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## Woodlands and forests

**Scotland's woodlands are diverse and support a variety of species. Our woodlands are in a good state and are improving.**

### Summary

Woodlands support a high proportion of Scotland's terrestrial biodiversity. Rare and threatened species are more often associated with semi-natural woodlands, but many have also colonised planted forests. Woodland ecosystems of all types supply a wide range of social, environmental and economic services to society.

There are many potential threats to woodland biodiversity; however, much is being done to address these threats and take advantage of opportunities to enhance biodiversity. A fundamental requirement for future success is for woodlands to be managed for multiple functions. Without sustained management, biodiversity would ultimately suffer in a country where no woodlands are truly natural.

### Introduction

The majority of our land was wooded in post-glacial times, but forest cover declined over thousands of years of human influence and changing climate. By 1905, there was 4.5% of [woodland cover](#). Re-forestation efforts since World War 1 have created 1 million ha of new forest, and by 2010 Scotland's forests and woodlands covered 1.39 million ha, which is 17.8% of the total land area.

A high proportion of our biodiversity is associated with woodlands and trees. Mature native woodlands, in particular, support a rich variety of species, and some of our native woodland types and plant and animal communities are unique to Scotland.

Woodlands provide a wide range of other [functions and services for Scotland's people](#).



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## Description of woodland and forest wildlife

Most of our current woodlands were created during the 20th century as plantations composed largely of introduced softwood species, mainly on marginal agricultural land in upland areas. Although these forests are still relatively new, many are already maturing in structure and composition and are developing a rich wildlife, including threatened species such as capercaillie, black grouse and red squirrel.

For the last 20 years, native and mixed woods have dominated new planting and a shift is also under way towards creating more woods around population centres.

### Designated woodland features

Some areas of native woodland are legally protected as Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC). As at March 2010, 69% of designated woodland features were in [favourable or recovering condition](#). This showed a sharp increase from 59% in 2005, as a result of management by Forestry Commission Scotland (FCS) to improve the features on the national forest estate (where over 95% of sites are now favourable or recovering condition), and joint efforts by FCS and Scottish Natural Heritage (SNH) to promote suitable management of privately owned sites.

### Native and ancient woodlands

Native woods include semi-natural (self-sown) woods and woodlands of planted origin. Some are also ancient woodlands (woods that have been continuously present in some form for at least 250 years), which are important for their cultural heritage value. Native and ancient woods generally have a high value for biodiversity.

Around 13% of our forest cover is semi-natural woodland, and a similar proportion is planted native woodland. The precise area, distribution and condition of all native and ancient woodland are currently being determined by a major project, the [Native Woodland Survey of Scotland](#).

Planting of new native woodlands has been a major part of woodland creation over the last 20 years to help meet targets under the UK Biodiversity Action Plan (UKBAP).

Native woodlands comprise seven types that are all [UKBAP priority habitat types](#):

1. upland birchwoods;
2. upland oakwoods;
3. native pine woodlands;
4. wet woodland;
5. upland mixed ashwoods;
6. lowland mixed deciduous woodland;
7. wood-pasture and parkland (includes both woodland and open grazing habitats).

A subset of these native woodlands, defined using a European Union-wide classification system, are also listed as European habitats of conservation concern on [Annex I of the European Habitats and Species Directive](#). A Biodiversity Surveillance Strategy for Scotland is being developed to monitor the area and condition of these habitats.

### Broad woodland habitat types

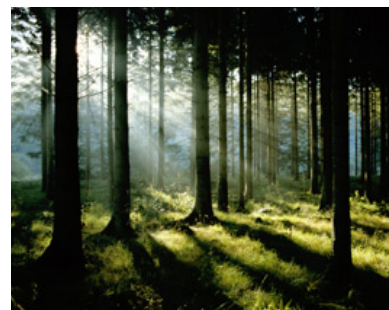
In woodland statistics two broad habitat types are distinguished: broadleaved and coniferous woods. [Current areas](#) of these were estimated to be 309,000 ha and 1.08 million ha respectively (as at March 2011). Native woods are a subset of these broad categories.

Most Scottish woodlands are dominated by non-native species. This is a result of the planting of conifer species for softwood timber, as well as historical planting of sycamore, beech and other hardwoods.

### Priority species

Priority species and habitats are those that have been identified as being the most threatened and requiring conservation action under the UKBAP. There are currently 169 priority species in Scotland with a primary association with woodlands and trees. This is a higher concentration of priority species than for other major ecosystem types. They comprise:

1. 14 mosses and liverworts;
2. 85 fungi and lichens;
3. 37 invertebrates;
4. 13 vascular plants;



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## 5. 20 vertebrates.

Biodiversity reporting for the UKBAP has indicated that, when last reported in 2008, 75% of woodland-related priority species and habitats were in stable/favourable or recovering condition, compared with 74% in 2005.

Although rare and threatened priority species are concentrated most strongly in native woods, many have also been able to colonise woods dominated by non-native species.

## Woodland biodiversity indicators and trends

The biodiversity value of woodlands depends on the composition of the wood, as well as factors such as the presence of invasive species, herbivore impacts, and the intensity and type of management of open and wetland areas.

Greater biodiversity (species richness as well as presence of rare species) tends to be associated with woodlands with several growth stages, such as mature trees, shrub layer, deadwood or open ground; and also with woods with a higher diversity of tree species or a greater proportion of native species.

A suite of woodland biodiversity indicators has been developed for the Scottish Biodiversity and Forestry Strategies to reflect these relationships (Table 1). Currently, a set of ecosystem health targets and measures are being developed that will build on these indicators.

**Table 1:** Woodland biodiversity indicators: all woodland types (extract from [Scottish Forestry Strategy indicators](#))

Woodland Biodiversity Indicators	Last Assessed	Value
Woodland Bird Index (baseline value was 100 in 1994)	2009	144
Woodland structure and composition: mean understorey shrub layer cover (occurring under a canopy of >15 m height)	1995–1999	17%
Woodland structure and composition: mean no. tree and shrub species within stands (sample plot size of 0.25 ha)	1995–1999	2.2
Woodland structure: mean deadwood volume (standing and fallen)	1995–1999	4.4 m <sup>3</sup> /ha
Woodland structure and composition: old growth as a proportion of Scotland's woodland cover (% of area older than 95 years conifer/135 years broadleaves)	1995–1999	4.8%

The [Scottish Woodland Birds Index](#) is derived from volunteer surveys of 1 km squares carried out within the Breeding Birds Survey, which is run by the British Trust for Ornithology (BTO). It has shown a gradual increase in woodland bird abundance of 44% since the index started in 1994.

Baseline [indicator values for woodland structure and composition](#) across all woodland types were derived from data collected as part of a national inventory carried out between 1995 and 1999 (Table 1). Trend information will be available once the new [National Forest Inventory](#) has been completed in 2015/16, and on a 5-year cycle thereafter.

1. *understorey shrub layer cover* is the percentage of cover of a shrub layer in stands with an upper canopy layer. The indicator reflects situations where multiple foliage layers may develop;
2. *the number of tree/shrub species* (both native and non-native) correlates with the presence of a wide range of plants and animals;
3. *deadwood* occurs as standing and fallen timber, and also as a habitat on living trees in the form of dead branches and rot holes, etc;
4. *the amount of old-growth woodland* is a key indicator of biodiversity. Old-growth woodland contains a high proportion of large and old trees, a diverse structure and deadwood.

Other useful trends come from the periodic [Countryside Survey](#), which has also assessed changes in plant species composition in woodlands. Between 1998 and 2007, plant species richness declined in both broadleaved and coniferous woods.

The changes may be partly due to an increased proportion of maturing woodland stands as a result of a peak of planting in the second half of the 20<sup>th</sup> century, but it may also reflect a reduction in management and regeneration of broadleaved woods over the same period.



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## Pressures affecting woodland and Forest wildlife

### Land use pressures

Current Scottish Government policy is to expand woodland area and retain existing woodland, except where woodland removal will have a clear net public benefit (see [Response by society: Land use and forestry policies](#)).

### Fragmentation and loss of woodland habitat

Development sanctioned by planning permission does lead to some losses of woodland. These are mostly very local in scale, with the exception of windfarms, which affect some forest areas in upland conifer forests of relatively low current biodiversity value. Conversion to agriculture is currently a minor issue, although it was more common in the past.

Fragmentation and degradation of native woods remains a risk due mainly to overgrazing by sheep and deer. Muirburn, which is carried out by grouse moor managers and shepherds to rejuvenate mature heather and grass, can also prevent the natural regeneration of trees near woodland margins.

### Loss of woodland to habitat restoration

There are also pressures to convert some planted woodlands to open habitats to help meet the [Scottish Biodiversity Strategy](#), notably where past tree-planting has damaged important habitats designated for their open ground habitats or species.

### Competing pressures for land

There are competing pressures for land use, such as agriculture, development, sporting, biodiversity and landscape conservation, and maintaining carbon sinks. These affect the potential to expand woodland habitats to strengthen woodland biodiversity.

### Economic and management pressures affecting woodland biodiversity

For most woodlands an absence of management is likely to have a negative effect in the long term on their biodiversity potential because their composition and structure have developed in response to forest management. Even semi-natural woods are subject to influences that may need to be managed, such as deer or invasive species.

Factors that influence the motivation of landowners to manage their woods are important. Where owners do not feel they have sufficient interest or incentive to manage woods, their biodiversity value and indeed their survival may be threatened in the long term.

Many native woods and small farm woods are not regularly managed at present and this may lead to lower biodiversity value in the long term.

Most planted 20th-century conifer forests were created as single-aged plantations for timber production, and initially they have limited biodiversity. In some upland sites, practical issues such as site quality and the risk of wind damage constrain the speed and extent to which a more diverse forest can be developed, while still providing a suitable incentive to manage them for timber.

### Other factors

#### Climate change

Climate change will have a range of positive and negative effects for woodlands, varying across Scotland. Current assessment of predicted effects on forestry and on woodland ecosystems are summarised on the [Forest Research website](#).

#### Deer

Deer are a natural component and valued asset of Scotland's woodlands, and can contribute to maintaining diversity. However, current deer population levels frequently have [a negative impact on woodland regeneration and biodiversity](#). [Excessive browsing or grazing](#), mostly by deer, was the main problem to be addressed in three-quarters of the designated woodland features classed as unfavourable in 2005.

#### Invasive non-native species

Invasive non-native species (INNS) are an important pressure in many woods. *Rhododendron ponticum* is the most extensive invasive species in Scottish woodlands and should be tackled where possible on a landscape scale to prevent re-colonisation. Currently, more localised problems come from plants like Himalayan balsam and Japanese knotweed.

Grey squirrels pose a threat to native red squirrels and are being culled in some areas to try to stop the spread of greys and the



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squirrel poxvirus that they can carry.

### **Nutrient enrichment and deposition of pollutants**

Atmospheric nitrogen deposition, and more local effects from diffuse agricultural run-off or stock grazing in small woods, can affect woodland biodiversity by altering the balance of species in favour of more nutrient-demanding species at the expense of some more typical woodland species.

Acidification of water bodies can be exacerbated by the capture of atmospheric pollutants by trees, and this is a risk in some catchments that have poorly buffered rocks and soils.

### **Social use of woodlands: Impacts on biodiversity**

Most woodlands are legally open to responsible access in line with the [Outdoor Access Code](#). Woodlands are increasingly popular for access and recreation, and commercial recreational activities provide benefits for woodland owners. These uses often support biodiversity conservation; however, public use may also conflict with conservation, for example by disturbing breeding species or trampling sensitive habitats.



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## Consequences of a change in woodland and forest wildlife

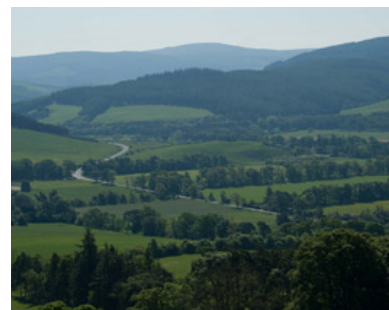
Woodlands provide a wide range of values or 'ecosystem services' to people. These include:

1. **provisioning services – associated with clear use (and/or consumption) of the environment**
  - timber and wood products;
  - non-timber forest products;
  - livestock shelter and/or feeding;
  - enhancing fisheries by improving riparian habitat and shelter;
  - deer shelter in upland forests.
2. **supporting and/or regulating services**
  - carbon sequestration;
  - enhancing water quality;
  - helping to reduce flood peaks;
  - reducing soil erosion;
  - filtering air pollution and improving local climate in urban areas.
3. **cultural services**
  - recreational use and employment;
  - physical health and mental well-being/spiritual refreshment;
  - landscape and cultural heritage values.

There is a broad association between many of these services and maintaining woodland biodiversity. For example, woodlands with varied structure and species composition will usually have a richer diversity of wildlife, be more attractive to people for visits and recreation, and could also be better at filtering nutrients, preventing erosion and enhancing riparian habitats than woods with a simple structure.

Significant losses or restriction of biodiversity may be associated with some reduction in some of these other values and services to society.

However, the relationship between biodiversity and the other ecosystem services of woodlands is not straightforward and needs to be better understood.



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## Response by society

### Land use and forestry policies

There are potential conflicts between environmental, economic and social values and also between objectives for land use and woodland management. Sustainable forest management policies and regulation, which are embodied in the [Scottish Forestry Strategy](#), help strike a balance between these values (services) nationally, and for individual forest areas. The strategy sets out Scottish Government policy and priorities for action for forestry under seven themes. As well as conserving biodiversity, these are: mitigating/adapting to climate change, timber, business development, community development, access and health, and environmental quality.

Land use decisions need to be balanced at local and national levels. Work to implement the Scottish Government's [Land Use Strategy](#) will develop a framework for making woodland expansion decisions.

The Scottish Government's [Rationale for Woodland Expansion](#), published in 2009, set out an ambition for 10,000 ha of new woodland to be planted per year, with a long-term aspiration for 25% of land cover of woodlands by mid-century. Around 40% of this expansion is intended to be with native or mixed woodlands.

The Scottish Government's [Control of Woodland Removal Policy](#) addresses loss and fragmentation pressures. It sets out the principle that woodland loss should only be permitted where it results in significant net public benefits. Mitigation of such losses by planting in other areas will often be expected.

Development planning policies and practice also influence the location and character of woodland expansion through [Forest and Woodland Strategies](#), and encouraging the development of green networks, most notably in the [Central Scotland Green Network](#).

Planning policy and management is important in directing development away from woodlands that are important for biodiversity and other values, particularly ancient and semi-natural woods.

Fragmentation losses can be redressed by [developing habitat networks](#) to build more resilient and healthy populations and allow population dispersal to new areas, which should also help biodiversity adapt to climate change (below).

### Promoting and regulating woodland management

Forestry is regulated by FCS (which acts as the Scottish Government's Directorate of Forestry), under the Forestry Acts and [Environmental Impact Assessment \(EIA\) Regulations](#).

Other legislation affecting environmental aspects of forests includes the Wildlife and Countryside Act (1981, amended 1985), the Nature Conservation (Scotland) Act (2004), Wildlife and Natural Environment Act (2011), the Water Environment and Water Services (Scotland) Act 2003, and also the Conservation Regulations (1994: amended in 2004 and 2007), which incorporate the European Union Directives on Habitats and Species and on Wild Birds.

Management of woodlands is promoted by FCS in accordance with the Scottish Forestry Strategy and international principles of sustainable forest management. Good practice standards and guidance for biodiversity and other values are set out in the [UK Forestry Standard \(UKFS\)](#) and associated guidelines.

FCS manages 35% of Scottish woodlands as the [national forest estate](#). Financial support is available for suitable management of private woodlands under the Scottish Rural Development Programme (SRDP), including grants for improving woods for biodiversity.

Planning and management for sustainable environmental, social and economic benefits from woodlands is generally best considered over the long term and at a landscape or whole forest scale, preferably within a regional context.

Long-term forest plans are in place for all areas on the national forest estate, and are now required as a condition of grant aid for most private woodlands. These plans set out how to increase the diversity of conifer forests as they mature.

The increasing demand for public access and use of woodlands is being met by promoting more planting and management of [woodlands in and around towns](#), for example by using a dedicated [Challenge Fund](#).

The [Native Woodland Survey of Scotland \(NWSS\)](#) is providing a comprehensive basis for management planning of native and ancient woods and developing native woodland habitat networks.

### Other factors

### Climate change



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Measures to help forest to adapt to climate change are included in the Scottish Government's [Climate Change Adaptation Framework](#).

## Deer

Collaborative management of deer, which integrates the management of woodlands and deer, is [encouraged](#). A code of practice for deer management is being developed by SNH.

## INNS

Under the Wildlife and Natural Environment Act 2011, SNH, FCS and Scottish Environment Protection Agency will have powers and responsibilities to enable invasive problems to be tackled. Grant support under SRDP is available to help landowners to tackle various invasive species problems.

## Nutrient enrichment and deposition of pollutants

As well as wider policies to address atmospheric causes at source, river basin planning and site management in line with good practice can help to reduce local enrichment effects on woodland biodiversity. Careful management of livestock grazing may also help. Measures are in place to minimise impacts on both aquatic and terrestrial ecosystems in these areas by careful design and location of forests.

## Social use of woodlands: Impacts on biodiversity

Most problems of disturbance to wildlife can be resolved by careful planning. FCS has published [good practice guidance](#) to help woodland managers.

## Effectiveness of measures so far

From indicators and other data (see [Description of the environment](#)), it is evident that since the 1980s at least there has been a period of increasing overall biodiversity value as planted forests have matured and been restructured; and many native woods have been created and restored or put back into positive management after a period of neglect. In addition:

1. designated sites are improving, although some more complex sites remain to be tackled;
2. habitat network development has started to address fragmentation;
3. low impact silvicultural systems have been promoted and are increasing;
4. targeted action for [key priority species](#) is starting to show results;
5. support for managed livestock grazing in woods has developed for conserving biodiversity of traditionally grazed areas like wood pastures.

However, there are still some less satisfactory issues, for example:

1. pressure from deer populations and invasive species such as rhododendron and Japanese knotweed;
2. lack of management in many broadleaved and mixed woods may be restricting recovery of some rare and threatened species.

## New pressures and responses

Potential new pressures on forests are climate change and [tree pests and diseases](#). Both require understanding and responses that build resilience and adaptability into future forests.

## Future measures

Targets and measures for ecosystem health will be developed to reflect international biodiversity commitments to managing land and water resources using an ecosystem approach. Part of the challenge will be how to balance broad ecosystem scale management with action to secure rare and threatened species.

Collaborative planning action across landscape or catchment scales should become more important, for example to:

1. resolve land use pressures;
2. adapt to climate change;
3. drive integrated habitat network or green network development;
4. manage deer populations;
5. control invasive species.

Continuing emphasis will be needed on conserving and restoring our native woodlands, using the knowledge gained from the Native Woodland Survey of Scotland to guide action.