecohydrological processes and forms of the mire/wetland floodplain habitats. This includes:

1) Undertaking a geomorphological analysis and ecological interpretation of physical impacts on the river and floodplain.
2) Identifying the floodplain features and SAC habitats associated with the abandoned and active floodplains and describing the impact of watercourse modification and other drainage activities.
3) Preparing ecohydrogical/hydrogeological characterisation of the mires following a full analysis of data already available supplemented by field data.
4) Providing brief details of the physical restoration opportunities for each mire and their logical sequencing at hydrological catchment and New Forest scales.
5) Reviewing the current body of evidence and suggest what longer term monitoring could be put in place to provide a national set of scientific evidence to support wetland restoration.

This report has been produced as part of the New Forest SSSI geomorphic and ecohydrological investigation project. It should be read in conjunction with the overview geomorphic and ecohydrological reports as well as the unit specific restoration reports produced. See:

- New Forest SSSI Geomorphological Survey Overview (NECR140);
- New Forest SSSI Ecohydrological Survey Overview (NECR141); and
- Latchmore Brook Restoration Options Appraisal (NECR143).

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Further information
This report can be downloaded from the Natural England website: **www.naturalengland.org.uk**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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1 Geomorphic and Ecohydrological Monitoring and Prioritisation Report

1.1 Introduction

This report has been produced as part of the New Forest SSSI geomorphic and ecohydrological restoration project. It should be read in conjunction with the overview geomorphic and ecohydrological reports as well as the unit specific restoration reports produced.

1.2 Overview

The geomorphic and eco-hydrological monitoring strategies have been combined into this standalone report. It has not been possible to combine the site prioritisation rankings because of the different criteria necessarily used. However, higher priority sites from both rankings should be considered as important as each other when planning restoration works and funding, this is discussed further in section 1.11.

1.3 Geomorphic Monitoring Strategy Background

A large number of monitoring approaches have been adopted across a range of river studies in the UK (Table 1-1). It is clear that many are inappropriate for monitoring the New Forest SSSIs due to a number of factors including expense, required monitoring intensity (spatial and temporal) and requirements not to damage the SSSIs. Some past monitoring approaches adopted within the New Forest for past restoration schemes include fixed point photography, river reconnaissance, water level and flow monitoring and biotope mapping and are discussed in the LIFE project documents (see geomorphic overview report for further information).

Table 1-1: Advantages and disadvantages of ecological/hydromorphic monitoring approaches for rivers

Monitored element	Monitoring approach	Advantages	Disadvantages
Hydromorphic processes	Hydromorphic audit	Cost effective Qualitative	Requires experienced assessor
	Flow monitoring	Valuable hydraulic data	Requires measurement across flow regime Spatial coverage should match process variability
	Gravel trapping	Provides data on sediment supply and transport	Costly, high maintenance
	Hydraulic measurement	Detail on local control on channel form	Requires measurement across flow regime Spatial coverage should match process variability
	Biotope mapping	Qualitative Detail on hydraulic habitat	Requires measurement across flow regime Requires experienced assessor
	Particle tagging	Detail on sediment movement	Spatial coverage should match process variability High loss rate
Hydromorphic form	Morphology survey	Detail on form and change	Spatial coverage should match process variability
	Erosion monitoring (pins)	Local quantification of bank line change	Spatial coverage should match process variability Impacts on physical integrity of the banks
	Accretion monitoring (mats)	Detail on out of bank sedimentation	Spatial coverage should match process variability
	Sediment	Information on sediment	Spatial coverage should match

Monitored element	Monitoring approach	Advantages	Disadvantages
	measurement	character, change and flux Can be carried out as part of wider audit work	process variability
	Aerial LIDAR survey	Extensive mapping Good precision Allows change quantification and mapping	Expensive Complex processing and interpretation
	Terrestrial LIDAR survey	Very detailed mapping High precision Allows change quantification and mapping	Expensive Complex processing and interpretation
	Fixed point photography	No specialist skills required for data collection Qualitative	Labour intensive
	Time lapse photography	Qualitative Cost effective Clear temporal change evidence	Moderate processing levels Poor control of image quality over time
Vegetation change	Ecological audit	Qualitative Cost effective	Requires experienced assessor
	Phase I mapping	Cost effective Partially quantitative through comparison of mapped habitat areas	Partially qualitative Quantitative assessment limited by broad-scale habitat descriptions Requires experienced assessor
	Quadrat sampling	Quantitative species assemblage data	Spatial coverage should match community variability Labour intensive
	Fixed point photography	Qualitative No specialist skills required for data collection	Labour intensive Broad change only
	Time lapse photography	Cost effective Moderate processing levels Clear temporal change evidence Qualitative	Poor control of image quality over time Requires careful placement (other studies have hidden them in bird boxes and trees to prevent vandalism and theft).
	Fixed point aquatic macrophyte surveys	Quantitative species data	Requires experienced assessor Labour intensive Not focused on adjacent floodplain adaptation
	Aerial LIDAR	Extensive mapping Excellent to monitor flow routes	Expensive Complex processing and interpretation

1.4 Pre restoration monitoring

The unit based reports produced as a result of this project will form a baseline data set usable for the next two years after which geomorphic processes will potentially have altered conditions sufficiently to warrant a new reconnaissance survey to update the base data and interpretation.

1.5 Unconstrained geomorphic monitoring strategy

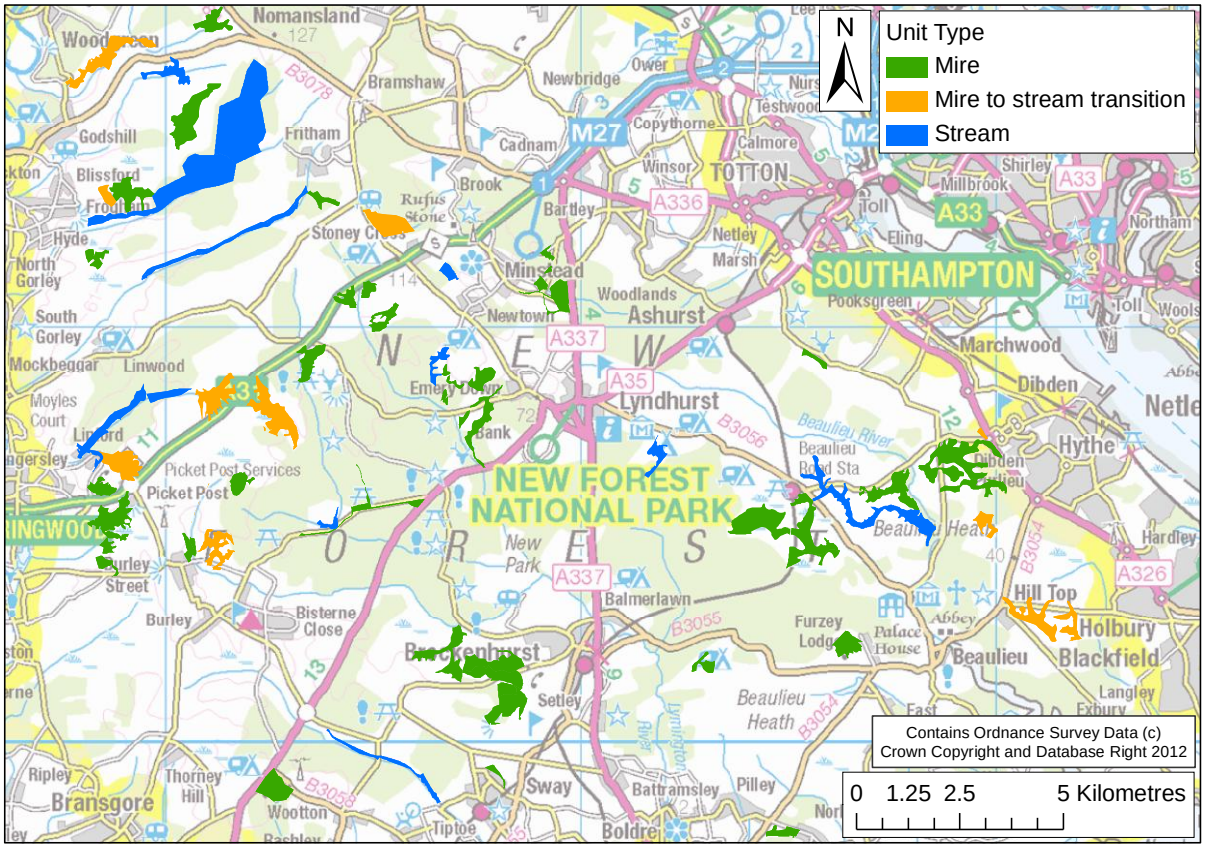
The table of monitoring approaches has been used alongside information gained from the site visits to recommend a set of assessment protocols appropriate for the entire New Forest. This is detailed in Table 1-2.

Table 1-2: Recommended monitoring approaches for the New Forest

Generic monitoring approach		Cost	Method description
WITHIN SSSI UNIT SCALE (short term monitoring)	Time lapse photography	5 x £200 - camera cost £200 - Half yearly downloading Annual summary £300 Per site costs	Daily fixed point photographic capture (annual statistical summary) – to analyse morphologic unit change, flow change, sedimentology change and vegetation change.
	2 yearly reconnaissance	£500 per site Per site costs	Visual survey of study reach to determine reach scale change.
	Biennial Quadrat/aquatic macrophyte survey	£350-£500 - survey £500 - analysis Per site costs	Quadrat survey to determine vegetation change / response to restoration Aquatic macrophyte survey at fixed points to monitor vegetation change /response in streams
INTERACTING SSSI UNIT SCALE (Medium term)	5 yearly detailed hydromorphic and ecological audit	£1,000 per site	A combined audit similar to the level of detail for current study. Also assessing upstream and downstream connectivity outside of SSSI unit boundary
NEW FOREST SCALE (Long term)	10 yearly LIDAR assessment	~£50,000 for all study sites	Recapture of LIDAR data to assess catchment scale change and response to restoration, alongside detailed hydromorphic audit.

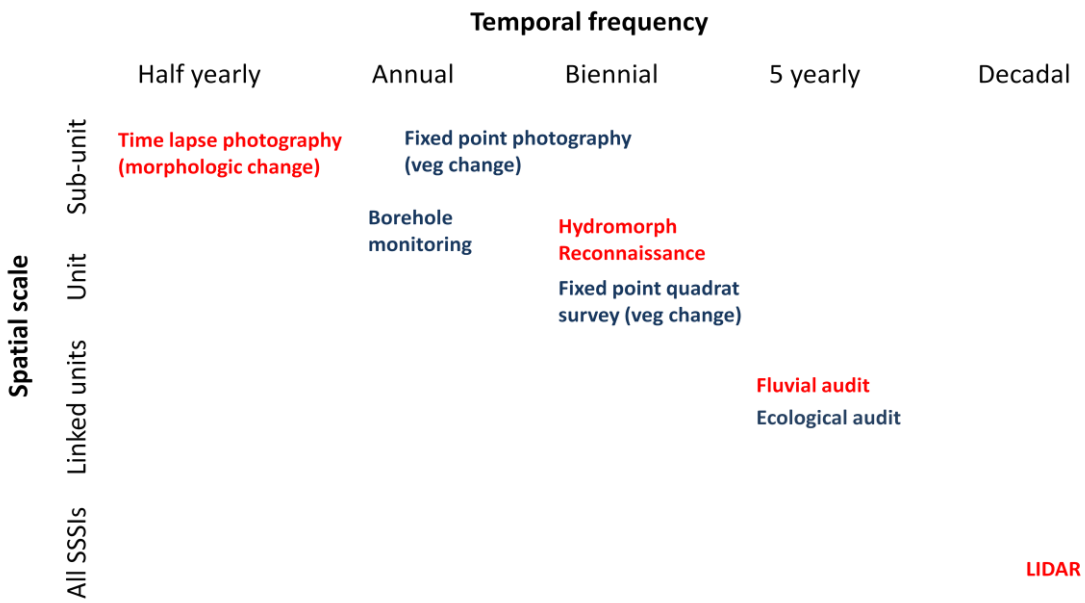
The protocol suggested in Table 1-2 and Table 1-3 is designed to monitor the geomorphic SSSI units illustrated in Figure 1-1. It necessarily targets key sites for detailed monitoring (section 1.6) whilst ensuring that all sites are reviewed both with regard to their internal integrity and their wider influence on linked SSSI and non-SSSI systems.

Figure 1-1: New Forest River and Mire SSSI units



The general dynamics of all the SSSI units should be assessed on a less frequent basis to ensure that their functioning is not deteriorating and rapid reconnaissance audits are suggested in combination with routine key site monitoring on a 2 yearly basis. The reconnaissance audits will include a biotope mapping component, to quantify process adjustment between 2 yearly audits. It is recognised that SSSI site restoration and response will influence linked systems and this should be assessed every 5 years using an approach similar to the combined ecological / hydromorphic assessment conducted for this project. Ten year LIDAR resurvey will allow whole system reassessment, looking in detail at channel and mire response and comparing flow path change over the decade. This approach is summarised in Figure 1-2 and Table 1-2 where generic costs are also given.

Figure 1-2: Spatial and temporal monitoring scales for the New Forest



This spatially and temporally nested approach has been applied to the New Forest SSSI units with more frequent monitoring techniques suggested at key sites identified in the restoration reports (Table 1-3) and described further in section 1.9. The unit restoration plans provide explanation around the site specific monitoring proposals shown in Table 1-3 and Table 1-4.

Table 1-3: Shorter term monitoring at SSSI river sites across the New Forest

Geomorphic Assessment Area	SSSI Units	Site Names	Requirements for monitoring
Lower Latchmore Brook	48	Latchmore Shade	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Mid Latchmore Brook	66	Amberwood/Alderhill	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Upper Latchmore Brook	540	Islands Thorns / Amberwood	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Black Gutter	35	Black Gutter Bottom	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Dockens Water	545	Dockens Water Woods	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Suburbs Wood	75	Suburbs Wood Mire	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Long Beech Inclosure	112	Long Beech	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Linford Brook	88	Linford Bottom	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Roe Inclosure South	117	Roe Inclosure South	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Buckherd Bottom	95	Buckherd Bottom	Time lapse camera x3 Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Picket Bottom	91	Picket Bottom	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Bagshot Gutter	368	Wick Wood Riverine Woodland	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
The Knowles	341	Ma 5 Wet	Time lapse camera x2 Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Corbet's Hat	341	Ma 5 Wet	Time lapse camera x2 Fixed point camera survey Fixed point quadrat survey

Geomorphic Assessment Area	SSSI Units	Site Names	Requirements for monitoring
			Fixed point aquatic macrophyte survey
West of Wood Crates	341	Ma 5 Wet	Time lapse camera x2 Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Harvest Slade	126	Harvest Slade Bottom	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Avon Water	539	Wootton Riverine Woodland	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Fleet Water	286	The Grove	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Cowleys Heath Central	423	Cowleys Heath Central	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Cowleys Heath East	422	Cowleys Heath East	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Park Hill Lawn	386	Park Hill Lawn (Pondhead)	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Ferny Croft South	426	Ferny Croft South	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Soldiers Bog	123	Soldiers Bog	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Ma 5 Wet	341	Ma 5 Wet	Time lapse camera x7 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Spring Wood Riverine Woodland	371	Spring Wood Riverine Woodland	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey

An estimate has been made for the total cost of monitoring requirements, for each relative timescale, for the geomorphic SSSI units assessed for this project:

- 6 monthly - downloading time lapse camera data (all sites cost rather than per camera) = **£5,000**
- Annually - analysis of time lapse camera data (all sites cost rather than per camera) = **£7,500, ;**
- Biennially - 1) Fixed point quadrat / aquatic macrophyte survey = **£49,000** (assumed £500 survey cost per site at this stage); 2) Hydromorphic reconnaissance = **£10,500**
- 5 yearly - Fluvial audit (hydromorphic) = **£25,000**
- 10 yearly - LIDAR recapture = ~**£50,000** (assumed cost of £290 per tile)

Initial equipment costs - time laps cameras = **£19,200**

Table 1-4 illustrates a 35 year spend profile for the unconstrained monitoring approach described above for all geomorphic sites assessed and Table 1-5 provides total costs associated to these on a total and yearly basis.

Table 1-4: 35 year monitoring spend profile for the New Forest River SSSI units

Time (years)	Time lapse and analysis		Reconnaissance	Fluvial audit	LIDAR
Initial camera outlay	12000				
0.5	5000				
1		7500			
1.5	5000				
2			10500		
2.5	5000				
3		7500			
3.5	5000				
4			10500		
4.5	5000				
5		7500			
5.5	5000			25000	
6			10500		
6.5	5000				
7		7500			
7.5	5000				
8			10500		
8.5	5000				
9		7500			
9.5	5000				
10			10500	25000	40000
10.5	5000				
11		7500			
11.5	5000				
12			10500		
12.5	5000				
13		7500			
13.5	5000				
14			10500		
14.5	5000				
15		7500		25000	
15.5	5000				
16			10500		
16.5	5000				
17		7500			
17.5	5000				
18			10500		
18.5	5000				
19		7500			
19.5	5000				
20			10500	25000	40000
20.5	5000				
21		7500			
21.5	5000				
22			10500		
22.5	5000				

Time (years)	Time lapse and analysis		Reconnaissance	Fluvial audit	LIDAR
23		7500			
23.5	5000				
24			10500		
24.5	5000				
25		7500		25000	
25.5	5000				
26			10500		
26.5	5000				
27		7500			
27.5	5000				
28			10500		
28.5	5000				
29		7500			
29.5	5000				
30			10500	25000	40000
30.5	5000				
31		7500			
31.5	5000				
32			10500		
32.5	5000				
33		7500			
33.5	5000				
34			10500		
34.5	5000				
35		7500		25000	

Table 1-5: Total geomorphic and ecological monitoring costs over 35 years

Scenario	Total cost	Cost / yr
Geomorphology	795500	22729
Geomorphology, no LIDAR	675500	19300
Geomorphology and ecology	795500	22729
Geomorphology and ecology, no LIDAR	675500	19300

1.6 Site prioritisation and basic survey strategy

Given financial constraints a reduced intensity monitoring strategy could be adopted centring on those sites identified in the unit audit reports as being significantly at risk with degraded system functioning and ecology (Table 1-6). This is also linked to the site prioritisation assessment in section 1.9. Only these sites would be subject to annual monitoring and analysis for other sites only assessed during 5 year audits

Table 1-6: Priority monitoring sites assessed as currently displaying degraded form, function and ecology

Site name	Type	Site area	SSSI unit number	Requirements for monitoring
Latchmore Shade	River	23.4	48	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Amberwood/Alderhill	River	126.5	66	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Islands Thorns / Amberwood	River	195.3	540	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Long Beech	River	43.6	112	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Wootton Riverine Woodland	River	23.6	539	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Harvest Slade Bottom	River	0.3	126	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Wick Wood Riverine Woodland	River	14.4	368	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Roe Inclosure South	River	15.8	117	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Parkhill Lawn (Pondhead)	River	15.9	386	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Picket Bottom	Transition	43.7	91	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Linford Bottom	River	46.3	88	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Dockens Water Woods	River	43.4	545	Time lapse camera x5 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey

Site name	Type	Site area	SSSI unit number	Requirements for monitoring
Ferny Croft South	River	85	426	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Cowleys Heath Central	Transition	41.3	423	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Cowleys Heath East	Transition	18.8	422	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
The Grove	River	9.8	286	Time lapse camera x3 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey
Black Gutter Bottom	River	23.5	35	Time lapse camera x2 Hydromorphic audit Fixed point camera survey Fixed point quadrat survey Fixed point aquatic macrophyte survey

Table 1-7 illustrates a 35 year spend profile for the basic monitoring strategy and priority sites and Table 1-8 provides total costs associated to this basic approach on a total and yearly basis.

Table 1-7: 35 year prioritised monitoring spend profile for the New Forest River SSSI units, basic approach

Time (years)	Time lapse	Time lapse and analysis	Ecology	Reconnaissance	Fluvial audit	LIDAR
Initial camera outlay	12000					
0.5	2500					
1		4000				
1.5	2500					
2			30000	10500		
2.5	2500					
3		4000				
3.5	2500					
4				10500		
4.5	2500					
5			49000		25000	
5.5	2500					
6				10500		
6.5	2500					
7		4000	30000			
7.5	2500					
8				10500		
8.5	2500					
9		4000				
9.5	2500					
10			49000	10500	25000	40000
10.5	2500					
11		4000				
11.5	2500					
12			30000	10500		
12.5	2500					
13		4000				
13.5	2500					
14				10500		
14.5	2500					
15			49000		25000	
15.5	2500					
16				10500		
16.5	2500					
17		4000	30000			
17.5	2500					
18				10500		
18.5	2500					
19		4000				
19.5	2500					
20			49000	10500	25000	40000
20.5	2500					
21		4000				
21.5	2500					
22			30000	10500		
22.5	2500					
23		4000				
23.5	2500					

Time (years)	Time lapse	Time lapse and analysis	Ecology	Reconnaissance	Fluvial audit	LIDAR
24				10500		
24.5	2500					
25			49000		25000	
25.5	2500					
26				10500		
26.5	2500					
27		4000	30000			
27.5	2500					
28				10500		
28.5	2500					
29		4000				
29.5	2500					
30			49000	10500	25000	40000
30.5	2500					
31		4000				
31.5	2500					
32			30000	10500		
32.5	2500					
33		4000				
33.5	2500					
34				10500		
34.5	2500					
35			49000		25000	

Table 1-8: Total geomorphic and ecological monitoring costs over 35 years for basic approach

Scenario	Total cost	Cost / yr
Geomorphology	629000	17971
Geomorphology, no LIDAR	509000	14543
Geomorphology and ecology	1182000	33771
Geomorphology and ecology, no LIDAR	1062000	30343

The total yearly cost for this basic monitoring approach, assuming no LIDAR is flown every 10 years, is approximately £30,343. This cost should be read in conjunction with yearly costs calculated for the eco-hydrological monitoring approach in the eco-hydrological overview report.

1.7 Ecohydrological Monitoring Requirements

This section outlines the general principles of ecological and hydrological monitoring recommended for the New Forest Wetlands. Then it outlines the specific requirements for each Ecohydrological Assessment Area and attempts to give some suggestion to the priorities.

1.7.1 Vegetation Monitoring General Principles

Within the individual Ecohydrological Assessment Area reports vegetation monitoring recommendations are made. This generally takes three forms:

- Fixed point camera surveys;
- Fixed point quadrat surveys;
- Transect studies.

These techniques are designed to collect the most useful data possible, in a relatively cost-effective and rapid manner. Full site resurveys, Phase I habitat surveys of ecological audits or NVC surveys could be conducted, but these would be costly and time consuming.

The fixed point camera surveys are primarily to assess long-term changes in the overall habitat and character of specific units, for example to assess the extent of scrub encroachment within a unit over time (which could then trigger restoration action). Fixed point camera photography could also be used to monitor critical areas, such as watercourse crossing points, to assess the continued impact of footpath erosion/inappropriate crossing points, or the re-establishment of mire/wet heath communities following restoration.

The fixed point quadrat surveys are to record more quantitative data following implementation of restoration measures, to assess vegetation community change. Within a unit, a number of carefully selected quadrat points (geo-located and feno-marked (a type of metal GPS marker) on the ground for ease of repeat surveying), for example adjacent to a blocked drain, can be used to assess how, and over what time period, mire and wet heath communities will be restored.

Transect studies incorporate two different study methods. The first would involve a simple alternating quadrat study at regular intervals along the transect from one habitat to another looking at the number or percentage cover of the invading species in each. This is ideal when looking for colonisation of open heathland by gorse, Rhododendron or Bracken. The second method would again involve dividing the transect into regular intervals and recording the nearest tree species found, its distance from the transect and its diameter at breast height (DBH) measurement. This would be used in areas where tree colonisation was being studied.

1.7.2 Species Monitoring General Principles

The New Forest also supports a number of notable and protected species, and the restoration measures detailed within this report have the potential to impact on a number of these species, both negatively and positively. Monitoring may therefore also be implemented to assess the impact on selected species; this should be done prior to implementation to establish a baseline and determine what species are present now and post-restoration to ascertain long term impacts.

Table 1-9 below provides brief details on species monitoring protocols and recommendations; where suitable habitats are present in units identified as sites for restoration the appropriate species survey/monitoring can then be conducted. This will also help to establish any environmental change arising from the measure implemented.

Table 1-9: Species Monitoring Recommendations

Species/Group	Survey/Monitoring Protocol	Reference
Great Crested Newt	Can undertake Habitat Suitability Index (HSI) assessments of pond (this is not a substitute for presence/absence surveys). Presence absence surveys involve conducting 4 visits to a pond, and utilising a number of survey techniques (e.g. bottle trapping, torching, egg searching, netting, refuge searching). For population estimates 6 visits are recommended. These surveys can only be conducted at the optimal time of year (March-July). Monitoring of presence/absence or population size pre- and post-restoration would give an indication of impact on this species.	Langton *et al.* (2001)
Breeding Birds (e.g. Dartford Warbler)	The breeding bird populations within the New Forest have been subject to considerable survey effort by the Forestry Commission (and others) and this should be continued. Birds are often used as indicator species as they adapt very quickly to environmental change. Therefore using historical survey data in comparison to future, post-restoration surveys, will highlight any changes resulting from the proposed works. Should works take place in sites not currently monitored, then, should time before construction allow, surveys should commence during the 2013 season to provide a baseline against which future monitoring can be compared. These surveys should be undertaken monthly as a minimum, and preferably fortnightly between April and July.	Bibby *et al* (2000) Gilbert et al (1998)
Overwintering Birds (e.g. Hen Harrier)	Efforts to monitor over-wintering bird populations should continue post-restoration, and during construction-phase, to determine the impacts on bird species. Where not already covered as part of routine, on-going survey efforts, vantage point surveys are recommended. The topography of most of the wetland complexes lends itself to this method of survey, many having raised ground above them, making vantage point selection relatively simple. It is recommended that these are carried out monthly.	

Species/Group	Survey/Monitoring Protocol	Reference
Southern Damselfly	A number of life stages of the southern damselfly could be monitored, including number of adults emerging (exuvia counts) or counting adults or larval populations. The type of monitoring protocol adopted depends on the resources available, and should be influenced by historical ecological records of this species. Fixed transects, counting adults, could be a useful, relatively rapid way of monitoring impacts on this species, with transects established across the relevant units.	Thompson *et al.* (2003)
Notable Plants (e.g. Hampshire Purslane, Wild Gladiolus, Pennyroyal, Slender Marsh Bedstraw, Dorset Heath	Due to the time of year at which the field surveys were conducted, few notable plant species were noted, however, the New Forest has been subject to extensive botanical surveys which should continue and inform future monitoring. Therefore, in order to assess the potential impact of restoration on notable plant species, a walkover survey of the restoration areas will be required, with counts of plants made if appropriate. This can then be followed by repeat monitoring counts to assess how the populations are impacted upon by the restoration schemes.	n/a
Sand Lizard Smooth Snake	Reptiles have the potential to be present within the restoration areas. Surveys should therefore be conducted prior to restoration to establish their presence/absence and population size (if necessary). Post-restoration monitoring should therefore be conducted to determine any impacts. This will require 6 visits (2 in April and 4 in May; weather dependant). The survey will involve searching the area around for reptiles whilst they are basking in the open or in partial cover and also checking any potential refuges. Artificial refugia should also be used, although for some species (e.g. sand lizard) detection rates are low. Capture-Mark-Recapture techniques could also be used for monitoring populations.	Edgar *et al.* (2010)

1.7.3 Water Level Monitoring General Principles

Within the individual Ecohydrological Assessment Area reports water level monitoring recommendations are made. Water level monitoring, where recommended, takes two main forms:

- Boreholes (or dipwells) which monitor groundwater levels;
- Stilling wells which monitor water levels in watercourses (including drains and ditches) and other open water bodies.

No monitoring is recommended to provide baseline information for sites unless:

- The vegetation does not seem to be in equilibrium with the current drainage. This is because, if vegetation appears to be in equilibrium with the current drainage, then the habitats which are there are supported by the current water level conditions. This means that monitoring is unlikely to add further useful information;
- And/or restoration plans are recommended for the site. Monitoring can be useful in confirming the need for restoration and in assessing its impacts.

Groundwater monitoring is not recommended in flush dominated wetlands - these are reliant on water running across the surface of the ground. This is relatively difficult to monitor with boreholes which monitor groundwater levels. The only potential exception to this is within valley bottoms with significant peat deposits, where water levels can be monitored in the peat.

In order to characterise the baseline hydrological condition of an area under investigation, prior to the implementation of any restoration plan, is recommended that the water level monitoring is continued for at least one whole calendar year and preferably for three whole calendar years from the date of the installation of the measurement equipment. This should allow the site to be monitored over a range of climatic and seasonal conditions and permit the magnitude and temporal patterns of water level variation to be quantified. Following the implementation of any restoration plan it is recommended that the hydrological monitoring continues for a minimum of 3-5 years, and preferably much longer. The resulting water level datasets should be regularly reviewed and assessed to provide further insights into the site hydrology, together with evaluating the impacts of any restoration works and the identification of any further works or management/maintenance that might be required.

Information about the nature and cost of installation arrays is given in Table 1-11.

Table 1-10: Cost and details of recommended approaches to Monitoring

Generic monitoring approach	Cost	Method description
Monitoring of groundwater levels (boreholes) and surface water levels (stilling wells)	Indicative costs: Basic network (3 installations): £6,500 Medium network (7 installations): £8,500 Large network (10 installations): £9,500	Initial site visit to finalise and agree monitoring network with NE and NFNPA (+ any other 3rd party) Installation of monitoring boreholes (within shallow hand-auger holes) and stilling wells (within ditches/streams). Purchase of automatic water level monitoring devices (data loggers) and installation of these within boreholes and stilling wells. One year of monitoring, including three download visits and associated data processing. The costs assume that JBA staff travel from Yorkshire to undertake the downloads. A saving of approximately £2,500 could be made if Natural England (or another local representative/contractor, as an in-kind contribution) were to undertake the download visits. Outputs would be: (i) the installed monitoring network and (ii) one year's worth of processed monitoring data. The costs do not allow for any interpretation of the monitoring data or for production of a report. These tasks could be undertaken at additional cost if required.

1.7.4 Monitoring Requirement for the Ecohydrological Assessment Areas

Table 1-11 outlines the suggested monitoring requirements for each Ecohydrological Assessment area. An indicative prioritisation ranking has been given to the sites based on the value and scale of restoration works indicated in Table 1-15. Those sites that require large scale works and/or might experience significant improvement through restoration (i.e. currently more degraded) have been given higher priority for monitoring. The total monitoring costs for the different ranking groups (based on mid range costs) are summaries in Table 1-12.The total is 118.5k for the first year of monitoring, although it is only £38.5k if only the high priority sites are monitored. The subsequent years for the hydrology monitoring elements would be significantly cheaper as the bulk of the initial costs are for the installation equipment.

Table 1-11: Summary of Suggested Monitoring for each Ecohydrological Assessment Area

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
A	17 3.9	North Weirs Mire et al.	Fixed point camera survey (specifically focussing on areas where footpaths are impeding flows and poaching) Fixed point quadrat survey to establish baseline.	20 sites plus collation and interpretation of results 10 quadrats plus data processing and analysis	£2– 2.5k	8 boreholes and 2 stilling wells (10 installations in total) Plus associated monitoring and data processing	£7- 9.5k	H

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
B	12	Lodge Heath Mire	Fixed point camera survey (specifically focussing on extent of Rhododendron encroachment and areas of poaching) Fixed point quadrat survey (focussing on recovery of poached areas) Alternating transect study to quantify size and extent of Rhododendron spread.	10 sites plus collation and interpretation of results 5 quadrats plus data processing and analysis 3 transects	£2-2.5k	6 boreholes and 1 stilling well (7 installations in total) within the valley mires Plus associated monitoring and data processing	£6-8.5K	L
C	26.4	Furzey Lodge Mire	Fixed point camera survey (specifically focussing on extent of pine scrub encroachment). DBH transect study to measure extent of colonisation.	10 sites plus collation and interpretation of results 5 transects	£1-1.2k	Flush dominated wetland – little peat – no monitoring recommended	-	M
D	179	Dibden Bottom and Noads Mire	Fixed point camera survey (specifically focussing on extent of pine scrub encroachment, areas where footpaths are impeding flows and footpath erosion/poaching) Fixed point quadrat survey to establish baseline prior to restoration works. DBH transect study to quantify extent of pine colonisation.	20 + 10 (30) sites plus collation and interpretation of results 10 quadrats plus data processing and analysis 5 transects	£3.5-4k	6 boreholes and 4 stilling wells (10 installations in total): 417: 3 boreholes and 2 stilling wells 418: 1 boreholes and 1 stilling well 419: flush-dominated – no monitoring recommended 425: 2 boreholes and 1 stilling well Plus associated monitoring and data processing	£7-9.5k	M
E	12.5	Common Moor	Fixed point camera survey Fixed point quadrat survey (specifically focussing on the western part of unit where restoration is proposed to monitor impacts on mire and wet heath communities)	10 sites plus collation and interpretation of results 5 quadrats plus data processing and analysis	£1-1.5k	3 boreholes and 3 stilling wells (6 installations in total) Plus associated monitoring and data processing	£6-8.5K	VL
F	34.8	Whites hoot Bottom	Fixed point camera survey (specifically focussing on areas where footpaths are impeding flows and footpath erosion/poaching) Fixed point quadrat survey	10 sites plus collation and interpretation of results 5 quadrats plus data processing and analysis	£1-1.5k	Flush dominated wetland – little peat – no monitoring recommended	-	VL
G	68.4	Vales Moor and	Fixed point camera survey (specifically focussing on	10 sites plus collation and interpretation	£3-3.5k	Flush dominated wetland – little peat – no	-	L

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
		Foulford Bottom	extent of pine and Rhododendron scrub encroachment) DBH and alternating transect studies to quantify rates of spread of these species.	of results 10 transects		monitoring recommended		
H	62.8	Picket and Buckherd Bottom	Fixed point camera survey (specifically focussing on extent of pine and Rhododendron scrub encroachment) DBH and alternating transect studies to quantify rates of spread of these species.	10 sites plus collation and interpretation of results 10 transects	£3-3.5k	Flush dominated wetland – little peat – no monitoring recommended	-	M
J	64.4	Soldiers Bog	Fixed point camera survey (specifically focussing on areas where footpaths are impeding flows and footpath erosion) Fixed point quadrat survey (specifically to monitor redevelopment of valley mire and wet heath habitats where restoration is implemented)	20 sites plus collation and interpretation of results 10 quadrats plus data processing and analysis	£2–2.5k	Flush dominated wetland –little peat – no monitoring recommended	-	M
K	28.5	Bratley	Fixed point camera survey (to monitor extent of scrub encroachment, focussing on extent of Gorse) Alternating quadrat study to quantify Gorse colonisation.	10 sites plus collation and interpretation of results 5 transects	£2-2.5k	Flush dominated wetland – little peat – no monitoring recommended	-	VL
L	42.9	Ma 5 Wet 5 part 2	Fixed point camera survey (specifically focussing on extent of pine scrub encroachment, and areas of footpath erosion/poaching at crossing points) Fixed point quadrat survey to establish baseline conditions prior to restoration. DBH transect study to monitor pine colonisation.	10+10 (20) sites plus collation and interpretation of results 5 quadrats plus data processing and analysis 5 transects	£2.5-3k	Mostly flush dominated – no monitoring recommended	-	VL
M	43.6	Long Beech	Fixed point camera survey Fixed point quadrat survey	10 sites plus collation and interpretation of results 5 quadrats plus data	£1-1.5k	Flush dominated wetland – little peat – no monitoring recommended	-	VL

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
				processing and analysis				
N	38.1	Little Wootton Pond	Fixed point camera survey (specifically focussing on extent of Rhododendron encroachment) Alternating transect study to measure extent of Rhododendron colonisation. Fixed point quadrat survey (to monitor development of wetland habitats) and establish baseline conditions.	10 sites plus collation and interpretation of results 5 transects 5 quadrats plus data processing and analysis	£2.5-3k	Flush dominated wetland – little peat – no monitoring recommended	-	H
O	5	Sway Mire	Fixed point camera survey (specifically focussing on areas of poaching) Fixed point quadrat survey (to monitor extent and quality of wet grassland areas, and recoveryof previously poached areas)	5 sites plus collation and interpretation of results 3 quadrats plus data processing and analysis	£0.8-1k	Flush dominated wetland – fixed point camera survey of gulley head	-	L
P	13.5	Norley Mire	Fixed point camera survey (specifically focussing extent of scrub encroachment in western areas) Alternating transect study to quantify scrub colonisation. Fixed point quadrat survey (focussing on recovery of poached areas) and to establish baseline. Fixed point camera survey to qualitatively monitor vegetation change in response to restoration measures.	5 sites plus collation and interpretation of results 3 transects 3 quadrats plus data processing and analysis 5 sites plus collation and interpretation of results	£1.7-2k	3 boreholes in the valley mire Plus associated monitoring and data processing	£4-6.5k	L
Q	7.4	Longdown Mire	Fixed point camera survey (specifically focussing on extent of pine and Rhododendron scrub encroachment and poaching) DBH and alternating transect studies to quantify rates of spread of these species. Fixed point quadrat	5 sites plus collation and interpretation of results 3 transects 3 quadrats plus data processing and analysis 5 sites plus	£1.7-2k	Flush dominated wetland –no monitoring recommended	-	M

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
			survey (focussing on recovery of poached areas) to establish baseline conditions. Fixed point camera survey to qualitatively assess vegeatation change over time.	collation and interpretation of results				
R	140.6	Deadmans Bottom, Millersford Bottom Mires and Ashley Hole Mire	Fixed point camera survey (specifically focussing on extent of pine, Rhododendron and other scrub encroachment and poaching) DBH and alternating transect studies to quantify rates of spread of these species. Fixed point quadrat survey	20 sites plus collation and interpretation of results 10 transects 10 quadrats plus data processing and analysis	£4-5k	Fixed point camera survey of gulley in Unit 41	-	M
S	49.1	Lay Gutter Valley	Fixed point camera survey to qualitatively assess vegetation change in response to restoration measures. Fixed point quadrat survey to establish baseline and quantify vegetation change.	20 sites plus collation and interpretation of results 10 quadrats plus data processing and analysis	£2-2.5k	3 Boreholes (3 installations in total) Plus associated monitoring and data processing	£4-6.5k	M
T	13.9	Ogden's Purlieu	Fixed point camera survey Fixed point quadrat survey	10 sites plus collation and interpretation of results 5 quadrats plus data processing and analysis	£1-1.5k	6 boreholes and a stilling well (7 installations in total) Plus associated monitoring and data processing	£6-8.5K	M
U	11.6	Suburbs Wood	Fixed point camera survey Fixed point quadrat survey	10 sites plus collation and interpretation of results 5 quadrats plus data processing and analysis	£1-1.5k	Flush dominated wetland – no peat – no monitoring recommended	-	L
V	41.8	Hazel Hill Lawns	No restoration measures proposed and no grazing or scrub encroachment pressures - no monitoring recommended	None		Flush dominated wetland – no peat – no monitoring recommended		VL
W	65.6	Acre Down and Warwick Slade	Fixed point camera survey (specifically focussing on areas of footpath erosion/poaching) Fixed point quadrat	20 sites plus collation and interpretation of results 10 quadrats	£2-2.5k	5 boreholes and 5 stilling wells (10 installations in total) Plus associated monitoring and	£7-9.5k	H

Eco-hydrological Assessment Area	Size (Ha)	Site Names	Requirements for monitoring: ecology			Requirements for monitoring: hydrology		Priority
			Type of monitoring	Monitoring Requirement	Annual Costs	Type of monitoring	First year Costs	
		Bog	survey (specifically focussing on restoration areas on the largest part of this complex of sites)	plus data processing and analysis		data processing		
X	13 7.6	Denny Bog	Fixed point camera survey (specifically focussing on extent of pine scrub encroachment, areas where footpaths are impeding flows and footpath erosion/poaching) Fixed point quadrat survey to establish baseline conditions. DBH transect study to quantify colonisation of pine.	20 sites plus collation and interpretation of results 10 quadrats plus data processing and analysis 10 transects	£6-7k	The following new installations are recommended, although existing dipwells could also be used for groundwater monitoring on Denny Bog 5 boreholes and 5 stilling wells (10 installations in total) Plus associated monitoring and data processing	£7-9.5k	H
Priority Classification - H - High, M = Medium, L = Low and VL = very low Annual cost of processing, collation and analysis of hydrological data is estimated to be about £1,000 (based on a local free resource trained to visit and download the information)								

Table 1-12: First Year and Subsequent Annual Monitoring Costs for the Priority Groups

Priority Group	Total First Year Costs (£)	Total Subsequent Annual Costs (£)
High	38,500	16,750
Medium	41,450	23,700
Low	22,500	12,000
Very Low	16,000	9,750
All	118,450	62,200

1.8 Combined monitoring costs

Monitoring costs for both the geomorphic (basic approach, geomorphology and ecology with no LIDAR) and ecohydrological (monitoring of high priority sites only) strategies, these are presented in Table 1-13 below as a total 35yr cost and annual cost. It should be noted that ecological monitoring costs could be reduced for transition sites if both the geomorphic and ecohydrological techniques are applied during the same visit.

Table 1-13: 35yr total monitoring costs and averaged yearly costs

Scenario	Total cost (35yr)	Cost / yr
Geomorphology (basic, with ecology, no LIDAR) and ecohydrological (high priority sites only)	1670000	47714

1.9 Geomorphic Site Restoration Prioritisation

Following the development of the unit specific restoration plans, the geomorphic sites have been ranked to determine a prioritised restoration list for the assessed SSSI units, based on the following criteria:

1. General habitat improvement - this has been qualitatively scored based on the likely extent of overall habitat improvement for the SSSI unit.
2. Key species positively impacted - this has been qualitatively scored based on the likely impact to key species within the SSSI unit.
3. Key hydromorphic processes reinstated - this has been qualitatively scored based on the degree of restoration of the key hydromorphic processes associated to each SSSI unit, this could include improvement to incision levels, key feature restoration, palaeo channel reconnection, anastomosed channel encouragement etc.
4. Flood connectivity improved - this has been qualitatively scored based on the degree to which river and floodplain connectivity is likely to be improved, based on the proposed restoration measures, for each SSSI unit. This could be through debris jam installation, bed raising, channel infilling and embankment removal.
5. The severity of the current situation - this has been qualitatively scored based on degree of existing degradation to the SSSI unit from both a hydromorphic and ecological perspective.
6. The impact on floodplain land use - this has been qualitatively scored based on the level of impact on the existing floodplain land use, e.g. the impacts of more frequent wetting of the floodplain.
7. Cost of restoration - this has been scored based on the likely level of cost associated to the restoration measures for each of the unit restoration plans. No specific costs have been calculated but the anticipated degree of work associated to the restoration plan has been subjectively scored.
8. Site access issues - this has been qualitatively scored based on any identified access issues to the site to undertake the proposed restoration measures identified in the SSSI unit restoration plans.

Each criterion was scored from 1 to 4, with 1 being a low impact and 4 being a high impact.

The positive criteria (numbers 1 to 4 above) were then summed and the negative criteria summed (numbers 5 to 8 above) to give an overall score out of 16 for each. The negative score was then subtracted from the positive score to give an overall classification score to rank the sites. This gives an indication of the likely overall restoration outcomes for each sites and where the benefits associated to the restoration significantly outweigh the constraints.

A comparison has also been made to the prioritised list for restoration identified in the Forestry Commission HLS 10 year restoration plan. It is not known the criteria used for the Forestry Commission prioritised list.

The sites have been listed in Table 1-14 below based on the prioritisation determined for the purposes of this project, ordered from high priority (were benefits significantly outweigh the constraints) to low priority. Please treat this as a subjective exercise as no weighting of criteria has been undertaken. Those highlighted in green in the Forestry Commission Restoration Year column show a good agreement to the prioritisation determined for the purposes of this project and those in red where there is poor agreement.

Table 1-14: Ranked priority list for geomorphic SSSI unit restoration

Site name	Site area	SSSI unit number	General habitat improvement	Key species positively impacted	Key hydromorphic process reinstated	Connectivity improved	POSITIVES	Severity of current situation	Impact on floodplain land use	Cost	Access issues	NEGATIVES	OVERALL SCORE	Forestry Commission Restoration Year
Parkhill Lawn (Pondhead)	15.9	386	4	4	4	4	16	3	3	2	2	10	6	2013/2014
Black Gutter Bottom	23.5	35	3	3	3	4	13	2	4	2	1	9	4	2012/2013
Islands Thorns / Amberwood	195.3	540	4	4	4	4	16	4	3	3	3	13	3	2017/2018
Amberwood/Alderhill	126.5	66	4	4	4	4	16	4	3	3	3	13	3	2014/2015
Latchmore Shade	23.4	48	4	4	4	4	16	4	3	3	3	13	3	2012/2013
Picket Bottom	43.7	91	3	3	3	3	12	3	2	2	2	9	3	Not listed
Wootton Riverine Woodland	23.6	539	4	4	4	4	16	4	3	3	3	13	3	2013/2014
Long Beech	43.6	112	4	4	4	4	16	4	4	3	3	14	2	2014/2015
Harvest Slade Bottom	0.3	126	4	4	4	4	16	4	4	3	3	14	2	2013/2014
Linford Bottom	46.3	88	4	4	4	4	16	3	4	4	3	14	2	2014/2015
Dockens Water Woods	43.4	545	4	3	3	3	13	3	3	3	3	12	1	2015/2016
Wick Wood Riverine Woodland	14.4	368	4	4	4	4	16	4	4	4	3	15	1	2016/2017
Ferny Croft South	85	426	3	4	3	4	14	3	4	4	2	13	1	2016/2017
Spring Wood Riverine Woodland	7.37	371	3	3	4	4	14	4	3	4	2	13	1	Not listed
Roe Inclosure South	15.8	117	3	3	4	3	13	4	3	3	3	13	0	Not listed
Cowleys Heath Central	41.3	423	3	3	3	3	12	3	3	3	3	12	0	2015/2016
Cowleys Heath East	18.8	422	3	3	3	3	12	3	3	3	3	12	0	2015/2016
The Grove	9.8	286	3	3	3	2	11	3	3	3	3	12	-1	Not listed

Colouring legend (overall score classification):

<0	Low priority
1 to 2	
2 to 3	
>4	High priority

There is a generally good agreement between the prioritised list developed for the purposes of this project (based on the criteria described) and the list produced by the Forestry Commission in terms of likely restoration years (over the next 10yrs). Those shown as not listed were not shown in the Forestry Commission Plan. It is likely that unit 540 does not show a good agreement between the two ranked lists as the linkage to the rest of the downstream Latchmore Brook units may not have been considered as part of the Forestry Commission criteria.

As a result of this analysis, this list can be used with confidence to prioritise sites when considering taking forward the unit specific restoration plans developed for this project.

1.10 Ecohydrological Site Restoration Prioritisation

This section should be read in conjunction with section 1.7.4 and Table 1-11.

Restoration measures were recommended for 17 of the 23 Ecohydrological Assessment Areas (see Table 1-15). There are only a few sites where large scale works are required (defined as those that would require an engineered structure). The majority of sites require medium scale works, which are defined as equivalent to 10-30 simple plugs or a few (e.g. 5) wooden dams. The benefits of the work have been judged on whether they are required for habitat protection (e.g. stopping a gulley from continuing headward erosion into a mire) or habitat improvement (e.g. blocking drains in a degraded mire).

In general there is a correlation between the scale of works and the benefits that it will bring, however, there are situations where this is not the case (e.g. where a large engineered weir is required in a gully to protect a small area of mire from ongoing headward erosion that would at some future date begin to erode the mire). It is difficult to rank the restoration priority against each other, as it is difficult to weigh benefits against costs. If costs are lightly weighed, then the scale of benefits would be the main control on priorities, whereas if costs are heavily weighed in the analysis, smaller scale schemes would be the priority.

However, it is clear that at some sites the benefits of restoration are proportional to the cost (e.g. Longdown Mire), whereas others restoration would achieve less benefits for similar outlay (e.g. the Enlarged Drain on Ashley Hole Mire). Restoration priorities will also potentially change as robust restoration objectives are developed for the sites.

Table 1-15: Restoration Recommendation Summary

Code	Name	Size (Ha)	SSSI Units	Restoration Required	Restoration Area	Habitat Protection (Note 1)	Habitat Improvement (Note 1)	Scale (Note 2)	Access issues (Note 3)
A	North Weirs Mire et al.	173.9	509, 511, 512 and 515	Y	Silver Stream	3	N/A	3	3
					White Moor	N/A	2	3	2
					Trenley Lawn	2	N/A	2	3
B	Lodge Heath Mire	12.0	446	Y	-	1	1	1	1
C	Furzey Lodge Mire	26.4	447	Y	-	1	2	2	1
D	Dibden Bottom and Noads Mire	179.0	425, 417, 418, and 419 (43)	Y	-	2	2	2	3
E	Common Moor	12.5	130	N	-	N/A	N/A	N/A	N/A
F	Whiteshoot Bottom	34.8	129	N	-	N/A	N/A	N/A	N/A
G	Vales Moor and Foulfor	68.4	125, 133 and 132	Y	-	1	N/A	3	2

Code	Name	Size (Ha)	SSSI Units	Restoration Required	Restoration Area	Habitat Protection (Note 1)	Habitat Improvement (Note 1)	Scale (Note 2)	Access issues (Note 3)
	d Bottom								
H	Picket and Buckherd Bottom	62.8	90 and 95	Y	-	2	N/A	1 to 2	1
J	Soldiers Bog	64.4	123	Y	-	N/A	2	2	1
K	Bratley	28.5	341	N	-	N/A	N/A	N/A	N/A
L	Ma 5 Wet 5 part 2	42.9	341	N	-	N/A	N/A	N/A	N/A
M	Long Beech	43.6	112	N	-	N/A	N/A	N/A	N/A
N	Little Wootton Pond	38.1	538	Y	-	N/A	3	2	2
O	Sway Mire	5.0	521	Y	-	1	N/A	2	2
P	Norley Mire	13.5	444	Y	-	N/A	1	1	1
Q	Longdown Mire	7.4	413	Y	-	N/A	2	2	1
R	Deadmans Bottom, Millersford Bottom Mires and Ashley Hole Mire	140.6	33, 32 and 41	Y	Valley Side Drainage	N/A	2	2	2
					Enlarged Drain	1	N/A	3	2
S	Lay Gutter Valley	49.1	43 and 44	Y	-	2	N/A	1	2
T	Ogden's Purlieu	13.9	50	Y	-	1	2	2	1
U	Suburbs Wood	11.6	75	Y	-	N/A	1	1	1
V	Hazel Hill Lawns	41.8	376	N	-	N/A	N/A	N/A	N/A
W	Acre Down and Warwick Slade Bog	65.6	341	Y	-	N/A	3	2	2
X	Denny Bog	137.6	428, 427 and 388	Y	-	2	3	3	2 to 3

Table notes
1. Benefits - 1 = Small, 2 = Medium, and 3 = large
2. Scale - 1 = Small (e.g. Couple of simple plugs or small wooden dam weirs), 2 = Medium (e.g. 10-30 simple plugs and a number of small wooden weirs), 3 = large (e.g. Engineered Structures)
3. Access 1 = Easy (e.g. Machines would have a short distance to travel and no matting required), 2 = Medium (e.g. Machines would have a long distance to travel and no matting required), 3 = Large (e.g. Matting required due to buoyant peat surfaces)

1.11 Selection of sites with greatest benefits from restoration for both approaches

It has not been possible to combine the site prioritisation rankings because of the different criteria necessarily used. However, higher priority sites, in terms of the greatest benefits from restoration, for both rankings should be considered as important as each other. This includes:

- Longdown Mire;
- North Weirs Mire et al.;
- Little Wootton Pond;
- Denny Bog;
- Acre Down and Warwick Slade Bog;
- Parkhill Lawn (Pondhead);
- Black Gutter Bottom;
- Islands Thorns / Amberwood - functionally linked to Amberwood / Alderhill and Latchmore Shade;
- Amberwood / Alderhill - functionally linked to Islands Thorns / Amberwood and Latchmore Shade;
- Latchmore Shade - functionally linked to Thompsons Castle, Lay Gutter, Islands Thorns / Amberwood and Amberwood / Alderhill;
- Picket Bottom - functionally linked to Linford Bottom;
- Wootton Riverine Woodland.

It has been noted above where there is a functional linkage between the high priority site and another adjoining SSSI unit and where restoration of the adjoining unit should be undertaken in conjunction with the identified high priority site to ensure long term functioning and sustainable restoration.