

Sustainable forestry and biodiversity - recent initiatives by Scottish Natural Heritage

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Introduction

During the last 20 years there has been a growing awareness that economic development is inextricably linked with the environment. This has led to a gradual realisation that policies and strategies for the continued economic and social development must be pursued in a way which is not detrimental to the environment which supports human activity.

During the same period, experience mainly from overseas, demonstrated that for environmental protection projects to be successful they must involve the communities affected by them. In other words, policies and strategies which aim to protect the environment must take into account the continued need for economic and social development. These two outlooks lie at the heart of Scottish Natural Heritage's approach to the conservation and enhancement of the natural heritage. One outcome is that there is much more enthusiasm and support for increasing forest cover than appears to be the case amongst conservationists in England to date.

Background

The principle of sustainable development was first enunciated in the so-called Brundtland Report (*Our common future*) in 1983 produced by the World Commission on Environment and Development. Environmental policy in the UK has given increasing prominence to these issues as articulated, for example in the White Paper on *Environment - this common inheritance: Britain's environmental strategy* (1990).

The founding legislation of Scottish Natural Heritage (SNH), the Natural Heritage (Scotland) Act 1991, introduced the word "sustainable" into UK legislation for the first time, a significant advance towards recognising the importance of the environment in sustaining human existence.

The Natural Heritage (Scotland) Act thus places on SNH a duty to balance its objectives for the natural heritage with the needs of rural development. The following paper outlines the way in which SNH has begun to interpret and put into practice these aspects of its remit particularly with regard to forestry.

Sustainable development

The SNH policy document *Sustainable development and the Natural Heritage: the SNH approach* was published in October 1993, and provides the basis from which the following five guidelines for sustainability are developed.

- Wise use - non-renewable resources should be used wisely and sparingly, at a rate which does not restrict the options of future generations.
- Carrying capacity - renewable resources should be used within the limits of their capacity for regeneration.
- Environmental quality - the quality of the natural heritage as a whole should be maintained and improved.

- Precautionary principle - in situations of great complexity or uncertainty we should act in a precautionary manner.
- Shared benefits - there should be an equitable distribution of the costs and benefits (material and non-material) of any development.

To date consideration of the sustainability of forestry has tended to focus on the first two guidelines. It has proven extremely difficult to conclude whether forest practices are sustainable or not. There can be no doubt that the recent developments in GB forestry policy have gone a long way to address the concerns of 10 years ago. Thus while forestry still has short-comings, it comes out rather well, in comparison with other systems which provide a similar range of benefits. Pursued in an appropriate and sensitive manner, forestry has considerable potential to contribute to sustainable development in other sectors.

Woods and forests can accommodate large numbers of visitors with little impact thereby helping to meet the growing demand for outdoor recreation. Stream-side woods can play a key role in providing the food source for the riverine fisheries and help absorb agricultural run-off. In producing a basic raw material forestry can help mitigate the greenhouse effect. The creation of flood plain forests to absorb flood water is more sustainable than the engineering solution of building levies and concentrating the problem further down stream.

SNH is actively promoting the role that native woodlands can play in delivering these benefits and supporting projects, such as Highland Birchwoods, which aim to demonstrate amongst other things the range of uses to which native timber can be put.

Rural development

The activities mentioned above in one way or another all contribute to rural development. Over the last couple of years SNH has been working with the Forestry Authority, Highlands and Islands Enterprise, Rural Forum, Scottish Office Environment Department and WWF Scotland in an informal partnership known as the Forests and People in Rural Areas Initiative or FAPIRA for short. The purpose of the initiative is “to promote the special value of woodlands and ways of deriving the greatest social benefits from woods and forests in rural areas, particularly for local people”. It has just produced a discussion paper *Forests and people in rural Scotland*. The Ministerial foreword by the GB Forestry Minister indicates the growing appreciation of the role forestry can play in rural development.

Enhancing biodiversity

Promoting the role of native woodland in fulfilling environmental and development objectives is likely to result in an increase in environmental quality, but it might not address the biggest threat to nature conservation in the 21st century - namely the continued fragmentation and isolation of semi-natural habitats. SNH continues to guard against this on a day-to-day basis through work with designated sites and planning, WGS casework, and promoting more widespread creation of native woods. However, a more strategic, proactive approach is needed if this long term trend is to be reversed and the biodiversity of Scotland’s forest resource enhanced in a coherent manner.

From an ecological perspective there has been a gradual evolution of thinking from species to habitats to ecosystems. While forest ecosystems may be an appropriate unit to work with in large countries such as Canada the concept is of limited applicability in many European countries such as Scotland where there is a more intricate mosaic of land-uses. This situation has led to development of the idea of habitat networks which aim to establish the connectivity and functionality of, say, a forest ecosystem without the need for wholesale tree cover.

Habitat networks attracted attention from European policy makers during the debate which led to the development of the Habitats and Species Directive. The EC commissioned a study from Institute for European Environmental Policy (IEEP) to consider the feasibility of a pan European Habitat Network which became known as ECONET. Despite support for a network approach from some countries, notably The Netherlands, the site-based lobby won the day. The ECONET idea is now, however, being taken forward again as part of the pan European Biological and Landscape Diversity Strategy (Annex 1) which was endorsed by Europe's Environment Ministers at the Third Environment for Europe Conference in Sofia from 23-25 October 1995.

Thus from both an ecological and political perspective there appears to be considerable merit in developing the concept of a network of forest habitats in Scotland. To this end, SNH commissioned IEEP and George Peterken to investigate the feasibility and desirability of a Forest Habitat Network in Scotland. The resulting report considers both the advantages and disadvantages of such an approach, concluding that it had much to recommend it. Through case study areas the report demonstrates that the development of a network in any particular locality would depend not only on biogeographical differences but also on differences in socio-economic context. Whilst the overall priority will always be to consolidate and expand existing woods, in some areas emphasis may be on restructuring existing plantations to provide a wider range of habitats. In other areas emphasis may be on creation of new native woods.

SNH does not intend developing a grand blueprint for a Forest Habitat Network but rather will work in a proactive way at the local and regional level to promote connectivity between woods of natural heritage interest. The first local study is being undertaken in the Cairngorms. It will indicate where better connectivity between woods in the Cairngorms area, and between them and woodland in surrounding areas, is desirable. There may be a number of ways in which such connectivity could be created. For deadwood species, for example, one approach would be to aim for continuous areas of old growth while an alternative might be to maintain a high proportion of standing and fallen deadwood in a more intensively managed area.

In other areas SNH will seek opportunities to promote the Forest Habitat Network concept in discussions on the appropriate balance between forestry and other land use interests. Indicative Forestry Strategies are an obvious example of the regional processes that can be used to develop the Forest Network concept, while FE design plans provide a local example.

Conclusion

SNH is working to forge stronger links between socio-economic development and the environment. It is often claimed that the main reason many of our native woods survived to the present day is because they were valued in one way or another and were consequently cared for and protected, particularly from over-grazing. Much could be learnt from this. Securing a role for native woodland in rural development is one of the main tenets of SNH's policy for conserving and enhancing the natural heritage value of Scotland's forest resources.

As we move into the 21st century native woodlands could become valued for their role in supporting riverine fisheries, flood protection, mitigating the effects of agricultural run-off, as places for recreation and to learn about the natural world. Many of the same woods could also act as the main pool of biodiversity in Scotland's forest resource as key components of a Forest Habitat Network.

Annex 1. Extract from the declaration following a meeting of European Environment Ministers at Sofia (October 1994)

Biological and landscape diversity

Recognising the uniqueness of landscapes, ecosystems and species, which include, *inter alia*, economic, cultural and inherent values, we call for a pan-European approach to the conservation and sustainable use of shared natural resources. We endorse the Pan-European Biological and Landscape Diversity Strategy, as transmitted by the Committee of Ministers of the Council of Europe for adoption at this Conference, as a framework for the conservation of biological and landscape diversity. We welcome the readiness of the Council of Europe and UNEP, in cooperation with OECD and IUCN, to establish a Task Force or other appropriate mechanism in order to guide and coordinate the implementation and the further development of the Strategy. In this respect we request the widest possible consultation and collaboration in order to achieve its objectives with a view to reporting on progress at the next Conference.

We welcome the IUCN report *Biological and landscape diversity in central and eastern Europe: best practices for conservation planning in rural areas*, carried out under the auspices of the EAP Task Force, and encourage its application, especially in mountain areas.

We urge that all parties effectively implement the Convention on Biological Diversity and other relevant conventions in the region. We urge all parties to elaborate and other countries to consider the elaboration of national strategies, plans and programmes on biological diversity by 1998, and call upon all countries to cooperate in taking concrete measures.

We call for the promotion of nature protection, both inside and outside protected areas, by implementing the European Ecological Network, a physical network of core areas linked by corridors and supported by buffer zones or other appropriate measures, thus facilitating the dispersal and migration of species.

We call for an adequate contribution from national, bilateral and multilateral funds and for increased contributions from the private sector for actively promoting conservation of biological and landscape diversity, and for the development and application of innovative financing mechanisms for this purpose. Relevant efforts should involve local communities, informal sectors and government authorities at all levels.

We call for the effects of agriculture on the environment to be recognised, and for agricultural practices to be conducive to the conservation and enhancement of biological and landscape diversity.

Pan-European Biological and Landscape Diversity Strategy

The Pan-European Biological and Landscape Diversity Strategy presents an innovative and proactive approach to stop and reverse the degradation of biological and landscape diversity values in Europe. Innovative, because it addresses all biological and landscape initiatives under one European approach. Proactive, because it promotes the integration of biological and landscape diversity considerations into social and economic sectors. The Strategy reinforces the implementation of existing measures and identifies additional actions that need to be taken over the next two decades. The Strategy also provides a framework to promote a consistent approach and common objectives for national and regional action to implement the Convention on Biological Diversity.

Why the Strategy?

Europe has a shared responsibility towards conserving its natural heritage and passing it on to future generations. Recent political and social developments in Europe offer a number of unique

opportunities to act in favour of the conservation of biological and landscape diversity. Throughout the continent, agricultural practice is changing, former military, industrial and agricultural land is becoming available and has a potential for nature development, international cooperation is increasing in all areas and there is growing public awareness and concerns on biological and landscape diversity issues. These considerations have led the Council of Europe in cooperation with other national and international organisations, both governmental and non-governmental, to take the initiative to develop united European action.

Many initiatives have been and are being undertaken to address the continuing deterioration of the natural environment. Their capacity would be enhanced and their effectiveness increased when:

- initiatives cover the whole of Europe;
- biological and landscape diversity is integrated adequately into all social and economic sectors;
- conservation of landscapes is adequately incorporated in the major initiatives dealing with biodiversity;
- subsidiarity, partnership and involvement are incorporated;
- initiatives make use of all mechanisms available, in order to change how society thinks and works in relation to biological and landscape diversity, including: international and national markets and trade policy, multilateral or bilateral funds, fiscal and financial policy, initiatives and programmes, public awareness and participation;
- all the main actors in the economic sectors, the land users, the authorities and the general public are involved;
- the same Strategic principles to achieve goals are implemented, thereby achieving possible synergy.

Aims for an action plan on forest ecosystems

- Conserve adequate areas to secure all types of forests in Europe, and specifically prioritise efforts towards alluvial and virgin forests, ancient secondary woodland, and riparian forest corridors, taking into account needs of indigenous and local peoples.
- Conserve forest habitats of species requiring large undisturbed forest ecosystems, including Bern Convention, Habitats Directive and UNECE threatened species.
- Devise and promote an action plan for biodiversity, landscape and ecological networking considerations to forest management and in the use of renewable forest products.
- Initiate studies on the adjustment of European forests management systems in order to optimize adaptation to climate change, to ensure the health and multiple functions of existing forests, and to optimize the sequestration and storage of carbon (Helsinki Ministerial Conference on Protection of Forests in Europe).
- Secure an effective network of protected areas to maintain the northern boreal forests.
- Strengthen sustainable management and protection of viable old growth forests in south-western and south-eastern Mediterranean regions.

- Identify and initiate restoration and regeneration plans of the most important fragmented forests of intrinsic value in CEE and Atlantic regions.
- Establish a conservation assessment and programme as a consequence of privatisation and/or market conditions impacting on sustainable forest management in the CEE.
- Establish procedures to ensure greater collaboration with indigenous and local peoples for effective sustainable management of forests for economic and cultural/biological diversity use in the Arctic, Boreal and CEE regions.
- Promote public awareness campaigns based on flagship species which highlight the issues involved in the protection of threatened species.
- Encourage countries to develop and implement regional lists and action plans for threatened species.

Sustainable forestry and nature conservation in English woods and forests - Discussion

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The main points to emerge in the discussion are summarised below.

A driving force for sustainable forestry?

“A ‘grand plan’ for sustainable forestry is unlikely to happen as there is no single driving force”.

Without commitment from people sustainable forestry will not happen. What will be the driving force to give people that commitment? In the past forest expansion was driven by the need to become self-sustaining in timber; now there seems to be no strong stimulus driving the expansion programme on today’s agenda, other than perhaps the ‘political correctness’ of being seen, in global terms, to be working towards the goal of sustainable forestry.

Should nature conservation be the driving force for sustainable forestry? Our aim must be to integrate nature conservation into all forces affecting forestry if it is to become economically, socially and environmentally sustainable. Our limited ability to place a monetary value on nature conservation may be restricting its use as a driving force.

“Are forests environmental resources with financial spin-offs or are they financial resources with environmental spin-offs?”

Forestry is ultimately likely to be driven by economics which depend on grant or other support regimes, markets and international influences. The definition of ‘commercial forestry’ is debatable, but could include all benefits which generate a monetary income although for some benefits it may not yet be possible or desirable to calculate this value.

There is a complete spectrum of potential income generation within semi-natural woods; some produce timber and other saleable products, whilst others exist purely for nature conservation or landscape reasons. It is likely that market forces will determine where the balance lies, but in the country as a whole production will largely centre on conifer plantations.

We need to decide why our forests are here and what we would like to gain from them. Does the multipurpose forestry concept actually work and is it desirable? Financial arguments for and against forestry are easy, but we (conservationists/estate owners/foresters etc) need to become much more adept at selling the non-market benefits to the public and the policy makers.

There are good reasons for wanting more trees today, for example increasing leisure time means that recreation density in some forested areas is already reaching overload. In future there may be other very different reasons for wishing to expand our forest cover and to manage existing woods sustainably. Climate change may produce effects which we do not at present foresee but which may become the dominant force driving all sectors of society. Expanding forest cover may be one method of coping with such change, eg through stabilising climates, or reducing soil erosion. At present there are perhaps more cost effective ways of tackling global warming but such priorities and options may change radically in the future.

The UK’s dependence on the forest resources of other countries, much of it not sustainably managed, places an obligation on us to increase our production.

Europe - a constraint or opportunity for sustainable forestry?

Is there any sign of a European sustainable forestry policy being developed? A recent document by the Agricultural and Rural Development Committee of the European Parliament discussed this issue. The problem of subsidiarity was emphasised. For example, countries which wish to develop their forestry through financial subsidies do not wish to compete directly with countries where subsidies are unnecessary to support forestry. The most likely benefit of such a policy would be to tackle problems which concern more than one country (eg fire in the Mediterranean countries, or disease control), and not to attempt to provide an overall framework for a sustainable forestry sector. Forestry continues to be driven by the policies of other sectors. (These issues were further discussed in an Italian paper by Visconte).

“The public feel ripped-off paying subsidies”.

Until there are significant reforms to the CAP across Europe, the development of sustainable forestry will be constricted by the inequalities between agricultural and forestry subsidies. The whole issue of subsidies will need to be reconsidered in light of how the paying public wish to see their money spent. Environmental subsidies may become more common place.

An existing European regulation on the harvesting and marketing of pre-industrial woodland could have positive results for the reinstatement of management in our small semi-natural woods, but does not seem to have been taken up by the Forestry Commission.

A philosophy, targets or framework for sustainable forestry - which do we need?

“We need to know what we want; mechanisms will follow”.

The concept of a target means different things to different people. To some, targets are a basis for collective lobbying and not an end in themselves. To others they are merely a vision. A target for doubling woodland cover has an appeal which can be used to stimulate public interest, but it should be supported by bottom-up regionally focused studies. For example, the Country Wildlife Trusts are looking at options for woodland expansion on a county basis, and English Nature on a ‘Natural Area’ basis - these figures may help to support the doubling target and will certainly clarify how any new woodland should be distributed across the country.

For some doubling woodland is only the start, we could do with much more woodland and much less agriculture. However, turning farms to forestry is counter to our culture in many rural communities.

Targets for forestry expansion are being justified from the industrial side of the forestry sector by illustrating the drop off in timber production which is forecasted in around 60 years time. However, it could be that industrial objectives for timber, technology, and international priorities will have advanced such that we no longer need the volume of timber that a rapid expansion of forest area would produce.

“We must look for opportunities, and not work to structured plans”.

Any plans or a framework for sustainable forestry will be constrained in future by, for example, global warming and its effect on agriculture. Land which we thought may have been coming available for tree planting may not be in future.

Should expansion of forest area be a target for nature conservation or might other habitats, eg parkland or heathland, take priority? Locally these other habitats must take precedence, but woodland has the advantage of having economic as well as environmental benefits.

“We lack vision as a society - not only for our woodland”.

Perhaps targets are not so important in achieving sustainable forestry as a vision of a ‘Brave New World’ where forestry can compete effectively with agriculture. At present CAP has no policies which accommodate forestry (other than allowing the planting on set-aside) but how much longer will CAP survive in anything like its present form?

“Sustainable forestry is about culture and attitude as much as targets and programmes”.

Local and national aims need to be brought more closely together. Society must sort out its priorities for forestry, agriculture and other areas of government subsidy. However, there are international obligations which must be adhered to with respect to conservation of the natural environment and with human rights (eg subsidies to forest nature conservation versus subsidies to agricultural livelihoods) the balancing of these is a major area where difficult decisions will need to be made over the coming decade.

The ‘Natural Areas’ concept (English Nature) and the Countryside Character programme (Countryside Commission) may be a vehicle for formulating our vision based on the constraints and opportunities for sustainable forestry which become apparent from their analysis.

Mechanisms for sustainable forestry management expansion - how will they work?

“To achieve sustainable forestry we need to move our approach from species to processes; and from sites to landscapes”.

The Dorset heathland provides an example where sustainable forestry involves the removal of trees (conifers) to benefit another habitat type. At present this is involving a few hundred hectares but this may increase in future if the balance of benefits lies in favour of increasing the heathland area.

The boundaries of SSSIs are perhaps becoming less meaningful as the standards of forestry practice improve to accommodate nature conservation objectives.

The impact on biodiversity of coniferisation of ancient woodland is not clear cut and depends on factors such as the amount of conifer cover and the robustness of the original ecosystem. There can therefore be no straightforward guidelines for management to produce sustainable ecosystems.

There is a concern that new woods are being promoted in areas where it is not economically sensible, thus requiring lots of subsidy, but in other areas conversion to forestry will be more economic. The design (size and species composition) of new woods is also often uneconomic, and incentives for small private owners are not big enough to produce viable woods. The private sector consider that the instability of grants is a major disincentive to plant and manage woods. The traditional estate owner is suffering an increasing feeling of powerlessness and of being misunderstood by the urban society.

For forestry to be sustainable linkages with other sectors need to be developed, eg catchment management priorities, rural community development.

Where will new expansion be? The Community Forest Programme can be used as an experiment to implementing expansion in other areas, but in itself it will only contribute about 10% of the desired woodland expansion.

Woodland initiatives can be helpful in promoting management of neglected woods, but the success of the Welsh initiative (Coed Cymru) may not be repeatable in other areas, eg Scotland, due to very

different scales of landscape ownership and management. With any of these initiatives it may take a long time to have an impact on sustainable forestry. Learning from others needs to become more widespread.

What should we aim for in terms of forest design? Large woods are closer to becoming economic and may be closer to nature. Well placed and managed conifer plantations may be more of an asset for sustainable forestry than small neglected “semi-natural” woods. “Traditional” landscapes will have to change to accommodate large scale forest expansion, and new landscapes will have to be accepted. Perhaps there is too much control on afforestation and more freedom to allow landowners to plant as they wish on agricultural land would generate more commitment?

Conservationists need to clarify objectives for forest wildlife - is the aim to maintain and enhance only internal forest species, or to use forests as a refuge for many species formerly of other habitats as possible? We need a “whole ecosystem” approach to managing our forests. Perhaps the amount of woodland ‘protected’ through the SSSI system should be reconsidered - for example by reducing the amount but raising its standard of management?

Research needs to become more focused and used to guide the policies of the future - practical solutions are needed.

Where do the priorities for sustainable forestry lie? - some thoughts from EN’s local team staff

The lack of management of existing woodland was seen as a major issue in Suffolk. Financial incentives were not considered large enough to encourage woodland owners. Large areas of conifer expansion were not welcomed in this area.

In Oxfordshire the re-creation of the ancient royal hunting forest landscape around Wychwood would be a priority for expansion, but deer were seen as a significant barrier to any woodland management. The only real solution at present appears to be fencing which was considered to be ‘gardening’ and is not in line with the philosophy of sustainable forest management. (EN is part of the England-wide ‘Deer initiative’, has recently been looking at best practice for deer management on National Nature Reserves, and is generally keen to reduce deer numbers.)

In the uplands concern was expressed over the effect of forestry expansion on the management of heather moorland. Could this habitat survive in combination with the appropriate kind of forestry?

In the Welsh Marches restoration of replanted ancient woodland was seen as an opportunity for achieving sustainable forestry with scope for more non-intervention woodland.

In the north-east, the extension of broadleaved gill woodlands would be welcomed, especially as agricultural land was considered unlikely to be released. Ex-industrial land would be an appropriate location on which to expand community forests.

Questionnaire

Further views from some of the participants are drawn from questionnaire responses (Appendix 4).

Measuring progress towards sustainable forestry

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Introduction

How will we decide in five years time whether or not forestry in England can be viewed as more sustainable than at present? The previous papers have considered the sorts of woodland, the sorts of approaches that may be needed. Targets such as those in the Biodiversity Action Plan are being set in qualitative and in some cases quantitative terms. However, even if these can be agreed what are their processes that will enable progress towards these targets to be assessed? Such systems need to be in place now or be capable of implementation very shortly if we are to make comparisons in the year 2000 with the current state.

This paper reviews what might be used for our purposes under broad headings (Table 1) dealing with, for example, the extent and broad composition of the woodland, the diversity of particular groups and the relationships between woodland and the rest of the landscape. There are also measures to do with the processes that take place within woodland, for example the level of external inputs and the degree to which management mimics natural processes. Some of the indicators are more-or-less direct measures of nature conservation value, the species indicators for example; others are indirect and may need qualification, such as the area under coppice (is it in places where it will be beneficial or not?). Underpinning the general monitoring scheme there need to be research sites where aspects of both managed and unmanaged woodland systems are studied in more detail. These would include both strict minimum intervention reserves where relatively natural processes could be followed as well as sites managed under different silvicultural systems to permit the impact of forestry treatments to be studied.

Clearly not all of the indicators will operate at the same scale. Some, such as the area-based ones, may be approached both at a national and at a local (county or EN natural area) level. Some may be done on a sample basis and the conclusions therefore only be robust and meaningful at a national scale, eg many species diversity measures.

The list produced is incomplete, but it provides a starting point for discussions and a basis for looking at the extent to which existing survey and monitoring schemes can be used to assess these indicators.

Existing survey/monitoring schemes

There are a wide range of existing survey/monitoring schemes that pick up many of the indicators suggested (Table 2). Some are already used as part of a monitoring schemes, others need some additional work before they can be used for monitoring. There is also a need to link together the different programmes.

Woodland area, for example, and broad composition can be obtained from the forestry inventory or the ITE Land Class surveys - the latter is less good from a woodland statistics point of view, but has the advantage that it can provide the relationship between changes in woodland cover and those in other habitats. Both have in the past tended to be repeated at roughly ten year intervals, although the forestry inventory is moving to a rolling programme with continuous updates from woodland grant scheme details.

Table 1. Attributes that might be used as indicators of sustainable forestry from a nature conservation point of view

Total woodland area	Broadleaved/conifer mixed. Semi-natural/plantation. Native/non-native. Local/non-local provenance.
Area under particular management regimes	Coppice. High forest. Minimum intervention.
Ancient woodland area	Semi-natural extent. Area lost/converted to plantations. Plantation area restored to native cover.
Protected woodland sites	Extent and number of sites. Adequacy of protection/management. Series of strict minimum intervention reserves.
Forest structure	Age/size class diversity at different scales. Area of veteran and open stage stands.
Isolation/connectivity of woodland	Inter-wood distances. Mean woodland area in 1 x 5 km transects.
Plant species diversity	Overall species richness. Proportion of indicators of different types. Rare species populations.
Woodland breeding bird diversity	Common bird censuses. Rare species populations.
Butterfly diversity	Overall species indices maintained. Rare species populations.
Key mammals	Range and local population sizes. Bat monitoring.
Grazing levels in forests	Extent of sites significantly over-grazed.
More natural processes	Level of inputs of fertilizers, pesticides. Natural regeneration v planting. Coupe size related to forest type. Retention of some trees on site.
Impact of forests/woodland on other habitats	Effect on water bodies. Loss of other habitats to forest cover.
Use of wood or wood products	Percentage that is from sustainably managed sites.
Tree health	Level of damage to key tree species.

Table 2. Survey/monitoring systems that could be used to address the indicators in Table 1.

Scheme and lead authority	Main features recorded relevant to Table 1 indicators	Key Table 1 indicators
<i>National inventory of woods and non-woodland trees.</i> Forestry Commission.	Total area of woodland across England, with site details from aerial photograph interpretation plus a 1% field check.	Total woodland area. Extent of native tree cover. Extent of broadleaf cover. Extent of coniferous woodland. Extent of coppice. Structural assessment from 1 ha field sample squares.
<i>Ancient woodland inventory.</i> English Nature.	Ancient woodland site boundaries across England, based on variety of historical and other sources.	Total ancient area. Ancient semi-natural area. Ancient replanted area.
<i>SSSI schedules and sample surveys.</i> English Nature.	Descriptions of sites; periodic standardised surveys of a sample of sites to check interest is maintained.	Extent, area of protected sites. Adequacy of their management.
<i>Countryside Survey 1990.</i> DoE/ITE.	Estimates of different habitat types by land classes with plant species information from standard randomly placed plots.	Total area of woodland in different categories and of other habitats with estimates of change between habitats. Estimates of species richness in woodland ground flora.
<i>FE sub-compartment database.</i> Forest Enterprise.	Crop details (age and tree species composition) on Forest Enterprise holdings.	Structure of state forests at local to national scales.
<i>FA records of Woodland Grant Schemes.</i> Forestry Authority.	Details of felling and restocking under grant schemes in privately owned woods.	Structure of privately owned managed forests at a national scale. Balance between coppice, high forest, etc.
<i>Long-term research monitoring sites such as at Lady Park Wood and the ECN sites, eg Wytham Woods.</i> Various.	Mainly permanent transect and plots in which a variety of structural and botanical information is recorded.	Underpinning research to calibrate simpler, quicker monitoring systems and improve our understanding of what changes recorded in these other systems mean.
<i>CBC records</i> <i>Butterfly transects</i> <i>Bat monitoring scheme</i> Various.	Species numbers or relative abundance.	Species diversity at a national level.
<i>Tree health surveys</i> Forestry Commission	Damage and condition of trees	Tree health.

The Ancient Woodland Inventory provides our current understanding of the extent of ancient woodland and is subject to revision as new information becomes available. These revisions cannot be used as a direct measure of recent change at present, however, because some are the re-interpretations of the state of the site because of new information rather than real changes on site. The revisions are also not an unbiased sample, since they come in as and when people become aware of a change or discrepancy between what is on the inventory and the state of the wood on the ground. Some people are more active than others in reporting revisions. Such data provide, however, an indication of possible trends that be checked by structured sample surveys.

The Woodland Grant Scheme records and the FE sub-compartment database contain information on the age structure and coupe size of managed private and state forests respectively that could be used to explore structural variation at different scales from forest to national level. Again, as with the Inventory revisions, the data for private forests is not an unbiased sample and the data may not at present be organised in a way that makes such assessments easy to do.

The various national animal species monitoring schemes (for birds and butterflies, and a bat scheme is being trialed) are not confined to woodland sites, but a sufficient number of woodland sites (or landscapes with woodland in them) are included to try to pull out results for changes in woodland species particularly. Surprisingly perhaps, there is no equivalent scheme for common vascular plants and relatively few woodland plots occur with the field squares of the DoE/ITE Countryside Survey. Changes in common species are, however, likely to be more useful in judging the overall success of the sustainable forestry programme at a national scale. Any monitoring of rare species is heavily biased towards the sites where the species currently occur and which tend to be unusual in their condition or treatment.

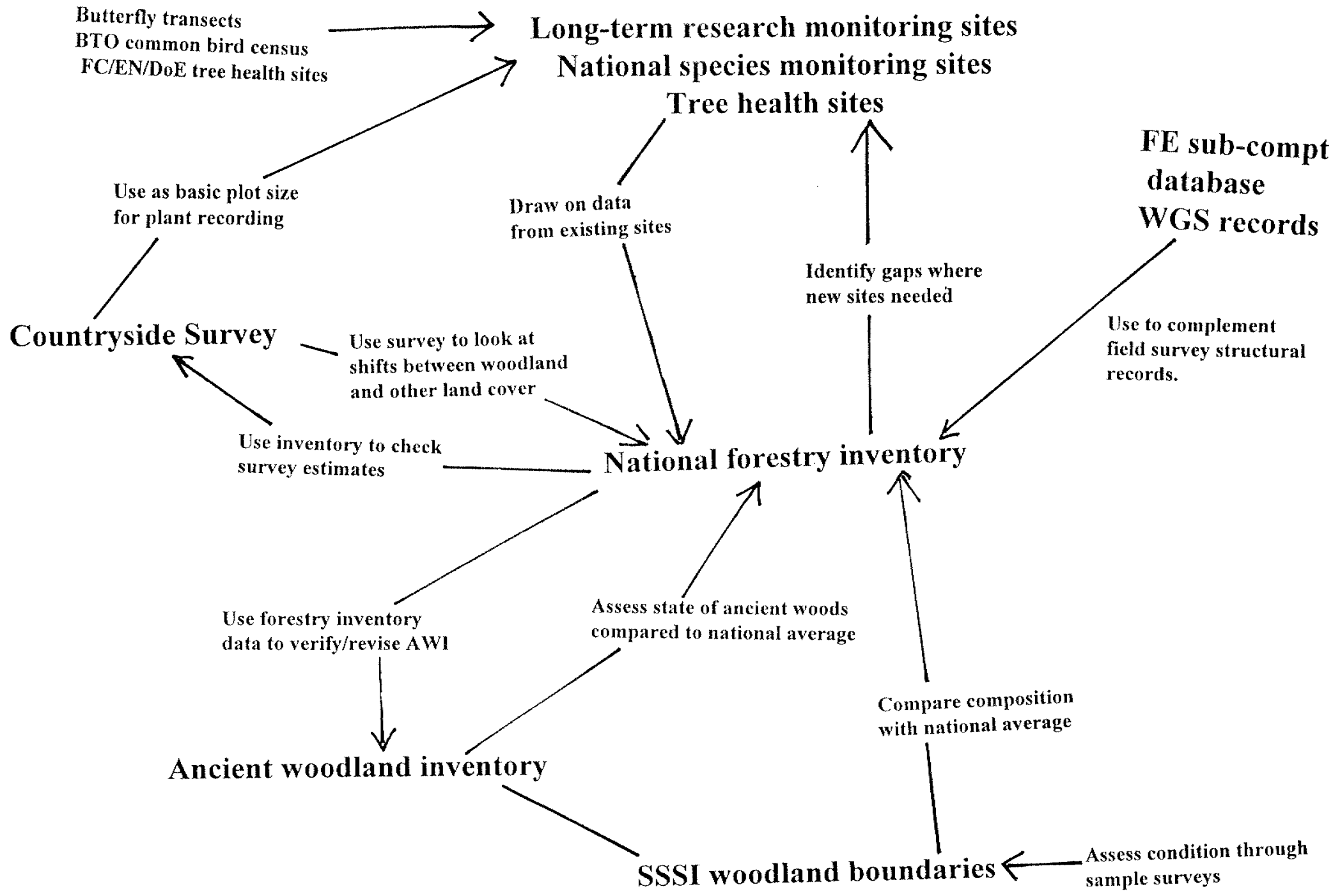
Developing a national framework for woodland monitoring

Monitoring the progress of sustainable forestry should cover economic and social aspects as well as ecological ones. The utilisation side needs to be considered through some form of certification, whether through the type of scheme favoured by the Forestry Stewardship Council or through development of the Forestry Authority Standards. Similarly there will need to be work on quantifying the inputs to forestry - at what point does the extra input of energy (through nursery costs, transport costs, weeding etc) in most plantation systems fail to be matched by increased production/energy output compared to lower intensity systems. Are these systems really as low intensity as is sometimes claimed? A valid criticism of coppice is that it places a much heavier nutrient demand on the site than high forest systems - the input from the atmosphere over the life of a coppice crop may now outweigh the removals, but was that always true in the past when litter and twigs were also regularly removed?

The range of information already available (Table 2) goes a long way towards meeting the needs outlined in Table 1, but the priority is to improve the links between these systems. For example, the Forestry Authority for England and English Nature are working to produce a combined GIS data set that will have the ancient woodland boundaries overlain on the national forestry inventory results. The same procedures used in compiling the national forestry inventory could be used as a basis for checking for recent changes in a properly structured sample of ancient woods to provide a context for the *ad hoc* revisions to the ancient woodland inventory made at present. The combined data set could also be used to measure the changes to woodland isolation at a landscape scale.

Individual species monitoring scheme sites could be plotted as another overlay to see to what extent the current sites do represent the range of woodland conditions present. Where gaps are identified it would be a case of approaching the voluntary bodies (who for the most part do the actual recording) to see whether there is anyone willing to adopt an appropriate wood to fill the gap. For plant recording the ITE system could be adopted in the first instance on reserves and in selected FE sites to improve the baseline for assessing woodland species change in the context of the changes in the wider countryside. Tree health monitoring sites could similarly be overlain as well as the location of research monitoring sites. This is illustrated diagrammatically in Figure 1.

I do not underestimate the work that will be involved in trying to pull the various systems together. However, increasingly both the Forestry Authority and the conservation agencies will be required to provide information on the state of England's (and the UK's) forests in connection with the Habitats and Species Directive and Biodiversity Action Plans. I suggest that the approach outlined represents a reasonably cost-effective way of being able to answer these and other similar questions.



Conclusions and the way forward

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The debate about how sustainable forestry and nature conservation should develop in the next century is still in progress. However, some themes emerge from the papers and discussion which indicate where English Nature should be concentrating its efforts. These are set out below and I hope that it will be possible to report progress on at least some of them over the next 12 months.

Woodland nature conservation depends on ancient woodland outside the SSSI system and on recent woodland to maintain the range and abundance of many woodland species and to reduce the effects of past woodland fragmentation.

- Identify best ways of locating new woods to buffer existing sites and reduce fragmentation.
- Improve advice on selecting and implementing different woodland management regimes.

Commercial conifer forests have a potentially greater contribution to woodland biodiversity than has been previously recognised alongside their productive value.

- Work more closely with FA Forest Biodiversity Initiative to link it more closely to studies on semi-natural woodland.
- Identify types of situations where commercial plantations of introduced plantations would lead to nett conservation benefits.

Potential areas for woodland expansion have been identified in general terms.

- Develop at county and Natural Area level estimates of the location and areas available for possible new planting or expansion by natural regeneration.

Local developments on sustainable forestry must be set within a national framework.

- Work with government and non-government organisations to develop a national framework including targets.
- Integrate local level estimates with national targets.
- Work with FA and others on national standards and certification.

Strategies are needed for encouraging the management of the thousands of small, particularly ancient, woods whose importance rests more in the social and conservation spheres than in production terms.

- Work with partners to set up/maintain local woodland initiatives.
- Examine whether adjustments to CAP livestock rules or hill grazing regimes can be achieved to encourage fencing of woods.

Significant increases in England's woodland cover can only be achieved if we are prepared for major changes in the landscape of some regions. Broad visions such as SNH's forest habitat network may help to shift opinions to make this more acceptable.

- Explore whether the forest habitat network concept could be applied to linking woodland clusters across several Natural Areas.

The impetus to increase significantly woodland cover in England is coming from outside English Nature. If we are not to be left in a purely reactive role then staff throughout local and national teams need to re-appraise attitudes to new forestry and be prepared to take a positive proactive stance.

- Determine how significant the potential negative aspects of new forestry are.
- Encourage search for opportunities for new development including those where nature conservation may be only one of the objectives.

Monitoring of changes in both existing and new woodland habitats and species is currently largely haphazard and uncoordinated.

- Seek to improve integration of the different types of woodland/forestry monitoring.

Appendix 1. English Nature's Position Statement on environmentally sustainable forestry and woodland management

England's forests and woods benefit us in many ways, by providing a rich diversity of habitats for wildlife, beautiful scenery, places for quiet recreation, opportunities for field sports, and renewable resources of timber and other wood products.

The guiding principle of **sustainable forestry** is to recognise that these benefits are interdependent, and forests should be managed as a multiple-value resource for present and future generations. English Nature wishes to see a prosperous forestry sector based on woods which are rich in wildlife. We will work with our partners in Government, the Forestry Commission, the forestry profession and woodland owners and managers, to ensure choices are available which allow woods to be managed profitably while maintaining and, where appropriate, enhancing their natural biodiversity.

English woods are distinctive internationally and in a European context by reason of the strong Atlantic element in their flora, including an abundance of species such as bluebells, holly and bryophyte carpets and ash-dominated stands on limestone. Also important are the many veteran trees in old parks and wood pastures. Our ancient semi-natural woodland contributes significantly to UK biodiversity by supporting notable communities of animals and plants, including dormice, nightingales, and fritillary butterflies. To safeguard these important features and enhance the woodland resource as a whole, English Nature recommends sustainable forestry should embrace the following nature conservation priorities:

- Ancient semi-natural woods are irreplaceable, and must be protected and managed so as to maintain and enhance their special character. The expansion of such woods on to adjacent land by natural regeneration should be encouraged.
- Many ancient woods have lost nature conservation value through being converted to plantations. Restoration of their native tree and shrub communities should be encouraged.
- More recent woods and plantations, especially semi-natural woodland, should also be managed so as to maintain and increase their value as wildlife habitat.
- Some woodland has grown up or been planted on important open ground habitats such as lowland heath, which is nationally and internationally scarce. Restoration of the former open habitat should be encouraged.
- New woodland should be created in appropriate locations, and the use of natural regeneration for this purpose should be encouraged. It is important that existing good wildlife habitat and features of geological and geomorphological interest are not damaged. New woodland in both uplands and lowlands should be targeted on land of low existing value for nature conservation, such as arable farmland and intensive grassland, and located where it will do most to enhance the local habitat mosaic. More use should be made of locally native trees and shrubs, and woodland designs which favour wildlife.
- In most woods management is vital to maintain both timber production and nature conservation value. The use of management plans to coordinate economic, environmental and social objectives should be standard practice.
- People should be able to enjoy and gain an understanding of the woodland habitat and its wildlife in their local area. With the agreement of owners and occupiers, access to woodlands should be encouraged.

To further these priorities English Nature will:

- **contribute** to national policies for sustainable forestry and seek greater integration with other rural sector policies, particularly those for agriculture;
- **collaborate** with our partners to develop the practice of sustainable forestry, ensure the forestry and woodland objectives of the UK Biodiversity Action Plan are met, and support the development of a strategic approach to forestry;
- **develop advice** on local objectives for the creation and management of woodland through Natural Areas, and encourage preparation of Indicative Forestry Strategies;
- **work positively** with owners, occupiers, the Forestry Commission, other Government Departments and local authorities to safeguard woodland SSSIs and other woods of high nature conservation value, and provide advice on woodland management including the impact of pest control methods on vulnerable wildlife species;
- **continue to support** the use of grant-aid as the principal incentive for the creation and management of woodland, and seek a more targeted and flexible use of economic instruments to benefit nature conservation;
- **promote and carry out** research on the conservation and monitoring of woodland biodiversity, and develop the use of our Inventories of Ancient Woodland for this purpose;
- **continue to support** national and local woodland initiatives, including the National Forest and Community Forests, and other initiatives concerned with the creation and management of woods and the marketing of sustainable woodland produce.

November 1994