Plate 1
Dry stream bed of Fletchers Brook - August 2005

Table 3-8: Flow Statistics

	Lymington (R. Lymington at Brockenhurst)	Hampshire Avon Tributaries (Dockens Water)
Catchment Size	98.9 km2	17.15 km2
Permeability	Mixed permeability	Low to Mixed permeability
Mean Annual rainfall (1961-90)	854 mm	831 mm
Elevation	8.4-117.7m	-
Mean flow	1.06 m3s-1	0.26 m3s-1
95% exceedance (Q95)	0.052 m3s-1	0.047 m3s-1
10% exceedance (Q10)	2.816 m3s-1	0.592 m3s-1

Source: Centre of Ecology & Hydrology

3.4.5 Flow patterns

Flow patterns are characterised by glides (slow flowing water), riffles (medium flowing water) and runs (fast flowing water). Life 3 studies in the Blackwater and Highland Water sub-catchments found that glides tend be to the most common form of flow followed by riffles and runs. Pools (still water) are noticeably rare in modified reaches being replaced by glides or runs. Pools where they occur are usually found at meander bends apices. Cascades and small water falls also occur at the faces of debris dams. Channelisation tends to affect the flow type in that it reduces the number of pools. Dominant flow types for the Highland Water and Black Water are shown in Figure 10. It is probable that a similar pattern would be found in the other river catchments.

3.4.6 Bank & bed material

Bank material is made up of clay, fines, sand and gravel. The banks tend to be dominated by cohesive, fine-grained material incorporating gravel as individual clasts or as a layer of basal gravels. Where the bed of the river has been lowered either artificially or as a result of incision, the underlying valley gravels have sometimes been exposed, but the overlying layer of fines is nearly always present and often covers more than half the bank face. Where no bed level changes have occurred, the banks are usually composed of more than 75% fines. The main composition of bed material making up the banks of the Highland Water and Black Water is shown in Figure 11.

Coarse gravel forms the majority of bed substrate (around 75%) intermingled with fine gravel (24%) in a lesser amount. Despite sands and clays being a dominant feature of the local geology, fines (<1%) are virtually negligible indicating that few low energy areas occur within the main channel. It is also possible that the fine sediment load is transported to the lower reaches of the rivers where conditions are more favourable for deposition or washed out onto the floodplain during flood events.

3.4.7 Sediment transport

Southampton University's monitoring work on sediment transport in the Highland Water Catchment suggests that:

- Bed load transport is dominated by fine gravels and coarse sand
- Critical discharge for the onset of bed load motion is in the order of 0.25 m3s-1 or 35% of bankfull discharge.
- The majority of bed load is derived from upstream bars and pools
- Riffles typically have stable gravel surfaces over which finer bed load is transported.
- Bed load transport rates are poorly correlated with discharge owing to supply exhaustion and the unsteady nature of the transport process

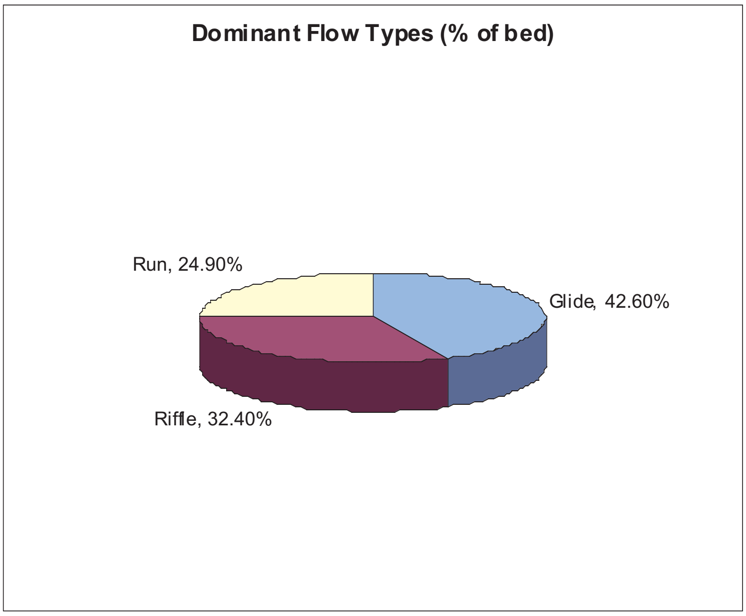
Bed load yields in semi natural reaches are low in comparison with other UK rivers due to the relatively low gradient, stable banks and relatively low stream power available for transport. However, comparison between a channelised and semi-natural reach of the Highland Water showed a 5 to 7 fold increase in bedload yield in the channelised reach for a range of flood events. This is thought to be due to:

- Greater confinement of higher flows within the channelised section (3.5 cumecs compared to 2.2 cumecs in the semi-natural reach)
- Increased slope due to lack of meanders
- Greater stream power for sediment transport due to higher width:depth ratios

Suspended sediment transport is characterised by the rapid rise and exhaustion of fine silts and clays with concentrations reaching around 1700 mgl-1 during high magnitude events. Flood yields may reach 176 tonnes though the typical flood yield is around 5-20 tonnes.

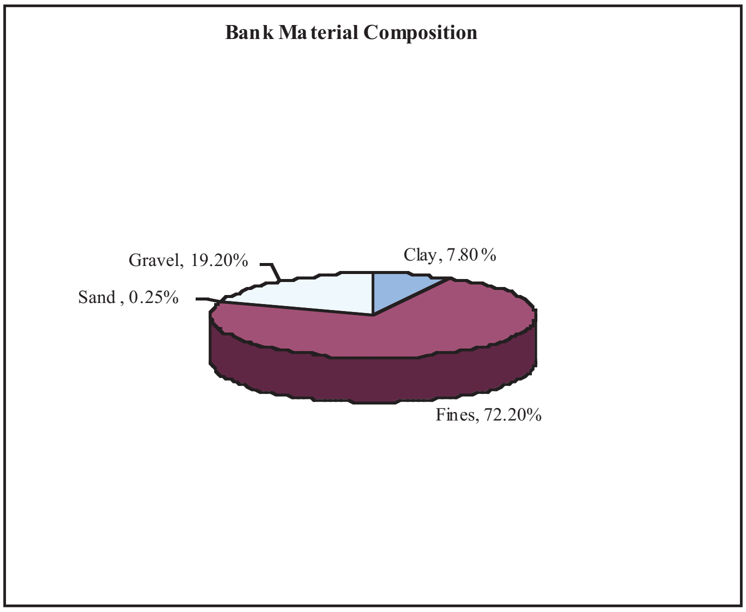
Over bank sedimentation is highly variable and depends on a number of factors including the presence of debris dams and exit pathways onto the floodplain. Once on the floodplain, deposition rates are strongly influenced by vegetation patterns and microtopography of the floodplain surface. Floodplain deposits are dominated by fine silts with high organic matter content.

Figure 10: Dominant Flow Types along Black Water and Highland Water



Source: Geodata Institute

Figure 11: Bank Material Composition



Source: Geodata Institute

3.4.8 Debris Dams

Debris dams are important features along the Forest streams, particularly in wooded catchments where large woody debris occurs on the floodplain. Debris dams are generally made up of naturally fallen woody debris and/or cut logs from forestry operations. Debris dams have a number of different forms as highlighted in Table 3-9. Debris dams are of significance because they:

- Influence the morphology of the channel including the pool-riffle sequence, roughness of the channel, bank stability and locations of sediment deposition. This variation in stream morphology is important in maintaining the diversity of aquatic life characteristic of New Forest streams.
- Act as sediment and gravel traps
- Promote over bank flow in localised areas to the benefit of floodplain habitats
- Hold back and thus slow up the rate of downstream flow particularly during peak discharges. The rate of water attenuation can be significant in the Forest streams given their flashy nature. For example, it was found that over a distance of 4028m the presence of 93 dams delayed the progress of small flood peaks by 100 minutes and large flood peaks by 10 minutes (Gregory et al, 1985)
- Provides food for invertebrates and shelter for fish

Table 3-9: Debris Dam Classification

Classification	Form	Hydraulic Influence
High Water Dam	Tree fallen across channel	Minor hydraulic influence during over bank flow
Partial Dam	Small accumulation of debris that partly spans the channel	Slightly disrupts flow hydraulics and usually reduced cross-sectional area
Complete Dam	Debris accumulation spans the channel	Affects hydraulics but does not pond water
Active Dam	Accumulation that spans the channel	Ponds Water
Other	Compiled from non-woody debris e.g. clay plug	Variable

Source: Geodata 2003

The frequency of debris dams along a river reach is variable over time. For example, periods of storminess can increase the amount of woody debris available to form dams, flood events can dislodge and flush them out or they can be deliberately removed. Gregory et al (1993), in their study of the Lymington River Basin found that 45% of gross woody debris load resulted from storm blow down and the remaining 55% varied according to distance downstream and land use factors. The greatest loads were found in deciduous woodland areas. Figure 12 shows the results of surveys carried out by Southampton University (Geodata, 2003) which reveal how the number and spacing of dams along Highland Water has varied over time, notably:

- An increase from 1983 to 2002 in the total number of debris dams following a reduction in the deliberate removal of debris dams (from around 1990 onwards).

- An increase in the number of complete and active dams (i.e. those with the greatest potential to cause geomorphological changes). It should be noted that prior to 1990 larger debris dams, which trap smaller debris coming in from upstream, were often removed. Indeed Highland Water had been cleared shortly before the 1990 survey although this clearance was followed by a large wind storm which felled many trees and dislodged much woody debris from the canopy.

- Consistent decrease from 1983 to 2002 in the number of partial dams

(N.B. The 1996 results were based upon River Corridor Survey data sets from which it was not always possible to identify the location or existence of smaller dams. Hence the 1996 survey results show many fewer dams than the other three field surveys.)

Table 3-10 shows the relative spacing of debris dams in the wooded catchments of the Highland Water and Black Water.

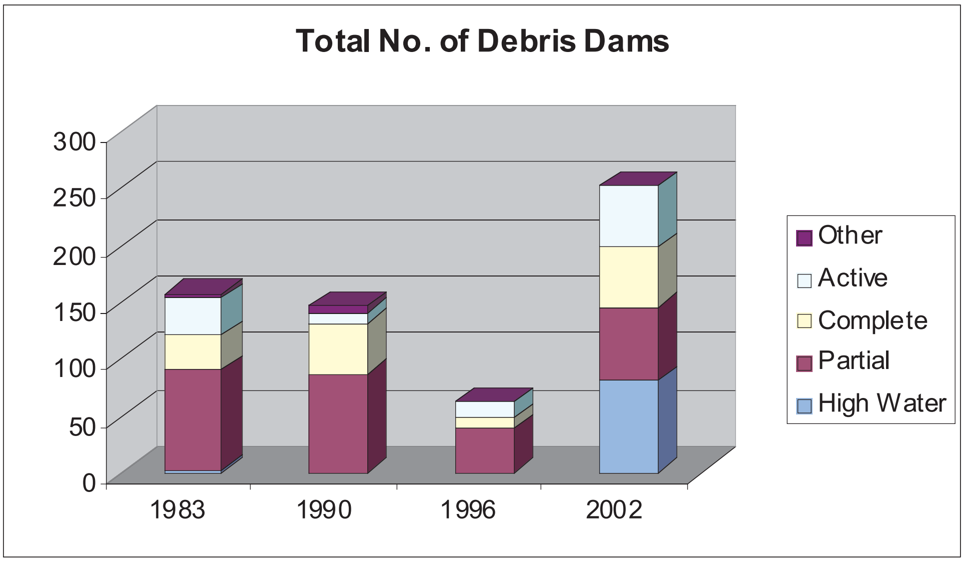
Table 3-10: Debris Dam Spacing along Highland Water and Black Water (2002)

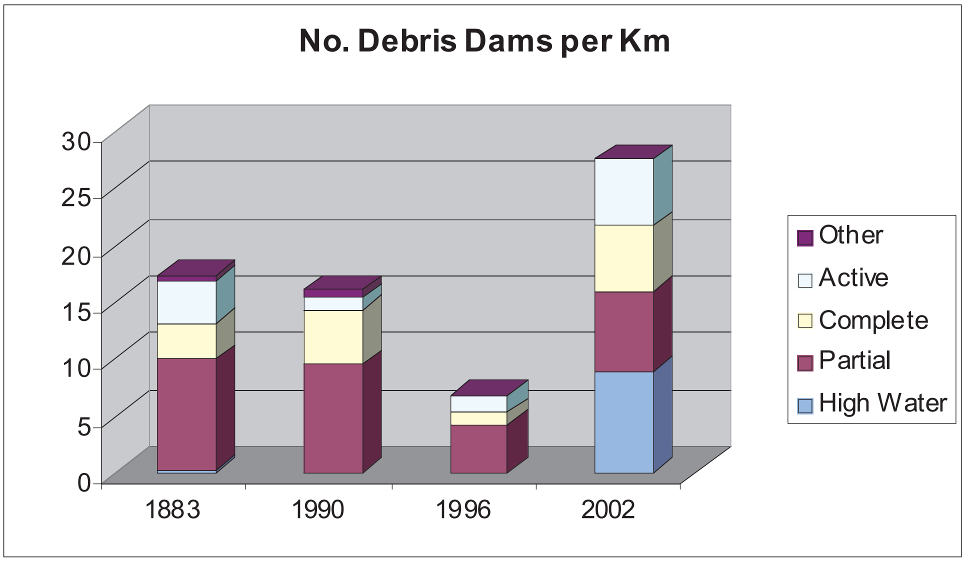
	Debris Dam Type				
	All dams	**High Water**	**Partial**	**Complete**	**Active**
Reaches with dams	65	14	52	39	36
Mean spacing (m)	76	279	170	225	241
Min spacing m)	14	10	26	43	51
Max spacing (m)	310	1128	744	585	744
Reaches without dams	7	N/A	N/A	N/A	N/A

Source: Geodata 2003

The management of debris dams along the New Forest streams has at times been controversial, particularly in relation to land drainage and the passage of migratory fish. Each dam is unique and any management needs to be considered on a site by site basis.

Figure 12: Frequency of Debris Dams along Highland Water





Source: Geodata Institute

3.4.9 Erosion

Bank erosion is due to a number of different factors. The most common types of erosion are fluvial erosion, particularly at apices of meander bends, and poaching by livestock. Direct bed and bank erosion by debris dams is usually confined to a small zone around each dam. However, sediment eroded from this zone tends to be dumped immediately downstream, narrowing the channel and deflecting water at the banks, resulting in more fluvial erosion and deposition, thus altering channel morphology.

However of greater significance to wetland restoration works is the damage caused by secondary erosion instigated by historic channel modifications. This is discussed in more detail in section 3.5.

3.4.10 Water Quality

The Forest streams are typically base poor with low nutrient concentrations. Water chemistry varies according to the underlying geology, soils and land use. Waters are particularly acidic in the upper reaches of the catchments which can give rise to the reddy coloured water due to rapid oxidation of iron deposits in the water. Historically water from the Forest springs have been used for medicinal purposes such as the treatment of leprosy, opthalmic disorders and mange in dogs (Langford, 1996)

Suspended sediment concentrations during dry weather flows are typically between 5-25mg per litre rising to greater than 200mg per litre during spates (Langford 1996) Pollen and spores from plants form a significant proportion of this load.

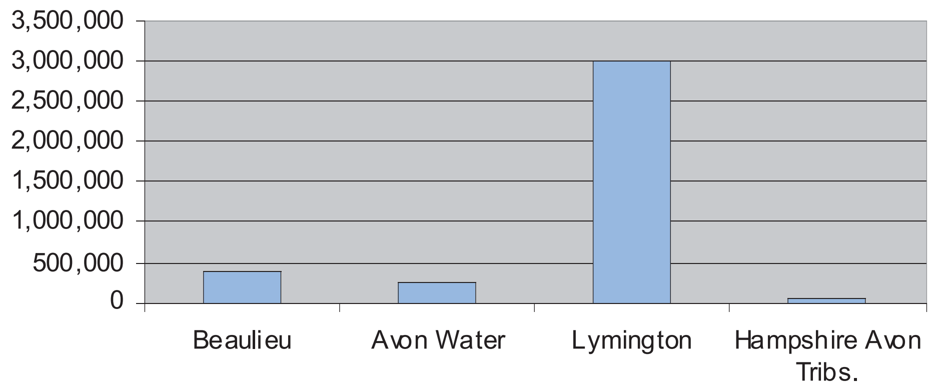
Water quality data for the New Forest streams is given in **Appendix E**. Water quality throughout the New Forest is routinely monitored by the Environment Agency. The quality of the rivers is assessed using the River Ecosystem Classification Scheme. Each stretch of river has been assigned a River Quality Objective which reflects the chemical quality requirement of aquatic plants and animals. General Quality Assessments are used to look at trends in water quality and use different aspect of water quality such as biology, chemistry, nutrients and aesthetics. A further explanation of these schemes is also given in **Appendix E**. The results presented in **Appendix E** give a useful snapshot in time of the water quality within the New Forest rivers and streams. The majority of river and streams are of good quality. Marginal and Significant failures are at times due to problems at sewage treatment works, or seepage from septic tanks or urban runoff.

3.4.11 Abstractions

Abstractions are licensed by the Environment Agency and take place from several sources along the New Forest streams (**Appendix F**). The largest licensed abstractions (Figure 13) are located at the lower end of the Lymington River for public water supply but have not been utilised for several years. However it is intended to bring the abstraction back on line in the near future. Other key abstractions tend to be for spray irrigation.

In addition to the amount abstracted under licence, a significant volume is also abstracted for trickle irrigation for soft fruits, particularly along the Beaulieu River. To date no licences have been required for this type of abstraction because it has not been required under law. The Water Act now makes it licensable and this will come into force in 2007 at the earliest.

Figure 13: Maximum Licenced Abstractions (m^3)



3.4.12 Flooding

The winter of 2000/01 was one of the wettest winters ever experienced in Hampshire and most areas prone to flooding did so at some point during this time. In addition to the natural flooding of the floodplain, a number of properties were also inundated. Flood reports compiled by the Environment Agency for this period are useful in identifying where flooding of properties in the catchment occurs and by what means (Table 3-11). However it should be noted that actions have since been undertaken to reduce many of these sources of flooding. Analysis of rainfall records and river flows confirmed that the majority of flooding occurs in response to short duration intense rainfall events, rather than to an accumulation of rainfall over a period (Halcrow/Environment Agency 2002). Anecdotal evidence from Forestry Commission staff suggest that the rivers and streams can over top their banks after only a few hours heavy rainfall, particularly when the ground is already saturated.

Flooding of properties is not always due to overtopping of river banks but from a variety of other means, notably:

- Raised ground water levels
- Under capacity of the drain and sewer network to cope with large volumes of surface run off.
- Backing up of drains and ditches
- Storm surge affecting the river estuary combined with high levels of fluvial flow in the rivers and/or spring tides.

Historically, Brockenhurst has experience flooding from the Weir Stream (a tributary of the Lymington River) with over 100 properties flooded in 1966. In the mid 1990's a flood alleviation scheme was implemented in the village which is understood to afford protection up to 1 in 25 year events. This is thought to have prevented flooding to the centre of Brockenhurst in 2000/01.

The natural flooding of the floodplain to maintain the condition of New Forest SAC habitats is discussed further in Section 3.5.

Table 3-11: Flooding of Property

River Basin	Location	Causes of flooding
Avon Water	Sway	Surface water runoff Overwhelming of drainage network
	Keyhaven	Fluvial flooding exacerbated by surge tides
Lymington River	Lymington	Raised local aquifer High surface water flow overwhelming sewage & wastewater drainage Surface water runoff Backing up of streams Overtopping as a result of combined high river flow and storm surge
	Brockenhurst	Surface water runoff Inadequate performance of storm water drains Overtopping from the Weir Stream
	Portmore	High surface water runoff overwhelming drainage network
Beaulieu River	Ipley Manor	Fluvial flooding combined with surge tide effects
	Beaulieu	Fluvial flooding combined with surge tide effects
	Lyndhurst	Stream overtopping (various events recorded between 1875-1938)
Bartley Water	Bartley	Overtopping from Bartley Water Backing up of sewage network Surface water runoff
	Minstead	High groundwater levels & sewer surcharging
	Woodlands & Netley Marsh	Inadequacy of Lanes Bridge to pass high flows High surface water runoff overwhelming sewage system, drainage network + blocked ditches
	Ashurst	High groundwater levels result in ingress and surcharge of sewers.
Cadnam River	Cadnam	Surface water runoff Overtopping from Cadnam River Overwhelming of drainage system
	Copythorne	Surface water runoff
	Ower	Overwhelming of drainage system
	Winsor	Flooding from sewage system Backing up of drainage ditches
Hampshire Avon Tributaries	N/A	N/A

Source: Halcrow/Environment Agency – Winter 2000-2001 Flooding in Hampshire Reports

3.4.13 Key Issues

a) Historic Drainage & Channel Modification

The New Forest streams are of considerable geomorphological and ecological interest in their own right, but they also contribute to the function and condition of other SAC habitats – notably alluvial/riverine woodland, mires, wet grassland and bog woodland. Seasonal flooding within the floodplain is particularly important and mires control the source and flow of water to the head streams.

However, the New Forest streams have been undergoing modification since the 1870's (possibly as early as 1840's) with further large scale modifications though the 1950's –1970's to improve ground conditions for forestry and grazing. This drainage has had a number of undesirable effects:

- Canalisation through straightening, over deepening and over widening of the river channels has led to a change in channel morphology and width/depth ratio. The resulting loss of meanders and overall reduction in stream length causes water to run through the shortened channel section more rapidly. In addition over deepening and bank-side spoil reduces the opportunity for out of bank flow and flooding of the floodplain.

- Prevention of natural flooding means that more energy is concentrated within the river channel itself resulting in increased erosion and transport of gravel. These gravels are deposited further downstream where the channel gradient reduces. This can result in the reduction of the channel capacity downstream, which in turn may cause drainage problems elsewhere.

- As the river tries to adapt to its new lowered stream bed level it creates headward erosion, often into the valley mires. In some places creeping headward erosion has led to deeply incised channels in the order of 1.5m deep and lowered the water table in the surrounding floodplain. Tuckfield (1976, 1980) studied the effects of channel and drainage modification of the New Forest Streams and noted that headward erosion could exceed 1 metre per year and volume of material eroded due to human intervention has been found to exceed 0.5m3 per metre of channel per year.

- Where new Inclosures were created following the Deer Removal Act, streams inside the Inclosures were often straightened and side drains cut into tributary valleys. The straightening of channels was usually restricted to within the Inclosure Boundary and indeed the 1870 1:2500 Ordnance Survey maps show many of these new drains originating at the boundary of the Inclosure. Over the years these drains have deepened significantly and migrated headward well beyond the boundary fence onto the Open Forest.

- Spoil heaps adjacent to watercourses act like flood banks which reduce the potential for over banking and flooding on to the natural floodplain. Conversely, they also prevent water from draining back into the streams during periods of high rainfall.

- Channelisation also leads to development of an in-stream mono habitat. Loss of bed substrate can lead to a reduction in trout spawning habitat.

b) Management of Debris Dams

The management of debris dams along the New Forest steams has been a contentious issue over the years and to some extent is still debated. In the past their removal has been indiscriminate. There is also debate that the presence of cut timber and conifer brash in the floodplain can result in the formation of dams that perform differently from those formed from naturally derived native hardwood. However it is now recognised that the removal of naturally generated woody debris from debris dams or from within the floodplain can contribute to the unfavourable condition of the SAC priority features of alluvial forest.

A joint policy paper (currently under review) has been prepared by the Forestry Commission, Environment Agency and English Nature (Appendix N) to provide guidance on how to deal with debris dams.

c) Trapped pre-Inclosure riverine and bog woodland

The process of enclosure combined with the effects of historic drainage and channel modification has resulted in the isolation and degradation of stands of alder and ash woodland that would have in the past bordered New Forest steams in a rich mosaic of wooded and open habitats. The maintenance of this woodland or restoration to a favourable condition requires that the full range of fluvial processes be allowed to function within a physically, hydrologically and geomorphologically intact natural or near natural system. Periodic flooding of the riverine woodland stands is essential.

d) Effects on downstream flooding

One aim of the LIFE 3 works has been to restore natural flooding to areas of floodplain within the Forest. This natural flooding is characterised by the retention of water in the floodplain. It is important that river restoration work does not increase the risk of flooding to downstream [residential] areas, either in frequency or severity. In the LIFE 3 project there were two flooding issues that needed to be considered.

i) Effect of restoration works on flood peaks

The restoration works included blocking drains, which will slow the hydrological response of the catchment as it will take longer for water to reach the main river channel. This will reduce the magnitude of flood peaks. The project also raised the bed level of the river, which had been heavily incised. This will reduce the capacity of the river, meaning that the river will spill onto the floodplain more frequently. Water will flow over the floodplain much more slowly than in the channel, and this will reduce the magnitude of flood peaks. Meanders were also re-introduced to reaches of river, increasing the channel length, which will again slow the catchment response, and reduce the magnitude of flood peaks.

Individually, and together, each of these techniques will reduce the flood risk downstream of the project area.

Initial results suggest that the restoration work has been successful in slowing the hydrological response of the Highland Water catchment, with increased travel time for flood peaks.

ii) Effect of restoration works on phasing of tributaries

Two of the three subcatchments of the Lymington River were involved in the restoration works. It was important to ensure that by slowing the response of these subcatchments, their hydrological responses were not brought into phase (i.e. so that the three floodpeaks were coincident, thus producing one larger floodpeak downstream). Detailed data analysis revealed that there is no evidence of a phased response from the subcatchments, and slowing any one response will therefore have a flood risk benefit. Preliminary modelling indicated that there would be a small net benefit in reducing flood risk.

Future studies will need to address these issues at an earlier stage in the project, allowing more appropriate data gathering and modelling analysis.

Modelling carried out for the Lymington Flood Strategy suggested that during moderate to high flood flows, when property is at risk, the effects of the LIFE 3 restoration works would be negligible in preventing downstream flooding. However, the modelling did indicate that the effect of the works would be a benefit, albeit very small, rather than increasing flood risk.

Given the flashy nature of the rivers, flooding can last for a few hours or a few days. The extent and depth of the flooding will vary according to a number of different factors including:

- Antecedent conditions - if the ground is already saturated then run-off will be more rapid
- Size and topography of catchment supplying water for that area of flood plain
- Intensity and duration of rainfall
- Geomorphology of the floodplain
- Channel characteristics
- Local land-use

Flood modelling is important in advance of any significant river restoration works.

The Environment Agency is currently developing a New Forest Catchment Flood Management Plan which will address the strategic issues relating to flooding.

e) Low Summer Flows

New Forest streams are dependent of rainfall for the majority of their flow. Thus during dry summers many of the streams exhibit low flows or dry up entirely particularly in the headwaters. However it is important that flow in the mid and lower reaches of the streams is maintained as near to natural as possible in order to preserve their unique environment.

To balance the need of the environment and of people for water the Environment Agency has created Catchment Abstraction Management Strategy(CAMS). Work has begun on the New Forest CAMS which will review whether current abstraction levels are adversely impacting the environment or if there is a risk of such an impact under full licensed levels.

Improvement in the condition of mires and the general hydraulic condition of the river system may help water retention particularly in the upper reaches of the catchments. It is anticipated that the extent of this improvement will be revealed by monitoring.

f) Water Quality & Diffuse Pollution

On the whole, water quality within the Forest steams is good but pollution incidents do occur from a number of sources such as domestic, agricultural and commercial premises. The pollutants from these incidents include sewage, oil, chemicals and silt. If the incident is an isolated event the effects on the water quality of streams are generally short lived, but depending on the scale and nature of the incident can cause fish kills.

Sewage disposal within the New Forest is an issue, with sewage treatment works that service Forest towns discharging treated effluent to watercourses. Although the quality of the effluent from these sewage treatment works is tightly regulated by the Environment Agency, non compliant discharges are made from time to time. In addition, many of the more isolated properties within the Forest are not connected to mains foul sewer and dispose of their sewage by means of package treatment plants and septic tanks. In the case of the latter, these are often old and in poor condition and can cause water quality problems, especially where discharges are clustered together along one stream. The Environment Agency has a number of Water Quality Improvement Plans in place to address these issues.

The nature of Forest streams, inherently low in nutrients, does mean that the biota is especially sensitive to any additional organic inputs whether this is from sewage disposal or other sources. Furthermore, the mainly rainfall dependent nature of Forest streams can result in low flows, especially in the upper reaches of the streams during summer. This can exacerbate any water quality issues already present by decreasing the dilution of pollutants and can cause fish kills in itself by low levels of dissolved oxygen.

g) Change in Forest Cover

Through the Forest Design Plan, tree cover is expected to change over the next 50-100 years with a move towards fewer conifers and greater areas of native broadleaves. More areas are also expected to return to Open Forest. It is likely that this change in cover will have some influence on the hydrological regime in terms of runoff, water chemistry or evapotranspiration rates (Nisbet 2005) but it is not possible to predict the degree of change without detailed study and modelling.

Further Reading

Geodata Institute **Life 3 Geomorphological Audit Final Report**

Langford T.E. (1996) **Ecological Aspects of New Forest streams, draining one of Britain's unique areas.** Freshwater Forum 6, 2-38

Colin R. Tubbs, **The New Forest**, *New Forest Ninth Centenary Trust 2001*

Centre of Ecology and Hydrology (CEH), (2005), National River Flow Archive, http://www.nerc-wallingford.ac.uk/ih/nrfa/index.htm

Nisbet T.R. (2005) **Forestry Commission Information Note 065 – Water Use by Trees**

3.5 ECOLOGY, FISHERIES & NATURE CONSERVATION

3.5.1 Introduction

The New Forest is one of the most important sites for wildlife in the UK, and is widely recognised as being of exceptional importance for nature conservation on a European and International level. It supports a rich and complex mosaic of habitat types, formerly common in lowland Western Europe but now rare and fragmented. The main habitat types comprise extensive wet and dry heaths with their rich valley mires and associated wet and dry grassland, the ancient pasture and enclosed woodlands, the network of clean rivers and steams and frequent permanent and temporary ponds. Outstanding examples of thirteen habitats of European interest are represented together with two priority habitat types – bog woodland and riverine woodland.

The habitats support an exceptional variety of plants and animals including the richest moss and lichen flora in lowland Europe, scarce flowering plants and an outstanding community of invertebrates. It also supports important bird populations and one of the largest areas for breeding waders in southern England.

The quality and diversity of the habitats has arisen due to the historic and present day land use and management. Of particular importance is the pastoral economy based upon the Rights of Common (Refer to section 3.8). The commoners' stock, mainly comprising ponies and cattle have the right to roam freely over extensive areas. Over the years grazing patterns have helped to develop a unique ground flora and kept more aggressive species such as bracken and purple moor grass in check.

The Forest streams and rivers also support important habitats beyond the Special Area of Conservation (SAC) boundary. In particular the estuaries of the Lymington, Avon and Beaulieu rivers support important reedbed, saltmarsh and mudflat communities. The grassland and pasture along the river valleys provide valuable foraging and cover for waders and other birds.

The importance of the New Forest for nature conservation is reflected in the number and extent of nature conservation designations within the National Park Boundary. The designation of the New Forest as a Special Area of Conservation (SAC) has been a particular driving force in improving the management and condition of the New Forest habitats and has acted as a catalyst to progress and fund wetland restoration. A continuation of the work already achieved during Life 2 (1997-2001) and Life 3 (2002 – 2006) is essential in maintaining and improving the condition of the wetland habitats.

3.5.2 Habitat Descriptions

The distribution of different habitat types found within the river basins are shown in Figure 14 and the area of coverage shown in Table 3-12.

Table 3-12: Habitat coverage within the River Basins

River Basin	Wet Habitat (Ha)	Dry Habitat (Ha)	Pasture Woodland (Ha)	Inclosure Woodland (Ha)
Avon Water	450	853	166	719
Lymington River	1573	2454	1777	3508
Beaulieu River	1343	2914	807	1804
Bartley Water	94	49	451	337
Cadnam	226	785	731	405
Hampshire Avon Tributaries	450	853	166	719

Wet habitat = mire, permanent pond, wet grassland, wet heath
Dry habitat = dry grassland, dry heath
Pasture woodland = pasture woodland, riverine woodland, bog woodland
Inclosure woodland = forest inclosure

To date wetland restoration works have focused on the restoration of alluvial & bog woodland, wet grassland and mires. However, wet heath and permanent and temporary ponds also form important wetland habitats. Therefore this section will concentrate on these habitat types. Detailed descriptions of the other habitat types can be found in the New Forest SAC Management Plan 2001 and in other references listed at the end of this section.

3.5.3 Riverine Woodland

The New Forest is considered to be one of the best areas in the UK for Riverine Woodland. In the lowlands, intensive agriculture and flood control combined with woodland clearance have reduced this habitat type to small, fragmented examples. However the New Forest stands are relatively extensive and where not affected by localised stream canalisation, remain functionally intact. They also contain extensive old growth stands which are exceptionally rare in Europe.

New Forest Riverine Woodland comprises around 212 ha distributed along the floodplains or the stream and rivers. The woodland stands generally comprise occasional to abundant Alder (Alnus glutinosa) and frequent Ash (Fraxinus excelsior). The woodland is frequently inundated by seasonal floods, although some stands have become isolated from the floodplain due to past drainage and channel straightening. The rich alluvial soils produce a very rich woodland flora which is sometimes modified by grazing animals. Greater Tussock Sedge (Carex paniculata) is absent and Purple Moor Grass (Molinia caerulea) is very uncommon. In terms of the National Vegetation Classification (NVC), riverine woodland falls into:

- W8 – Ash-Maple-Dogs Mercury Woodland (Fraxinus excelsior-Acer Campestre-Mercurialis Woodland)

or

- W7 - Alder-Ash-Yellow Pimpernel woodland (Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum woodland.

It frequently lies somewhere between the two.

Within the W8 type woodland Alder is confined to the river banks, with Oak *(Quercus robur)* and Ash the dominant species within the woodland canopy with occasional Field Maple *(Acer campestre)*. The tree crown can contain some ancient specimens. The shrub layer is very rich and includes species such as Hazel *(Corylus avellana)*, Hawthorn *(Crataegus monogyna)*, Dogwood *(Cornus sanguinea)*, (*Euonymus europaeus)*, Wild Privet *(Ligustrum vulgare)*, and Blackthorn *(Prunus spinosa)*, with frequent Holly *(Ilex aquifolium)*, Bramble *(Rubus fruticosus)* and Rosa spp. The Holly trunks are noted hosts to rare lichen species.

The ground flora is also very rich and includes such species as Common Dog Violet *(Viola riviniana)*, Wood Speedwell *(Veronica Montana)*, Yellow Loosestrife *(Lysimachia vulgaris)*, Lesser Celandine *(Ranunculus ficaria)*, Wood spurge *(Euphorbia amygdaloides)*, Cuckoo Flower *(Cardamine pratensis)* and the Lady Fern *(Athyrium filix-femina)*.

Within the W8 community Alder occurs in bigger stands especially in areas where there are peat accumulations in old channels and around springs. The Alder often shows signs of previous coppice management. Ash is also frequent with occasional Oak. The shrub layer is much poorer than in the drier floodplain woodland but Holly and Willow is usually present.

The ground flora is characterised by a prominence of wetland species including Remote Sedge *(Carex remota)*, Yellow Pimpernel *(Lysimachia nemorum)*, Bugle *(Ajuga reptans)*, Marsh Valerian *(Valeriana dioica)*, Water Mint *(Mentha aquatica)*, Lady Fern *(Athyrium filix-femina)*, Marsh Bedstraw *(Galium palustre)* and Marsh Marigold *(Caltha palustris)*.

3.5.4 Bog Woodland

Bog woodland is a European priority habitat because it is considered to be rare and extremely restricted, particularly in north western European lowlands where mire drainage and reclamation has destroyed large areas of former bog woodland. In the UK its total extent is estimated to be less than 1,000 ha. The New Forest is considered to be one of the best areas in the UK for Bog Woodland containing around 200-250 ha.

Bog Woodland is found on peat and contains a significant number of bog species in the ground flora. Bog woodland features two types of community - sallow carrs which are found in the acid headwaters and mires and alder carr which is found on richer soils in valleys on swampy ground. In terms of the NVC classification bog woodland communities can be divided into W4b and W5b as described below.

W4b – Downy Birch-Purple Moor-grass woodland – Soft-rush sub-community *(Betula pubescens -Molinia caerulea woodland – Juncus effuses* sub-community)

The W4b community is dominated by Downy Birch *(Betula pubescens)* with varying amounts of Grey Willow *(Salix cinerea)* and occasional Alder *(Alnus glutinosa)* over an open bog habitat. It is generally associated with the larger valley mires. Some communities are of very ancient origin but the growth is young and some is due to recent woodland expansion onto the valley mire. Alder is confined to ancient stands and is totally absent from stands that have colonised open mire in the last 130 years. The groundflora is typified by Sharp-flowered rush *(Juncus acutiflorus)* and Purple Moor Grass *(Molinia caerulea)*, the latter controlled by grazing. The character of the community is often influenced by forest management regimes and grazing.

W5b – Alder-Tussock sedge Woodland- Yellow Loosestrife sub-community *(Alnus glutinosa-Carex paniculata woodland- Lysimchia vulgaris* sub-community)

The W5b community is characterised by an abundance of Alder. Occasional Grey Willow *(Salix cinerea)* and Downy Birch *(Betula pubescens)* occur in the shrub layer over shade tolerant Greater Tussock Sedge *(Carex paniculata)* tussocks. The ground flora is restricted by the amount of light that can penetrate the canopy, although the base-rich soils are capable of supporting a rich fen woodland flora including Purple Loosestrife *(Lysimachia vulgaris)*, Water Mint *(Mentha aquatica)*, Purple Loosestrife *(Lythrum salicaria)*, Gipsywort *(Lycopus europaeus)*, Lesser Spearwort *(Ranunculus flammula)*, Remote sedge *(Carex remota)* and Royal Fern *(Osmunda regalis)*.

3.5.5 Mires

The New Forest mires cover an area of around 2020ha and occur as either seepage step mires or valley mires. They support a suite of communities including Valley Bogs, Bog Pools, Soakways, Poor Fen, Moorgrass Mires, Marl Flushes and Transition Mires. Although some areas have been damaged by drainage, most of the New Forest mire systems are still largely intact, and its extensive cover and transitions to other heathland communities is unparalleled in the UK. It is unlikely that such a variation in mire communities over such an extent in an intimate mosaic with other heathland exists in comparable form anywhere else in the Atlantic zone.

Valley mires can be found in the valley bottoms where low hydraulic gradients and impermeable subsoils prevail. Wide, shallow valleys can support extensive mires while the steeper valleys tend to support smaller more localised mires. Mires are characteristically acidic with a low nutrient status. However, in the Forest, the underlying geology strongly influences the water chemistry and nutrient status which are important in determining the distribution of different mire communities. The central flows of valley mires which receive water from the Headon Beds may be neutral or slightly alkaline, while those fed from sand and gravels are acidic. The mires become increasingly acidic and nutrient poor with distance from the central flow with communities changing from enriched fen and carr to Sphagnum bog towards the periphery.

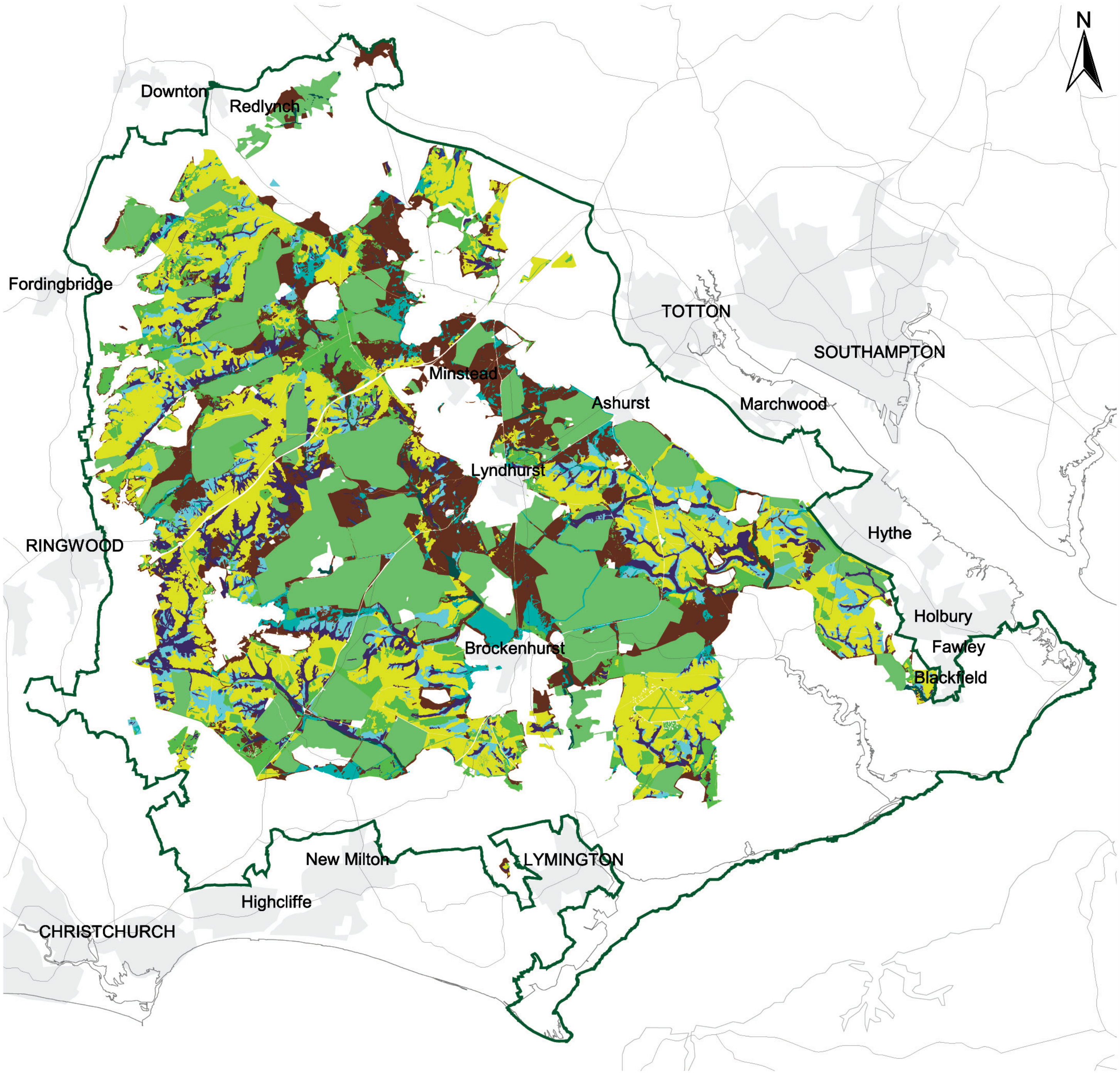


Figure 14

Habitat Types

New Forest Life
PARTNERSHIP

Legend

Habitat type[1]

- Bog Woodland
- Dry Grassland
- Dry Heath
- Dry heath
- Inclosure Woodland
- Mire
- Pasture Woodland
- Permanent Pond
- Riverine Woodland
- Wet Grassland
- Wet Heath

New Forest National Park

1 Only habitat types within the New Forest Perambulation are shown

Produced by: Date: 07 February 2006

Scale: 1:130,000 Source: G:\Data\Life 3\FinalReportMapping

Valley Bogs

Valley bogs are the most extensive form of mire community found in the Forest and occur both in valleys and seepage steps. The community is characteristic of NVC type M21a – Bog Asphodel-Bog Moss Valley Mire – White Beak-sedge Bog Moss sub-community. *Sphagnum papillosum* is dominant while other sphagnum moss species, for example *Sphagnum subnitens, S auriculatum, S. capillifolium* and *S. recurvum* are frequent. Other common species include Common Sundew *(Drosera rotundiflora)*, Cross-leaved Heath *(Erica tetralix)*, Bogbean (Menyanthes trifoliate), Perfoliate Pondweed (Potamogeton polygonifoliuous) and Bog Myrtle *(Myrica gale)* as well as a significant proportion of the British population of Bog Orchid *(Hammarbya paludosa)*. The bryophyte flora is especially rich featuring many bog specialist liverworts.

Bog pools

Many of the larger mires support bog pools where low flows or stagnant water result in high acidity and very low nutrient levels. Carpets of Sphagnum moss are scattered with vascular plants such as Bog Bean *(Menythanthes trifoliate)*, White beak-sedge *(Rhynchospora alba)* and Common Cotton Grass *(Eriophorum angustifolium)*. Local species include Lesser Bladderwort *(Utricularia minor)*, Great Sundew *(Drosera anglica)*, Brown Beak-sedge *(Rhynchospora fusca)* and Bog Sedge *(Carex limosa)*. Bog pools are one of the few communities that do not rely on grazing for their survival.

Soakways

Soakway communities are associated with the natural drainage systems of pristine mires. The community is typified by NVC type M29 – Marsh St John's Wort – Bog pond weed soakway. Linear creeping mats of Marsh St John's Wort *(Hypericum elodes)* and Perfoliate Pondweed *(Potamogeton polygonifolius)* are highly distinctive and are often accompanied by Lesser Spearwort *(Ranunculus flammula)* and Bulbous Rush *(Juncus bulbosus)*. A range of other bog or poor fen plants can be found including *Sphagnum auriculatum*, Marsh Pennywort *Hydrocotyle vulgaris*, Bog Pimpernel *(Anagallis tenella)*, Common Sundew *(Drosera rotundifolia)*, Bog Aspodel *(Narthecium ossifragum)*, Bottle Sedge *(Carex rostrata)*, Lesser Water Plantain *(Baldellia ranunculoides)*, Marsh Lousewort *(Pedicularis palustris)* and Marsh Bedstraw *(Galium palustre)*. The diversity of species is dependent upon the degree of grazing and poaching and whether the soakway is permanently or seasonally wet.

Poor fen

Poor fen communities are composed of species which are tolerant of a higher nutrient status than the valley bog communities. The soils are consistently waterlogged and acidic with modest water flow. Poor fens are usually well grazed and provide commoners' stock with an early spring bite and essential grazing during times of drought. Like other mires, areas of poor fen have also been damaged by drainage.

The poor fen community is typified by M6di Star sedge-Bog moss mire-sharp flowered rush sub-community. *Sphagnum recurvum* is the dominant species while Sharp flowered rush *(Juncus acutiflorus)* is constant but controlled by grazing. Typical poor fen associates include Velvet Bent *(Agrostis canina)*, Star Sedge *(Carex echinata)*, Marsh Willow Herb

(Epilobium palustre) and the mosses *Sphagnum palustre* and *Polytrichum commune*. In the New Forest, poor fens often host Marsh Violet *(Viola palustre)* and White Sedge *(Carex curta)*.

Purple Moor-grass mires

Purple moor-grass mires have a high level of water movement. Low grazing levels produce ideal conditions for rapid Purple moor-grass *(Molinia caerulea)* growth and dominance. This species together with Bog Myrtle *(Myrica gale)* effectively suppress other less competitive species producing a rather floristically impoverished community. Other species include Sharp flowered rush *(Juncus acutiflorus)*, Tormentil *(Potentilla erecta)* and Cross-Leaved Heath *(Erica tetralix)*. In terms of NVC the community is representative of M25a: Purple moor-grass-Tormentil mire-Cross-leaved heath sub community.

Marl Flushes

The most striking Marl Flushes are found in seepage step mires on marl (lime rich clay) where the water is base rich (pH7.0 or higher) and allows tuffa to be deposited on mosses. However not all marl flushes are base rich enough to allow tuffa deposition. Stoney Moors provides a good example of a Marl Flush. In the New Forest, Marl Flushes are typified by the following communities:

Eleocharis quinquefolia-Drepanocladus revolvens mire which is a lowland form of NVC community M10a: *Carex dioica-Pinguicula vulgaris mire-Carex viridula oedocarpa-Juncus bulbosus* sub-community

Highly lime rich Marl Flushes (pH 7.0 or higher), depositing tuffa, with lime loving species prominent. The presence of Few Flowered Spike Rush *(Eleocharis quinquefolia)*, the brown moss *(Cratoneuron commutatum)* and the abundance of the brown moss *Drepanocladus* revolvens are diagnostic. Associated species include Carnation Sedge *(Carex panacea)*, Tawny Sedge *(Carex hostaina)*, Bog Pimpernel *(Anagallis tenella)*, Devils Bit Scabious *(Succisa pratensis)* and Lousewort *(Pedicularis sylvatica)*, Lesser Skullcap *(Scutellaria minor)* and Quaking Grass *(Briza media)*. Purple moor grass *(Molinia)* is held in check by tight grazing. These marl flushes support a very rich flora including notable species such as Broad-leaved Cotton Grass *(Eriophorum latifolium)*, Common Butterwort *(Pinguicula vulgaris)* and the bryophytes *Cratoneuron commutatum, Philonotis calcarea* and *Preissia quadrata*.

Eleocharis spp-Campylium stallatum mire-Narthecium ossifragum-Drosera rotundifolia sub-community which incorporates NVC Community M14 *Schoenus nigricans-Narthecium ossifragum* mire

This community is found in less enriched Mire Flushes (pH 6-6.5) which does not result in the deposition of tuffa. The only abundant moss is *Campylium stallatum*. Species characteristic of more acidic mires are evident including Bog Asphodel *(Narthecium ossifragum)* and Common Sundew *(Drosera rotundifolia)*. Associated species include Sharp-flowered rush *(Juncus acutiflorus)*, Carnation Sedge *(Carex panacea)* and Cross-Leaved Heath *(Erica tetralix).*

Transition Mires

Transition Mires occur on deep, waterlogged peat which are irrigated by base-rich water producing very wet swampy condition. They support brown mosses and tall sedges but Black Bog-rush *(Schoenus nigricans)* is never present. Transition mires are particularly notable for the rare species which they support including Slender Cotton Grass *(Eriophorum gracile)*, Bog Sedge *(Carex limosa)*, Slender Sedge *(C. lasiocarpa)*, *Sphagnum contortum, S. teres, S. subsecundum*, Marsh Lousewort *(Pedicularis palustris)*, Great Sundew *(Drosera anglica)*, Lesser Bladderwort *(Utricularia minor), Pressia quadrata, Calliergon giganteum* and *Philonotis calcarea*. The communities are generally typified by NVC M9: Carex rostrata-Calliergon cuspidatum/giganteum mire, although a number of different stand types can be identified [3]

Mires and their importance for breeding waders

The New Forest mires (together with other New Forest open wetland habitats) are extremely important for breeding waders including snipe, curlew and redshank. The snipe population represents nearly 6% of the English population, the curlew population represents 15% of the southern England regional population and redshank 1.5% of southern England numbers, the majority of which breed at the coast. In addition the number of breeding lapwings are likely to be of regional significance.

The 2004 New Forest Breeding Waders Survey funded by Life 3 which repeated a similar survey conducted ten years previously (Tubbs & Tubbs, 1994) , confirmed that mires in particular remain extremely important for breeding snipe, curlews and redshanks, although their numbers have been reduced by 29%, 25% and 22-26% respectively. The number of breeding lapwing pairs have increased by 34-39%.

3.5.6 Wet grassland

The New Forest represents one of the best areas in the UK for wet grassland and is probably second only to culm grasslands for acid fen meadow. Wet grassland communities are of international importance for nature conservation and it is possible that the UK contains more of this habitat than survives in the rest of Europe, with the possible exception of the Republic of Ireland.

New Forest Wet grassland (or wet lawn) covers around 1063 hectares most of which is found along the non-wooded parts of floodplains. Flushed lawns are a characteristic feature of valley slopes and pasture woodland glades across the Forest. They comprise a suite of plant communities confined to impermeable or slowly impermeable clays, or permeable soils affected by high ground water levels. The lawns tend to be waterlogged in winter but dry out to some extent in summer.

The community types and distribution are strongly influenced by stocking regimes, soil moisture retention and soil fertility. Generally the swards are tightly grazed (<2cm) and are characterised by the presence of Velvet Bent (Agrostis canina) and sedges such as

[3] For full description of community stand types refer to the New Forest SAC Management Plan

Carnation Sedge *(Carex panacea)*, Common Sedge *(C. nigra)* and Common Yellow Sedge *(C. viridula oedocarpa)*, along with species typical of wet grassland such as *Molinia caerulea*, Devil's Bit Scabious *(Succisa pratensis)*, Creeping Willow *(Salix repens)* and Marsh Thistle *(Cirsium dissectum)*. Extensive carpets of Bog Pimpernel *(Anagallis tenella)* are seasonally prominent. Where soil water retention is highest or around flushes Marsh Pennywort *(Hydrocotyle vulgaris)*, *Juncus acutiflorus* and Marsh St. John's Wort *(Hypericum elodes)* are abundant. The more acidic sites support Sphagnum lawns and an increasing heathland element typified by Cross-Leaved Heath *(Erica tetralix)*.

3.5.7 Wet Heath

Wet heath communities cover 2,100 hectares of the New Forest. Wet heath occurs on nutrient poor mineral soils or very shallow peats that are at least seasonally waterlogged but may be dry on the surface in summer. The vegetation communities are strongly influenced by burning and grazing. Stands which are managed by burning and grazing have the highest biodiversity. The vegetation communities are typified by NVC communities M16a, M16b and M16c.

M16a: Cross-leaved Heath – *Sphagnum compactum* wet heath-typical sub-community

This community is the most extensive and accounts for nearly 50% of wet heath cover. It is generally found on the poorer soils in the northern half of the Forest and is characterised by the presence of Heather *(Calluna vulgaris)*, Cross leaved Heath *(Erica tetralix)* and Purple Moor Grass **(Molinia caerula)** although the degree of dominance depends upon water levels and management regime. *Sphagnum compactum* is the dominant moss species. Lichens particularly the wet heath varieties such as **Cladonia strepilis** and *Pycnothelia papillosum* can be frequent. Typical vascular plants include Deer-grass *Trichophorum cespitosum* and Heath Rush *(Juncus squarrosus)*.

M16b: Cross-leaved heath-*Sphagnum compactum* wet heath-Devil's bit Scabious-Carnation Sedge sub-community

This community accounts for 40% of wet heath. It is more tussocky in nature due to the steady movement of surface water and tend to be much more herb rich than M16a due to the richer underlying soils. A rich herb community can usually be found between the Molinia tussocks including such species as Tormentil *(Potentilla erecta)*, Devilsbit Scabious *(Succisa pratensis)*, Heath Milkwort (Polygala serpyllifolia), Carnation Sedge (Carex panacea), Meadow Thistle *(Cirsium dissectum)* and Sawwort *(Serratula tinctoria)*. Other notably species include Petty Whin *(Genista anglica)*, Sneezewort *(Achillea ptarmica)* and Creeping Willow *(Salix repens)* and the nationally scarce Marsh Gentian *(Gentiana pneumonanthe)*.

M16c: Cross-leaved Heath – *Sphagnum compactum* wet heath-White beak-sedge-Oblong-leaved Sundew sub-community

This heathland community type accounts for the remaining 10% of New Forest wet heaths. It is characterised by a reduced cover of Heather *(Calluna vulgaris)*, Cross-leaved Heath *(Erica tetralix)*, Purple Moor Grass *(Molinia caerula)* and an extensive cover of mosses including

Sphagnum compactum and Sphagnum tenellum. Vascular plants include Deer-grass *(Trichophorum cespitosum)* and Heath Rush *(Juncus squarrosus)*. Wetter hollows and runnels support Common Sundew *(Drosera rotundifolia)* and the rarer Oblong-leaved Sundew *(Drosera intermedia)* which is a particularly distinctive feature of this community. Bare peat tends to be colonised by the local *Rhynchospora fusca* and the club moss *Lycopodiella*.

3.5.8 Temporary & Permanent Ponds

Temporary ponds (sometimes referred to as ephemeral ponds) are scattered throughout the New Forest and are typified by small water-filled depressions on poorly drained soils which dry out temporarily during the summer months and occasionally during very dry winters. These areas can support a unique assemblage of plants and invertebrates. Sanderson (1999) classified the communities of temporary ponds into five types:

- Spike-rush-Purple moor-grass community
- Lesser marshwort-Floating club-rush
- Creeping bent-Marsh foxtail- Knotweed community
- Floating sweet-grass community
- Pool edge assemblages

The communities of Permanent Ponds are complex but vary according to the water chemistry and have not been fully investigated or classified. Nutrient poor-acid/neutral ponds are often dominated by Shore-weed *(Litterellion uniflorae)* communities while richer acid/neutral ponds often have Common water-crowfoot (Ranunculus peltatus) as a dominant species. Further details of communities and individual species can be found in Sections 1.3.19 & 1.3.20 of the SAC Management Plan.

3.5.9 Streams

Although the Life 3 project has concentrated on restoring streams with the aim of improving the condition of riparian habitats, the streams themselves are unique. In fact the New Forest streams are a geographically isolated type with no equivalent in lowland England. As the streams flow downstream they become progressively less acidic and nutrient poor and consequently exhibit a unique vegetation succession from acid communities similar to those found in mountainous upland regions, through richer stream floras as they pass through open grassland and woodland communities, to more typical enriched neutral river plant communities in the lower reaches.

The ecology of the streams has been documented by Langford (1996) and the communities are described in detail in Section 1.3.20 the SAC Management Plan. The streams support a unique assemblage of macrophytes (higher plants) and important populations of macroinvertebrates and fish species as highlighed below.

Macrophytes

The New Forest streams support a unique assembly of plant species. Common species of macrophytes are listed in Table 3-13. Along many reaches of stream where the channel is shaded stands of macrophytes are generally non existent. However where open sections of channel have been channelised resulting in silt deposition downstream in slow flowing sections can be prolific.

Table 3-13: Macrophytes of New Forest Streams

Species	Common Name
Emergent/marginal plants	
Agrostis stolonifera	Creeping bent
Alisma plantago-aquatica	Water plantain
Apium nodifloru	Fools watercress
Caltha palustris	Marsh marigold
Glyceria fluitans	Floating sweet grass
Hypericum elodes	Marsh St Johns Wort
Juncus acutifloris	Sharp flowered rush
Juncus bulbosus	Bulbous rush
Ludwigia palustris	Hampshire purslane
Mentha aquatica	Water mint
Menyanthes trioliata	Bogbean
Myosotis scorpioides	Water forget-me–not
Oenanthe crocata	Hemlock water dropwort
Ranunculus flammula	Lesser spearwort
Rorippa nasturtium-aquaticum	Summer watercress
Scophularis auriculata	Water betony
Sparganium erectum	Bur reed
Veronica beccabunga	Brooklime
Submerged/instream plants	
Callitriche hamulata	Water starwort
Callitriche platycarpa	Starwort
Callitiche stagnalis	Starwort
Elodea canadensis	Canadian pondweed
Potomageton polygonifolius	Bog pondweed
Ranunculus peltatus	Water crowfoot
Ranunculus omiophyllus	Water crowfoot

Source: Langford (1996)

Macroinvertebrates

Detailed studies have been carried out on the macroinvertebrate communities for the Life 3[4] Project for the Lymington River catchment (Black Water & Highland Water). The New Forest streams support a diverse population of macroinvertebrates including several rare species (Table 3-14). Community structure varies according to whether the channels are sinuous or channelised (Table 3-15). However, the conservation value of the macroinvertebrate fauna does not differ between sinuous channelised reaches. Of particular note is that some areas of marginal aquatic habitat were found to support extremely valuable invertebrate communities

[4] Michael Thomas (July 2002) A Study of Habitat Structure and Macroinvertebrate Communities of the Highland Water and Black Water.

including the rare Mud Snail, Lymnaea (Omphiscola) glabra. The richest marginal habitats are those that flood on a regular basis including palaeomeanders and ephemeral leaf litter pools.

In addition to those listed there are numerous other significant invertebrate species associated with wetland habitats which are listed in Table 1.3.25.1 of the SAC Management Plan.

Table 3-14: Distribution of Rare Taxa in the Highland Water and Black Water

Species	CCI	Black Water				
		Main River		Marginal Habitat		
		Channelised	Sinuous	Composite	Paleomeander	Other
Lymnaea glabra	RDB2			P	O	
Agabus chalconatus	Notable			P	P	
Agabus melanarius	Notable				P	
Chaetarthria seminulum	Notable					P
Helochares punctatus	Notable			P	O	
Hydraena nigrita	Notable		P			
Hydraena rufipes	Notable	P				
Hydraena testacea	Notable				F	F
Hydrochus angustatus	Notable			O	O	O
Hydroporus ferrugineus	Notable				O	P
Hydroporus obsoletus	Notable					
Laccobius attratus	Notable			P		P
Paracymus scutellaris	Notable			P	P	O
Capnia bifrons	Regionally notable	F	F	P		
Niphargus aquilex	Regionally notable		F	O	P	O
Average CCI		18.76	22.31	18.20	29.48	21.71

Species	CCI	Highland Water		
		Main River		Marginal Habitat
		Channelised	Sinuous	Composite
Hydraena rufipes	Notable	O		
Hydroporus obsoletus	Notable			P
Capnia bifrons	Regionally notable	F	F	
Niphargus aquilex	Regionally notable	P		
Average CCI		15.69	14.61	14.28

F- Frequent	present in	>50%	of samples	SAMPLES TAKEN IN AUTUMN 2002
O-Occasional	present in	25-50%	of samples	SAMPLES TAKEN IN SPRING 2003
P-Present	present in	<25%	of samples	

Source: Michael Thomas (July 2003)

Table 3-15: Channel Structure Relationship between Significant Species

	Mean no. of individuals / sample		t-test
Black Water and Highland Water	Channelised	Sinuous	p=
Gammarus pulex	32.9	79.2	0.010
Paraleptophlebia submarginata	31.1	75.4	0.011
Pisidium sp.	0.1	0.6	0.020
Glossiphonia complanata	0.1	0.9	0.034
Lype reducta	0	0.8	0.037
Black Water			
Simuliidae	0.6	3.4	0.011
Rhithrogena semicolorata	2.4	8.6	0.035
Gammarus pulex	42.4	88.4	0.045
Highland Water			
Platambus maculatus	0.4	3.2	0.006
Silo pallipes	48.2	8	0.011
Paraleptphlebia submarginata	9.4	56.4	0.017
Habrophlebia fusca	0	1.6	0.035

Source: Michael Thomas (July 2003)

3.5.10 Fisheries

The New Forest streams support healthy stocks of sea trout and brown trout and some stretches of the Lymington, Beaulieu and Hampshire Avon Tributaries are designated as Salmonid Fisheries under the EEC Freshwater Fisheries Directive. Sea trout are also found in the Avon Water and Bartley Water[5]. The sea trout populations are unique to each river and possibly even to individual tributaries. A number of coarse fish species are also present. The tidal flaps at the lower ends of the Avon Water, Bartley, Beaulieu and Lymington affect fish migrations to some extent.

The distribution of fish species throughout the Forest streams is shown in Table 3-16. Although not recorded in the 2001 survey (Gent, 2001), Brook Lamprey are found in the New Forest streams and were recorded during the surveys carried out in the Lymington for the Life 3 Project in 2003 (Wright, 2003). Lamprey and Bullhead are Annex 2 species

The fisheries surveys carried out in the upper Lymington catchment in 2003 prior to the Life 3 river restoration works in Highland and Black Water, recorded seven species of fish. Total numbers of fish caught were greater in sinuous stretches compared to channelised stretches (**Figure 15**). Greater numbers of Lamprey tended to be caught in sinuous sections, probably because lamprey prefer silty sediments, which are found in the slower flowing areas of the sinuous stretches. Conversely brown/sea trout and bullhead were caught in higher numbers in the channelised stretches. These species prefer gravel substrates and faster flows characteristic of channelised stretches. Brown/sea trout dominate the fish community both in terms of density and biomass in both sinuous and channelised reaches (**Figures 16 & 17**). Fish densities were also greater in sinuous stretches.

[5] Sea trout are also present in the Danes Stream and Dark Water which lie outside the six catchments under consideration in this Plan

Eel are present in all of the Forest watercourses but have declined in recent years. The Environment Agency is researching options to improve elver passage into and up the forest Streams.

Generally, no fishing[6] has been permitted inside the Forest Perambulation since 1968. Outside the Perambulation the Beaulieu is fished by day ticket between the sea and Beaulieu and from Beaulieu to Northgate the river is fished by a syndicate. Four angling organisations fish the lower end of the Lymington. On the Avon Water some informal fishing takes place between the sea and Sway. The Beaulieu Estate operates a licensed net to catch sea trout at Beaulieu.

3.5.11 Protected fish species

The brook lamprey is an eel-like fish belonging to one of the most ancient groups of jawless fish. They spawn in March/April laying eggs in shallow depressions in suitable gravels (average size of less than 0.5cm), created by lifting away small stones with their suckers. After hatching the ammocoetes swim or drift downstream to areas of still water where they burrow in the silt. They can remain in their nursery habitat for up to seven years before metamorphosis and emergence as adults. The adults do not migrate far and spawning grounds tend to be in close proximity to nursery grounds. Nor do adult brook lamprey feed and they die approximately one month after spawning.

Sea trout populations are unique to each river with adults returning to spawn in the river in which they originated. Adult sea trout enter the rivers from April/June and migrate up-stream to spawn in headwater gravel beds between October and January. Smolts move downstream for the marine migrations from March to June. The time for this migration is largely water temperature dependant.

Bullhead is the only freshwater cottid found in the UK. It is a small fish which rarely reaches 18cm in length. It is a unique and distinctive fish due to a combination of male parental care and nest building, production of sounds, potential for mate choice, high degree of territoriality and a body and eyes adapted to a flowing environment.

A useful background to habitat preference and sensitivities of these fish species is given in "*River Avon cSAC Conservation Strategy*".

[6] Fishing is permissible under the terms of certain hunting licences

Table 3-16 : Fish Species in New Forest Streams

River	Location	Predominant Species	Minor Species
Avon Water Lymington River	Efford SZ30863 93621	Brown trout, Sea trout, Dace	Flounder
Beaulieu River Cadnam River	Wainsford SZ29870 95008	Brown trout, Sea trout, Roach	Minnows, Stoneloach
	Bolderford Bridge SU 29101 04133	Brown trout, Chub, Gudgeon, Sea trout	Stoneloach, Bullhead, Eels
	Haywood Bridge SZ 31928 99306	Brown trout, Sea trout, Dace	Flounder, Chub, Pike
	Ivywood SU31482 02449	Brown trout, Pike, Gudgeon, Dace	Bullhead, Stoneloach, Minnows, Minnows, Gudgeon
	Puttles Bridge SU 27039 02862	Brown trout, Chub, Pike	Bullheads, Stoneloach, Minnows
	Bratley Water SU2371406674	Brown trout, Eel	Bullhead, Minnow, Stoneloach
	Hart Hill SU2392706282	Brown trout, Eel	Minnow, Bullhead, Stoneloach, Lamprey
	Burley Lodge SU2408905317	Brown trout, Eel	Bullhead, Lamprey, Minnow
	Dog Kennel Bridge SU2409105061	Brown trout, Eel	Lamprey, Minnow, Stoneloach, Bullhead
	Blackwater Bridge SU2562904729	Brown trout, Chub, Eel	Bullhead, Minnow, Stoneloach, Lamprey
	Lucus Castle SU2463910232	Brown trout, Eel	Bullhead, Minnow, Stoneloach, Lamprey
	Highland Water Reptillary SU2736306830	Brown trout, Eel	Bullhead, Minnow, Stoneloach
	Poundhill Heath SU2845704804	Brown trout	Bullhead, Lamprey, Minnow, Stoneloach
	Withybed Bottom SU2476509884	Brown trout	Bullhead, Lamprey, Minnow
	Blackensford Lawn SU2308506958	Brown trout, Eel	Bullhead
	Blackensford Brook SU2374906571	Brown trout	Minnow, Bullhead, Stoneloach Stoneloach
	Dames Slough SU2498905020	Brown trout	Minnow, Bullhead, Lamprey,
	Warwickslade Bridge SU2562904729	Brown trout	Bullhead, Minnow, Stoneloach
	Fletchers Water SU2760204320	Brown trout, Eel, Elvers	Bullhead, Lamprey, Minnow, Stoneloach
	Rhinefield Enclosure SU26129 04593	Brown Trout	Bullhead, Minnows, Stoneloach, Lamprey
	Ipley Bridge SZ 38042 06757	Brown trout, Sea trout	Minnows, Stickleback, Stoneloach, Bullheads
	Mately Bridge SU 33281 07178	Brown trout	Minnows, Stoneloach, Bullheads
	Shepton Bridge SU36956 04438	Brown trout	-
	Worts Gutter SU 36472 02753	Brown trout	-
	Ashurst Bridge SU 34382 12438	Brown trout	-
	Costicles DS site SU 31320 10410	Brown trout, Roach	-
	Costicles US site SU 31320 104108 N/A	Brown trout, Minnow	-

Source: New Forest Fisheries Survey, 2001 & 2003

Figure 15:
Comparison of frequency of Fish Species between sinuous and channelised reaches

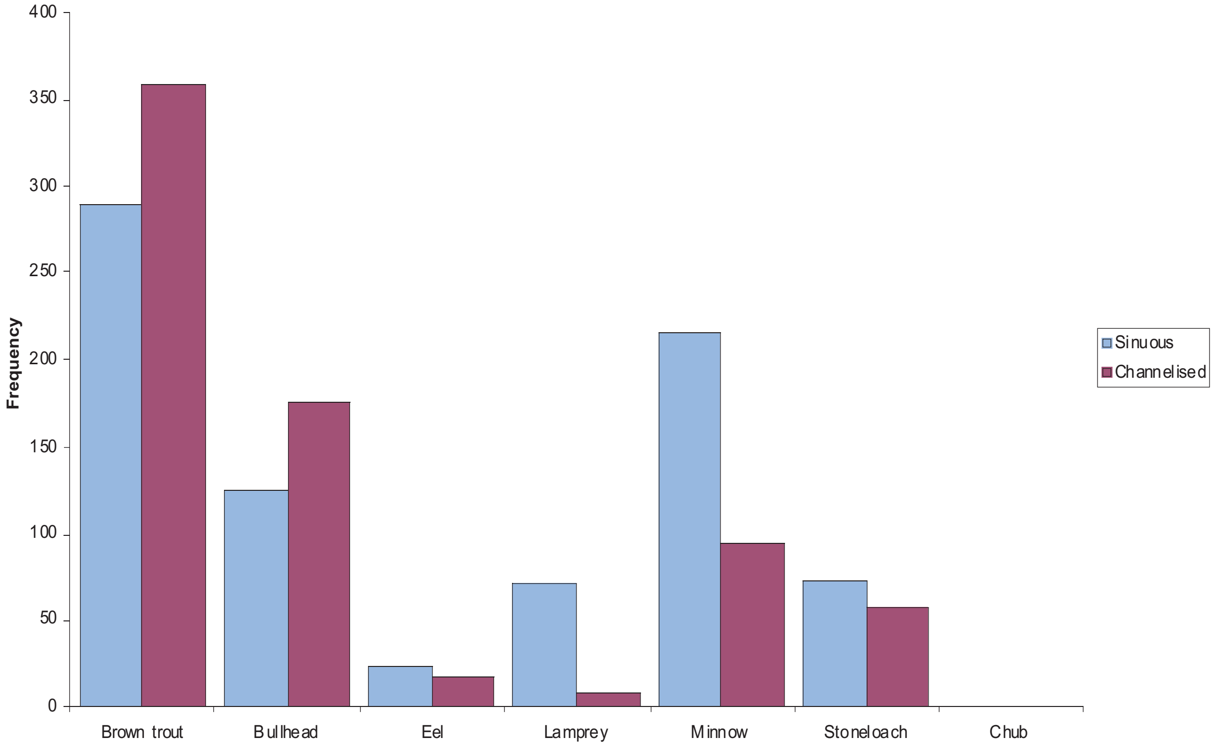


Figure 16:
Comparison of species density between sinuous and channelised stretches

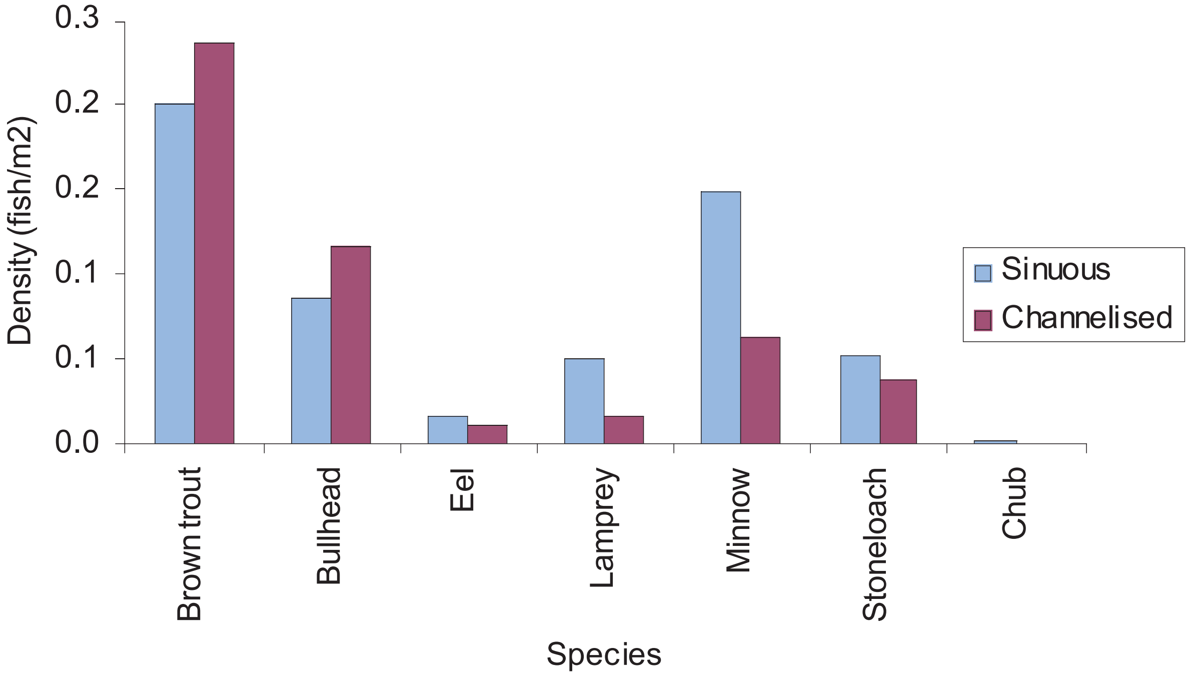
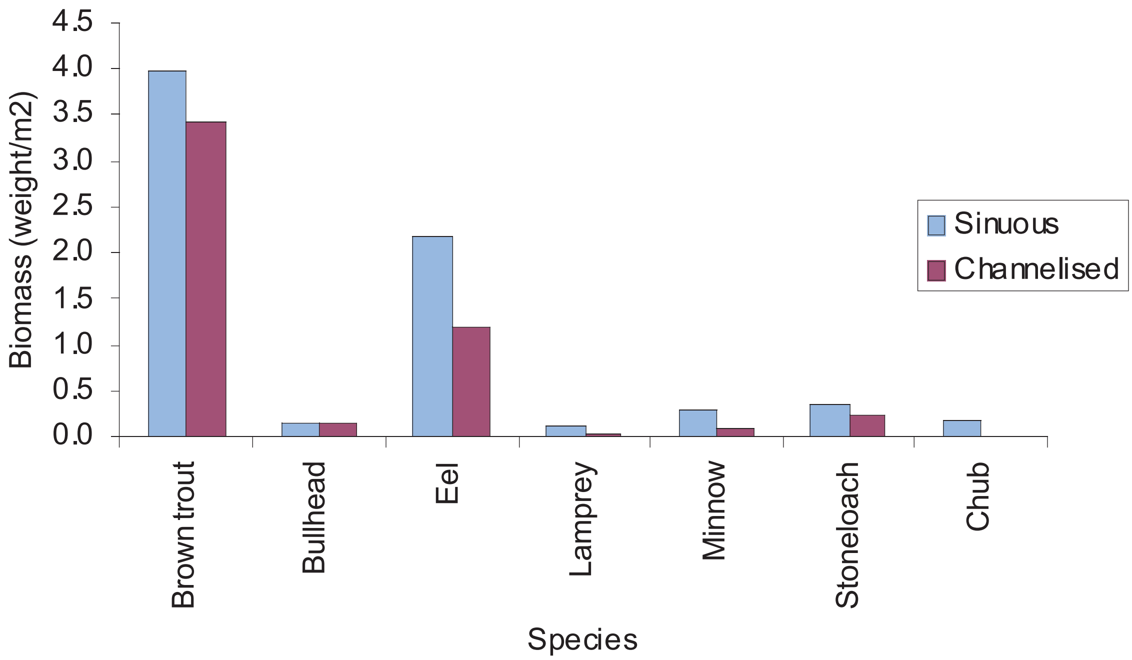


Figure 17:
Comparison of fish biomass between sinuous and channelised stretches



Source: Environment Agency (Figures 15-17)

3.5.11 Protected Wetland Mammal & Bird Species

The New Forest wetland habitats support a huge range of mammal and bird species a number of which are afforded protected status as summarised in Table 3-17.

Table 3-17: Protected Wetland Mammal & Bird Species

Species	Wetland Habitat	Status
Mammals		
Water vole	Streams & rivers	Schedule 5 Wildlife & Countryside Act British Mammal Red Data Book
Otter	Streams & rivers	Annex II & IV Habitats Directive Schedule 5 Wildlife & Countryside Act British Mammal Red Data Book
Birds		
Shelduck	Valley Mires/Permanent ponds	RSPB Amber list
Teal	Valley Mires/Permanent ponds	RSPB Amber list
Lapwing	Valley Mires/Wet grassland/ Permanent & temporary ponds	RSPB Amber list
Curlew	Valley Mires/Wet grassland/ Permanent & temporary ponds	RSPB Amber list
Redshank	Valley Mires/Wet grassland/ Permanent & temporary ponds	RSPB Amber list
Snipe	Valley Mires/Wet grassland/ Permanent & temporary ponds	RSPB Amber list
Kingfisher	Rivers & Streams	RSPB Amber list

3.5.12 Nature Conservation Designations

The ecological importance of the New Forest and surrounding area is highlighted by a number of designated sites of nature conservation value on a national and international level. The sites are listed in Table 3-18 and their location in relation to the six main river basins is shown in **Figure 18**. The status of the designations is described in **Appendix G**. In addition there are a number of Sites of Importance for Nature Conservation (SINCs) which are listed in **Appendix H**, together with the criteria for their selection.

Table 3-18: Designated Sites of Nature Conservation Value

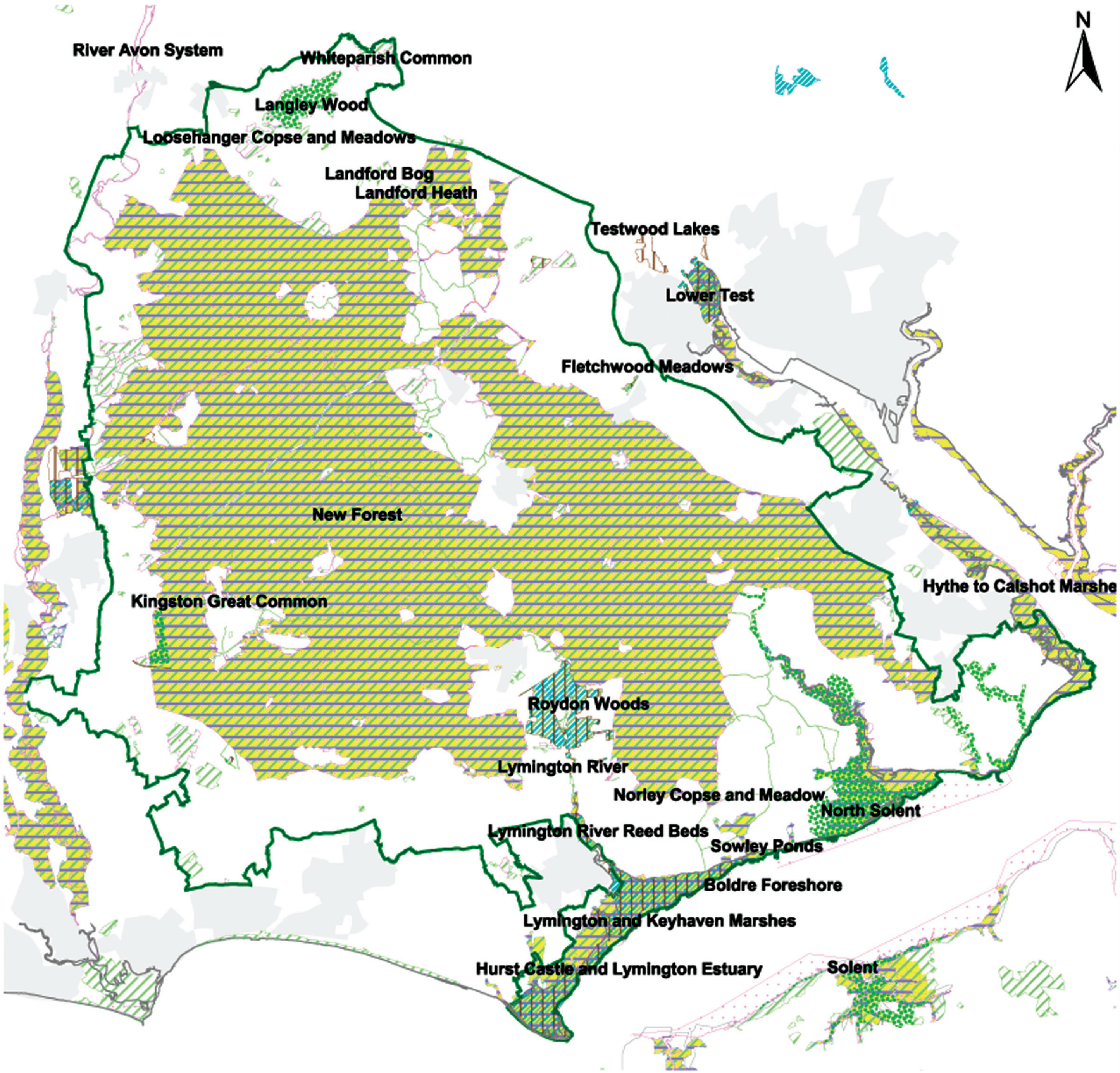
Site Name	Special Areas of Conservation (SAC)	Site of Special Scientific Interest (SSSI)	Special Protection Area (SPA)	Ramsar	National Nature Reserve (NNR)	Local Nature Reserve (LNR) & Hampshire Wildlife Trust Reserves (HWT)
New Forest	✓	✓	✓	✓		✓*1
Langley Wood	✓	✓				
Whiteparish Common	✓	✓				
Landford Bog	✓	✓				
Landford Heath		✓				
Loosehanger Copse and Meadows	✓	✓				
Roydon Woods	✓	✓				
Lymington River	✓	✓	✓	✓		
Copythorne Common		✓				✓
Fletchwood Meadows		✓				✓
Hythe to Calshot Marshes	✓	✓	✓	✓		✓
Lymington & Keyhaven Marshes		✓				✓
Hurst Castle &Lymington Estuary	✓	✓	✓	✓		✓
Sowley Pond		✓	✓	✓		
Norley Copse & Meadow		✓				
Solent	✓					
KingstonGreat Common					✓	
North Solent	✓	✓	✓	✓	✓	
River Avon	✓	✓	✓	✓		✓*2
Lymington River Reedbeds		✓	✓	✓		✓
Boldre Foreshore						✓

*1 includes the following HWT Reserves - Linwood, Long Aldermoor, Bagnum, Holmsley Gravel Pit.

*2 includes Blashford Lakes HWT Reserve

Figure 18

Designated Sites



New Forest Life PARTNERSHIP

Legend

Designation
- Wildlife Trust Reserves
- SAC
- NNR
- Ramsar
- SSSI
- LNR
- SPA

New Forest National Park

Produced by:

Date: 07 February 2006

Scale: 1:130,000

Source: G:\Data\Life 3\FinalReportMapping

3.5.13 Ecological, Fisheries & Nature Conservation Issues

a) Condition status of habitats

The Government has set a Public Service Agreement target to bring 95% of England's SSSIs into favourable or recovering condition by 2010. Furthermore, the nature conservation objectives for the New Forest SAC state that the features for which the New Forest has been designated must be maintained or restored to favourable condition. A considerable area of the New Forest SSSI is still in unfavourable condition and this has been and will continue to be a key driver in progressing the Life 3 Project and finding funding for future works.

b) Drying of mires

Peat development in New Forest mires is very slow, typically accumulating at a rate of 20cm per 1000 years giving rise to shallow peat rarely in excess of 2 metres deep (Clarke 1988). This makes mires particularly vulnerable to damage from artificial drainage because the drainage and associated headward erosion causes lateral peat slumping as the water table drops and causes further drying of the upper soil profile. The drying effect can be seen in changes to the vegetation community with species indicative of drier conditions such as pine and birch, or species indicative of lower water levels and faster flows such as Purple Moor Grass and Bog myrtle becoming more abundant. Scrub invasion can lead to secondary management issues such as loss of grazing.

Mires act like giant sponges and provide the main sources of water to headwaters. Thus the drying of mires means that a stream's source of water is reduced which can be significant during extended dry periods, particularly in the summer months resulting in lower flows.

c) Drainage & canalisation resulting in loss of flooding regime and natural features such as debris dams in alluvial and bog woodland and wet grassland

As highlighted in section 2.3, canalisation has resulted in reduced flooding of the floodplain thus isolating stands of riverine woodland, bog woodland and wet grassland and reducing the hydraulic connectivity which is vital to maintaining the condition of these habitats. A key aim of the wetland management is to restore the original function of the floodplain.

d) Invasion of Exotics

Species such as Rhododendron, American Strawberry *(Gaultheria shallon)*, Sycamore, Turkey Oak, Sweet Chestnut, Red Oak, and Scots Pine and other coniferous species have been introduced as a result of natural colonisation or deliberate planting. It is considered that they can detract from the natural species diversity of woodland habitats and take up space that could be used for native species. However, some species are far more troublesome than others (See Table 19). In addition, other alien wetland loving species, notably Himalayan Balsam *(Impatiens glandulifera)*, Parrots Feather *(Myriophyllum aquaticum)* and Australian Swamp Stonecrop *(Crassula helmsii)* are invading streamsides and ponds. These species can be extremely invasive, highly damaging to native flora and fauna and difficult to control or eradicate.

Although some survey work has been undertaken on the location and distribution of exotics, little is known about certain species, for example North American Skunk Cabbage, which has been found relatively recently in a few locations on the Forest. Care must be taken to ensure restoration work does not lead to the inadvertent spread of exotics.

Table 3-19: Pests & Exotics

Exotic	Characteristics
Rhododendron	A highly invasive shrub introduced from Asia as a garden ornamental shrub. Abundant in private grounds throughout the New Forest and surrounding area. It has negligible nature conservation or browse value. Its provides dense shade which excludes ground flora. Its litter and leachates also have a sterilising effect on the soil.
Gaultheria shallon	Invasive ericaceous shrub from NW America. Spreads by a system of underground rhizomes. Its leathery leaves resist penetration by herbicides and once established it dominates the ground and understorey layers of wood and heath.
Turkey Oak	Introduced into Britain from the Balkans around 1750, and has been present in the New Forest in the late 19th or 20th century. It is invasive and is usually present as a small number of mature trees amongst a host of younger stems. It is of little timber value as it is prone to warping and shrinkage. A key host to the knop per gall. Can hybridise with native oaks thus compromising the genetic make up of native oak in the New Forest.
Scots Pine	Although once native in the Forest the present trees have developed from introduced stock. Initially used as a nurse crop for broad leaved plantings. Highly invasive and where dense stands occur they act as a significant constraint on regeneration of native species.
Sweet Chestnut	Introduced to Britain by the Romans as a source of nuts for food and has been present in the New Forest since at least the 14th century. Although its nuts are valued as a source of food for wildlife, it is non-native and does not support the wealth of insects and lichens found on mature native oak and beech. Its leaf litter is rich in tannins and breaks down very slowly, creating soil conditions that do not favour woodland herbs and mosses.
Red Oak	Introduced from North America as an amenity tree. Like Sweet Chestnut it does not support a rich insect or lichen community
Other species	A number of other non-native species have been planted in more recent times including hybrid lime and various conifer species such as Western Hemlock, Douglas fir, Lawsons cypress and Norway spruce
North American skunk cabbage	Recently found in some mire systems
Japanese knotweed	Garden escapee which colonises along river banks and can become very invasive.
Crassula helmsii (Australian Stonecrop)	An aquatic plant from Australasia. Invasive in permanent and temporary ponds where its rapid growth creates a blanket cover which out competes native flora with associated impacts on invertebrates. Present in many temporary and permanent ponds through out the Forest
Himalayan Balsam (Impatiens glandulifera)	Introduced from Asia as a garden exotic which has subsequently escaped and colonised riverbanks. Rivers provide a mechanism for its spread and colonisation.

Significant Pest species, Exotic/Invasive, Minor Exotic

e) Dead Wood Removal

As well as providing a timber resource for debris dams, dead wood in riverine & bog woodland is important for invertebrates, fungi and other species and is important for the natural processes of nutrient recycling through decay and decomposition. It can also help provide inaccessible niches to protect regeneration saplings from grazing. Therefore it is important not to clear up naturally fallen timber. However cut timber, particularly from conifers can form particularly dense debris dams which may impede the passage of fish and therefore it may be preferable to remove such timber from the floodplain after felling **(see Appendix N – Debris Dam Policy and Appendix O - Timber Management Protocol).**

f) Coppice of alder/sallow stands in riverine woodland

Many of the stands of riverine woodland were coppiced to some extent in the past, which would have resulted in greater ecological diversity as light conditions changed over the phases of coppice re-growth. However, much of this coppice is now closed canopy or derelict. However there is now scope to include coppicing and pollarding in work plans where such work would positively contribute the improvement of SAC habitats.

g) Trapped pre-inclosure riverine and bog woodland

Prior to enclosure, riverine and bog woodland would have bordered the streams in a rich mosaic of wooded and non-wooded habitats. However, the effects of drainage, enclosure and subsequent forestry activities have altered the true species diversity of the habitats by the planting of non-native forestry crops, often up to the banks of the streams. Furthermore spoil banks from drainage works have frequently been re-colonised by scrub. Loss of grazing within the Inclosures has also had an impact on the species diversity.

In order to reverse this trend a key element of the Life 3 works to date has been the restoration of the hydraulic processes and the removal of exotics from the flood plain.

h) Effect of river restoration on fish species

It is anticipated that some changes in the density or distribution of fish numbers may occur as a result of river restoration works but the exact short term changes will not be known until monitoring sites are revisited in 2006 and long term changes not ascertained for some years beyond. The re-instatement of sinuous reaches will provide a mozaic of differing habitats able to support a more diverse fish population in terms of age and size range. Deep pools also provide refuges for larger trout and provide thermal refugia during hotter periods, organic deposition creates habitat for lamprey juveniles, backwaters act as shelters from spate conditions and riffle areas become more stable and therefore better for spawning and salmonid survival.

i) Effect of channelisation on macroinvertebrate communities

Habitats that have become isolated from the main river due to channelisation and subsequent lack of seasonal flooding can support a much-impoverished invertebrate community (M. Thomas, July 2003). The species diversity in these areas tends to be restricted to those species that are able to tolerate a degree of desiccation, are capable of moving between aquatic habitats or have a very short aquatic stage to their life cycle.

However there are some habitat within such areas that has been found to support rarities like the Mudsnail.

Differences between invertebrate communities of channelised reaches and sinuous reaches show that historic drainage work has had a detrimental effect on invertebrate communities. Furthermore many areas of SAC habitat affected by historic drainage work are currently in unfavourable condition in terms of the invertebrate community.

Restoration work that can increase the heterogeneity within the channel will lead to the recovery of a more natural invertebrate community structure, through increases in some key taxa and decreases in others.

j) Decline in breeding wader bird populations

Breeding wader bird surveys, including the survey carried out by the RSPB for the Life 3 Project, have noted the continuing and significant decline in breeding wader populations and their ranges in lowland Britain. Thus it is considered more important than ever to maintain and enhance habitats such as those within the New Forest which still support large numbers.

Population trends in the New Forest also note a decline in breeding wader numbers. Although no detailed studies have been carried out, there is the general presumption that human disturbance may be partly to blame, although there are a number of other factors, for example predation and loss of habitat, which also need to be considered. The PROGRESS Project is currently carrying out a detailed modelling study looking at a number of factors including the distribution of key bird species around the Forest and the feasibility of creating tranquil areas to minimise disturbance. Results and recommendations from this study are awaited.

It is hoped that the restoration of wetland habitats under Life 3 will help to restore or provide new wetland habitats suitable for breeding snipe, curlews, redshank and lapwing.

k) Low flows placing stress on fish populations

In the summer months, low flows are frequently experienced in the headwaters and tributaries of the New Forest streams. Such events are one of the natural factors causing the large ‘natural’ variations inherent in migratory fish populations. Retention of precipitation through mire restoration will help to ameliorate the effects of low flows.

l) Temperature changes and potential effects on in-stream ecology

Studies currently being carried out by Southampton University reveal significant differences in water temperature between open and shaded reaches along Forest streams. Further investigation and monitoring is required to determine what influence these temperature variations may have on water quality and in-stream ecology. However, when considering the effects of future works, where there is the requirement to fell dense conifer stands to open up the watercourse it would be advisable to consider the potential effects of raised water temperatures particularly where reaches are prone to low flows.

Further Reading

Wright R.N. & Westerhoff D.V. (2001) **New Forest SAC Management Plan**. Lyndhurst: English Nature

Wheeldon, J. (2003). **The River Avon cSAC conservation Strategy**. English Nature, Peterborough

D-J Gent, **Hampshire and Isle of Wight New Forest Catchment: Rivers Avon, Beaulieu, Blackwater, Cadnam, Darkwater and Lymington Fish Survey Report 2001**, Environment Agency

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Colin R. Tubbs, **The New Forest** , New Forest Ninth Centenary Trust 2001

N.A. Sanderson, (October 2004) **Fencing Proposals Under Life 3 Ecological Report**

RD Goater, D. Houghton & C. Temple, (November 2004), **New Forest Breeding Waders Survey 2004**, RSPB

M. Thomas (July 2003) **A Study of Habitat Structure and Macroinvertebrate Communities of the Highland Water and Black Water**, Environment Agency

T.E. Langford (1996) **Ecological aspects of New Forest streams draining one of Britains unique Area:** Freshwater Forum Volume 6

S. Weymouth & S Cooch (2000), **A survey of the Physical and Ecological Status of the Valley Mires in the New Forest Special Area of Conservation (SAC)**, Forestry Commission

3.6 LANDSCAPE

3.6.1 Existing Landscape

The landscape of the New Forest is…

> *"…. an exceptional landscape which has largely escaped the changes brought about elsewhere by modern agriculture and industrial society. Its character still reflects the medieval Royal Forest which covered much of the area. It is a landscape of great beauty, which conveys peace and tranquillity and gives inspiration and great enjoyment to many people. Above all the Forest is a living landscape; its character still shaped by traditional land management and the way of life of local people."* New Forest Committee 2003

The Forest has been subdivided into twenty-seven Landscape Character Areas to assist with planning and development control within the Forest. Table 3-20 shows which Landscape Character Areas the river basins fall into. Descriptions of the key characteristics of these Landscape Character Areas in relation to the river basins are given in Appendix I.

In recognition of the special qualities of the landscape, the New Forest Heritage Area has been subject to tight planning control and the designation of the New Forest as a National Park will continue to give this statutory protection. Indeed the key purposes of the New Forest National Park are to:

- Conserve and enhance the natural beauty, wildlife and cultural heritage of the Park, and
- Promote understanding and enjoyment of its special qualities

The New Forest has also been recognised for its unique cultural landscape and exceptional natural beauty by its inclusion on the Government's Tentative List of World Heritage Sites and has been accepted by UNESCO as meeting the requirements for inclusion on the Tentative List. A decision is still awaited from the UNESCO World Heritage Committee.

Table 3-20: Landscape Character Areas

Landscape Character Area	Avon Water	Lymington River	Beaulieu	Bartley Water	Cadnam	Hampshire Avon Tributaries
Upper Avon Valley						✓
Poulner Woods & Pastures						✓
West Wellow Heaths & Common					✓	
Copythorne Forest Farmlands				✓		
Hythe & Ashurst Forest Farmlands			✓			
North West Solent Estates			✓			
Lymington & Pennington Coastal Plain	✓	✓				
Sway Pasture & Smallholdings	✓					
Southern Heath & Forest	✓	✓				
Northern Heath & Forest		✓				✓
Furzey Woodland & Villages				✓	✓	
New Forest Central Woodlands		✓				
Lymington River		✓				
Beaulieu Heath			✓			
Beaulieu River			✓			
Eastern Forest Heaths			✓			

3.6.2 Landscape Issues

a) Landscape changes

Tree felling, scrub removal and modifications to the river channel do result in localised landscape changes. Removal of trees can be an emotive subject among local residents and visitors to the Forest. Therefore it is important that too much change does not take place all at once and thus Life 3 works have been spread out and phased to avoid the perception that areas are being significantly changed. This strategy will continue into the future and if possible fit into the five year Inclosure working plans which are designed to spread out and minimise disturbance and impact

With the proposed changes in tree cover (refer to Forest Design Plan) and a gradual shift to broad-leaved native species, in order to restore the condition of the Forest, wide scale changes will take place over the longer term and on a broader scale.

b) Landscape features and exotics

Certain isolated stands of trees, for example stands of mature pines, can in some areas become key landscape features in their own right, even though from an ecological perspective their removal would be desirable. Where this is the case, policy allows for the retention of the trees if they form a significant landscape feature and each site has been and will continue to be considered on a site by site basis. Studies were carried out in the 1970's reviewing the significance of Scots Pine on the open forest as a landscape feature. These reports[7] still provide useful reference for current day site planning

c) "Forest Furniture"

Where "Forest furniture" such as bridges, signs or swing gates need to be replaced it is important that their aesthetic appearance fits into the landscape of the Forest and follow Forest guidelines in terms of appearance. Verderers' approval, along with consents from other relevant bodies, are required for certain items on the open forest.

Further Reading

Environmental Resources Management (2000) **The New Forest District Landscape Character Assessment**

New Forest Committee (2003) **Strategy for the New Forest** (Chapter 3)

Pasmore A.H. & Lavender (1973) **A Survey of Scots Pine on the Open Waste of the New Forest**, New Forest Commoners' Defence Association

Small D. (1978) **New Forest – A Review of Treatment of Scots Pine Stands Made in 1977**, New Forest Forestry Commission

[7] Pasmore A.H. & Lavender (1973) A Survey of Scots Pine on the Open Waste of the New Forest, New Forest Commoners' Defence Association
Small D. (1978) New Forest – A Review of Treatment of Scots Pine Stands Made in 1977, New Forest Forestry Commission

3.7 ARCHAEOLOGY & CULTURAL HERITAGE

3.7.1 Existing Archaeology & Cultural Heritage

The New Forest contains a unique and special archaeological resource which has been largely well preserved due to the land use history, the protection afforded by Forest Law and by modern day conservation designations and management. However, some sites have been damaged by previous drainage works and forestry operations. The Forestry Commission has drawn up an "Archaeological Management Plan for the Crown Lands of the New Forest" which outlines the general approach to the management of archaeological sites.

There are some 2,000 sites of archaeological and historic interest recorded in the New Forest area. Over 260 of these sites are designated as Scheduled Ancient Monuments (SAMs). Such sites are afforded protection under the Ancient Monuments and Archaeological Areas Act 1979 and the National Heritage Act 1983. At least 155 SAMs are designated within Crown Lands. The location of these sites relative to the river basins is shown in Figure 19.

In addition, there are numerous other known archaeological features. Advice on the location and nature of these sites is provided by the Hampshire County Council Archaeologist and Hampshire Field Club.

Table 3-21 summarises the archaeological history and evidence found in the Forest today.

Table 3-21: Archaeological History

Archaeological History	Evidence
Bronze Age (2500 – 750 BC)	Evidence of woodland clearances for stock grazing. Numerous burial mounds mainly located on the heaths
Iron Age (750BC – 43 AD)	Hillforts and enclosures
Roman Invasion (43AD – 400AD)	Evidence of Roman Pottery industry particularly in north of the Forest around Islands Thorns, Amberwood and Sloden Inclosures. Small sections of Roman Road have also been found suggesting that the Forest may have been of strategic value to the occupying army.
Anglo-Saxon Period (400AD-1066AD)	Evidence of small scale settlement and abundance of features including park pales, Royal hunting lodges and boundary banks.
Post Anglo-Saxon	Inclosure Earthworks, coastal salterns, bee gardens and Second World War infrastructure

Wetland restoration works have to date encountered the following types of site:

- Boiling Mounds
- Charcoal pits
- Pounds
- Kilns

Boiling Mounds

Boiling Mounds, sometimes referred to as Burnt Mounds are usually located close to watercourses. They are characterised by spreads of burnt material and fire cracked flints. Excavation sometimes reveals evidence of structures below or within the spread of burnt material. It is thought that such sites were used to heat water using heated stones. They may have been sites where feasting, food preparation, ritual washing or sweating took place.

Boiling Mounds are not well understood and it is considered important that sites are protected for their archaeological potential. More boiling mounds have been recognised in the New Forest than anywhere else in Hampshire. It is likely that their origins and purpose are closely associated with the Forest and understanding them in the future may give an insight into how prehistoric society used and valued the Forest.

Charcoal Production

It is thought that charcoal was used in the New Forest iron and gun powder industries. Charcoal sites would have comprised a wood stack, mounded with earth and leaves to allow a slow burning fire. The archaeological evidence of such sites is slight and is associated with patches of black ground. The mound, or kiln, may leave a large circular bank, between 6 – 13 meters in diameter. The charcoal burner would have had a hut adjacent to the mound. The working area of the mound and charcoal burners hut may result in a terrace which can be particularly apparent on steeper slopes. The sites are sometimes associated with sawpits.

Pounds

Pounds are associated with stock management in the Forest and were used for pigs, goats, horses, cattle and sheep. The evidence of pounds can be seen in small oval, rectangular and D-shaped earthworks and are slighter but more sharply defined than the earthworks associated with lodges. Many are found on the high ground to the west of the forest. It is possible that they were used seasonally and associated with droving or transhumance activity.

Pounds form a visible reminder of the woodland heritage and are an integral part of historic woodland use and character of the Forest.

The earthworks are fragile and vulnerable to damage and erosion.

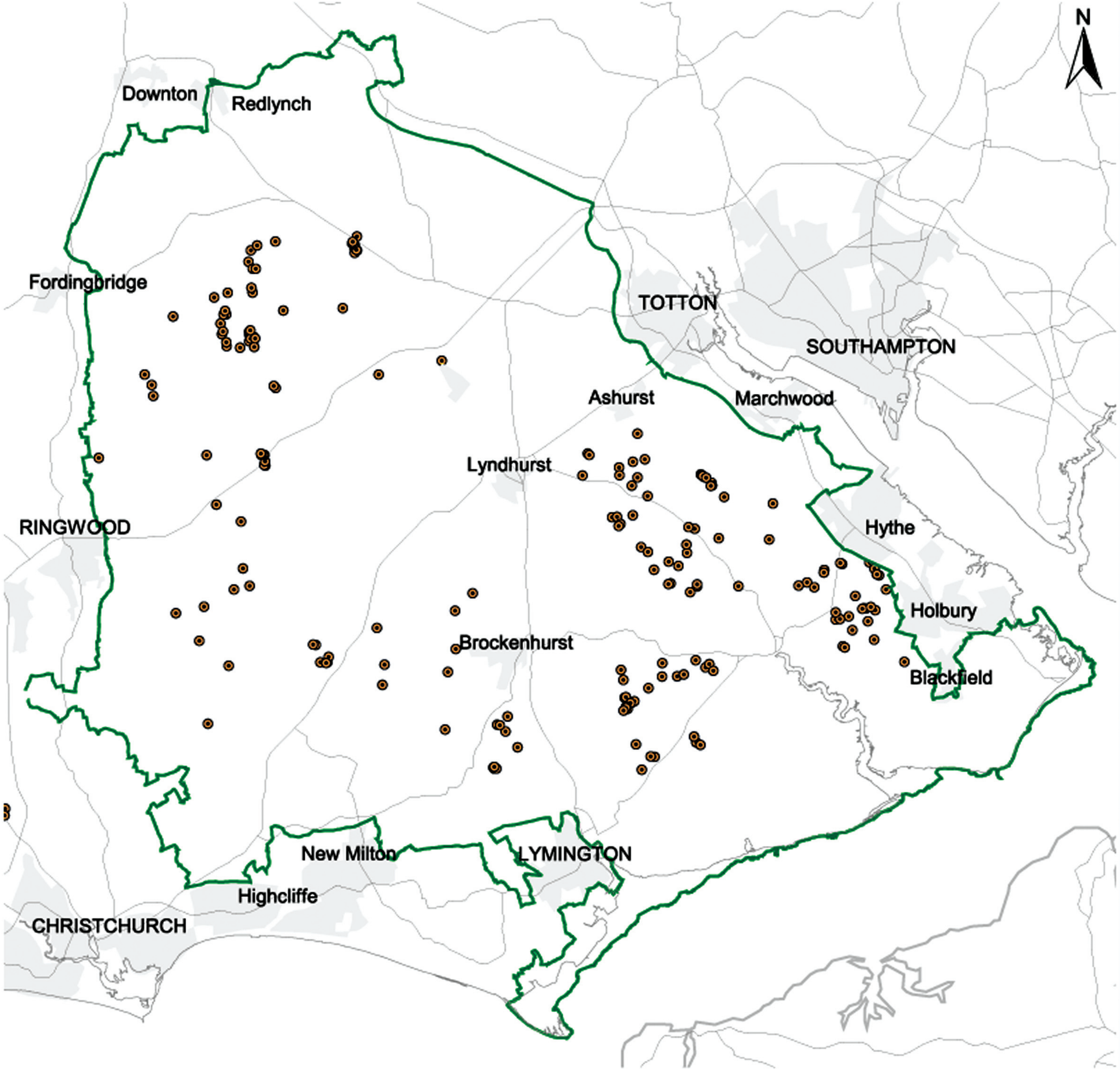
Roman Kilns

Roman Kilns are considered to be of very high archaeological importance. Kilns are the structures in which pottery was fired. They may be discernible on the surface as a low mound or entirely buried. They are sometimes associated with other related archaeological

Figure 19

Scheduled Ancient Monuments

New Forest Life PARTNERSHIP



Legend

Scheduled Ancient Monument

New Forest National Park

Produced by: Date: 07 February 2006

Scale: 1:130,000 Source: G:\Data\Life 3\FinalReportMapping features such as other kilns, waste heaps, terraced working areas, clay extraction pits or dams on watercourses. Waster heaps are accumulations of pottery shards discarded during the production process which may show up as low mounds or concentrations of pottery.

Roman kilns are of archaeological importance for the insight that they provide into Roman pottery production, industrialisation and economy as well as providing a chronological framework against which to date pottery from other archaeological sites. The sites are fragile and vulnerable to damage.

3.7.2 Archaeological Issues

a) Protection of archaeological sites

The Life 3 Partners are statutorily obliged to consult with English Heritage and the County Archaeologist over any risks to archaeological sites and their management in relation to any works being carried out. Where the archaeological potential of the site is high and more needs to be known, field evaluations are carried out by professional archaeologists.

In addition, Hampshire Field Club has a considerable database of non-statutory sites with their own categorisation of importance and vulnerability. However, this data is not publicly available or routinely shared with other statutory bodies. Information held by the Hampshire Field is taken into consideration when conducting the works and where possible the site marked out in advance of the works.

b) Archaeological potential

It is recognised that there are a large number of archaeological sites within the Forest that are unknown and that are potentially located within areas proposed for wetland restoration works. It is not inconceivable that further dedicated studies to reveal new sites may take place within the next 10 years. It may be necessary to undertake small localised studies for certain works under the direction of the County Archaeologist if potential damaging works were to take place in an area of high archaeological potential and data was insufficient to ensure adequate protection of sites.

Further Reading

Archaeological Management Plan For The Crown Lands Of The New Forest, Forestry Commission 2001

Colin R. Tubbs, **The New Forest** (Chapter 3), New Forest Ninth Centenary Trust 2001

PPG16 Archaeology & Planning, HMSO 1990

3.8 LAND USE

3.8.1 Introduction

A detailed description of land use and history is given in the SAC Management Plan and the Strategy for the New Forest. The following section aims to give a concise outline of the main land use activities taking place across the six main river basins and land use issues associated with wetland restoration works.

The dominant land uses within the six main river basins are as follows:

- Forestry
- Agriculture & Commoning
- Recreation
- Settlements & Infrastructure

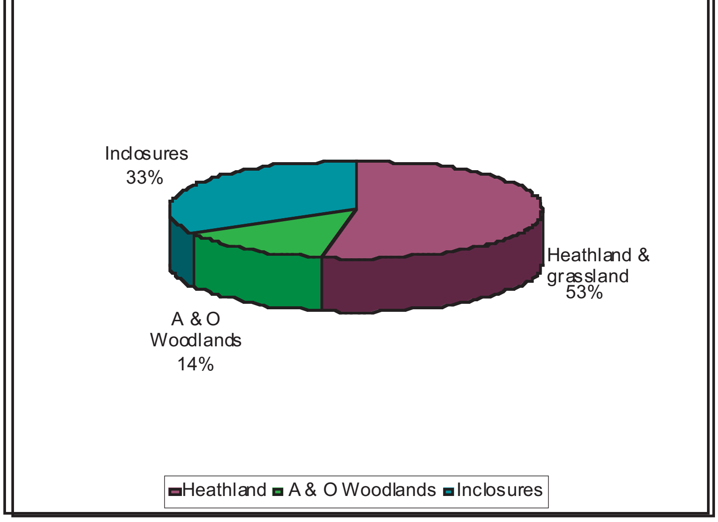
3.8.2 Forestry

The Forestry Commission currently manages 25,825 hectares of land which can be broken down as follows:

- Heathland & Grassland
- Ancient & Ornamental Woodlands
- Inclosures

The break down of these cover types is shown in **Figure 20**.

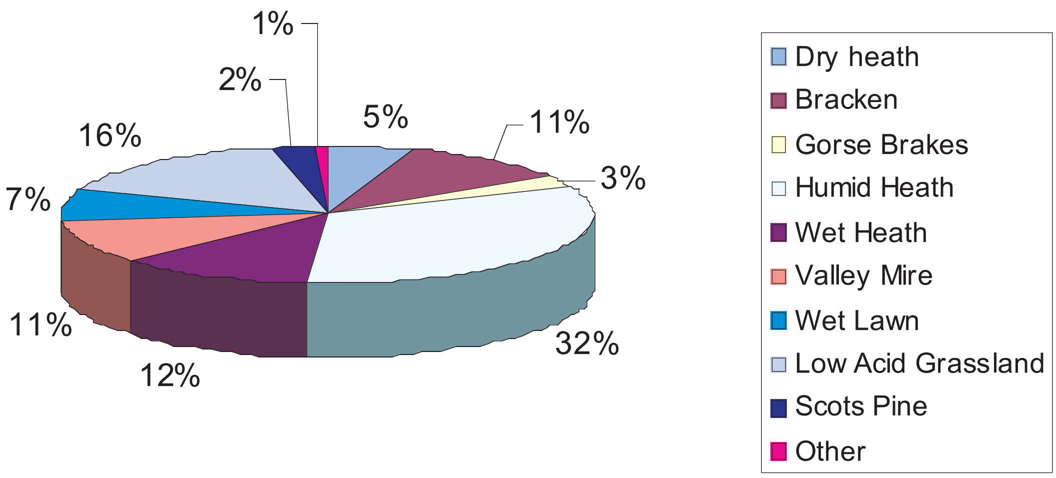
Figure 20: Crown Lands – Land Cover Classification



Heathland

Heathland covers 13,633 hectares of Crown Lands. The heathland can be broken into a number of vegetation types as shown in **Figure 21**. It is an important area for targeting wetland restoration works containing 1,450 hectares of valley mire and 3,095 hectares of grassland communities. The Heathland Plan sets out the policies and strategies for managing such areas, many of which are integral to wetland restoration and the maintenance and restoration of favourable habitat condition.

Figure 21 Categories of Crown Land Heathlands (Hectares)



Inclosures

Inclosures cover 8,500 hectares. The origin and history of the inclosures is covered in more detail in Section 2. The Inclosure woodland provides the primary source of commercial timber within the New Forest from a combination of broadleaved and conifer woodland. The Inclosures are managed under the Inclosure Plan which amalgamates the prescriptions of 20 Forest Design Plans. The Ministers Mandate (**Appendix M**) combined with the Government's Forestry Strategy for England's woods and forests has prompted a change in management strategy with more emphasis being placed on:

- bio-diversity
- public access and recreation
- woodlands which contribute to local employment and support industries using wood products
- Recognition of archaeological and cultural features.

The future plan for land use cover within the Inclosures is shown in **Figure 22**. The transformation to a new mosaic of habitats is to be achieved through a series of management prescriptions linked to:

- Thinning
- Converting conifer plantations to broadleaf woodland
- Converting mixed woodlands to broadleaf
- Ride Management
- Proactive management of existing broadleaf and conifer woodland
- Natural regeneration
- Transformation to Pasture Woodland
- Transformation to Near-natural woodland
- Transformation to heathland and mire
- Access for Commoning Stock

The progression of wetland restoration works will be an important part of this transformation.

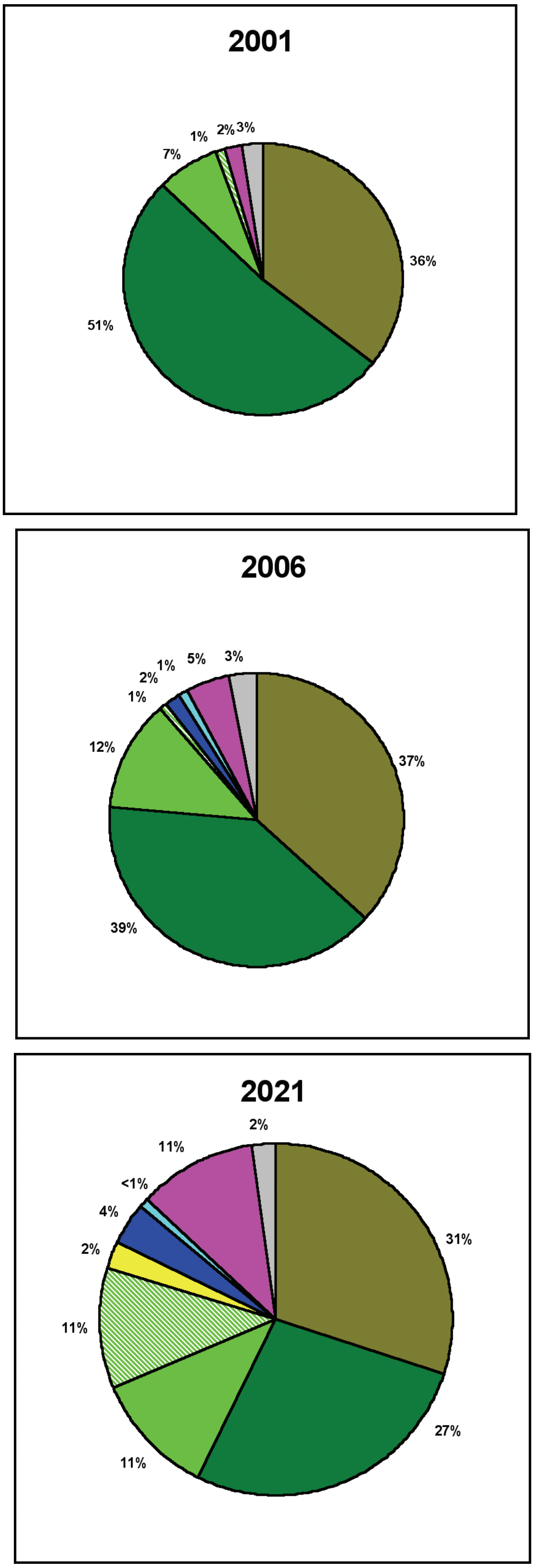


Figure 22
Change in Forest Cover

Ancient & Ornamental Woodlands

The Ancient & Ornamental (A&O) Woodlands, named under the 1877 New Forest Act, are the unenclosed ancient beech and oak woods some of which are direct descends from the original "wildwood". They also include limited areas of pre-inclosed woodlands fenced within the statutory Inclosures. The term also applies to secondary post-1850 regeneration woodland encroaching on the Open Forest and to riparian woods which line many of the Forest's rivers and streams. Some 3,692 hectares can be attributed to A & O woodland.

The management strategies and polices for the A & O woodlands are included in the Plan for the Ancient and Ornamental Woodlands.

3.8.3 Commoning

Commoning is an ancient tradition which can be traced back to at least Saxon times. Grazing associated with Commoning has been essential in shaping and maintaining the habitats found in the Forest today. The relationship between Crown and Commoners has had a turbulent history, as outlined in Chapter 2, and benefits resulting from works such as those carried out under Life 3 are often viewed with suspicion or scepticism.

Rights of Common (Table 3-22) are attached to land or property and are conferred by its ownership or occupation. There are no limits to the numbers of stock attached to a property carrying commoning rights and it is a combination of market forces and available grazing which determines stocking levels. Indeed financial returns tend to be limited and it is tradition and 'a way of life' that has sustained commoning to date. There are currently 470 practising commoners, although around 1300 properties have commoning rights.

The management of Commoning is the responsibility of the Verderers Court. The Verderers comprise 5 elected and 5 appointed Verderers whose role it is to regulate the Rights of Common and development on the open Forest. Their role is guided by the New Forest Acts and byelaws. On 20th July 2005 the Verderers agreed a series of policies (Appendix J) to protect the "special qualities of the forest". In particular:

> *"The primary objective of the Verderers is to protect and administer the New Forest's unique agricultural commoning practices, to conserve its traditional landscape, wildlife and aesthetic character, including its flora and fauna, peacefulness, natural beauty and cultural heritage, and to safeguard a viable future for commoning upon which these depend."*

The requirement to receive the consent of the Verderers is generally restricted to activities in the Open Forest (Heathland and A&O Woodland) and the Forestry Commission has a duty to consult and gain agreement with the Verderers in relation to activities or proposed developments on the Open Forest.

The Verderers are assisted by 5 Agisters who oversee commoning activities across the whole of the Forest. Each agister has his own geographical area of responsibility in which he oversees animal welfare, drifting and marking activities. The drifts are an important occasion when all the livestock on the Forest are rounded up. This allows branding of new foals,