

2. NATURAL RESOURCES



Photo: Neil McIntyre.

## 2. NATURAL RESOURCES

### 2.1 Introduction

This chapter presents information on the state of the natural heritage of the National Park. This is an area in which there has been much work done and, in comparison to some areas, a relatively large amount of data is available. However, there remain areas and subjects in which little research has been carried out, which are also highlighted here.

This chapter is based largely on the natural heritage review carried out by Scottish Natural Heritage, drawing on research in the Cairngorms over the last decade. It seeks to bring together the most accurate and recent information. The technical annex accompanying this chapter has been written by Scottish Natural Heritage and will also be published separately by The Stationary Office as 'The Nature of the Cairngorms: Diversity in a Changing Environment'.

Throughout this chapter, information is provided where possible at the scale of the National Park boundary. However, much of the information collected on the natural heritage has covered the wider Cairngorms area, extending beyond the boundary of the Park. Where this is the only data available, it is provided here with reference to its scale beyond the Park boundary, as it is the best indication of the state of the resources in the Park.

### 2.2 The Area

The distinctive natural heritage of the Cairngorms is underpinned by some key characteristics that determine the environment. In particular, conditions are shaped by the climate, geology and geomorphology, which shape the ground and determine the composition of soils. The landscape, partly the product of these basic conditions and partly the product of human influence and management, sets a broad context for the habitats, species and our own understanding and enjoyment of the area.

#### 2.2.1 Geology, Landforms and Soils

The Cairngorms area contains internationally and nationally important geology and landforms. These provide an insight into the long-term processes of landscape evolution and climate change that have shaped the area we have come to know and value today. The rich geological record of the Cairngorms is recognised by its inclusion in the UK Tentative List of World Heritage sites and by 30 sites listed in the Geological Conservation Review. This identifies sites of importance that are representative of key earth science features in Britain.

#### Formation of the Cairngorms

The story of the Cairngorms that we know today begins over 400 million years ago when two ancient continents collided and pushed sediments upwards into a huge mountain chain that is now completely eroded away. The continental collisions also melted rock deep in the earth's crust, which cooled and solidified several kilometres below the surface, forming igneous intrusions (granite). These gradually moved towards the surface, and the overlying softer rocks were weathered away to expose the granite. There are many geological faults in the area, but few, if any, appear active today.



Photo: David Gowans.

The current form of the Cairngorms results from erosion about 50 million years ago. Subsequent weathering and erosion removed weaker rock and formed the major glens and straths in their current locations. Much of the landscape was therefore in place before the ice age period, about 2.5 million years ago. Many glacial episodes then followed, separated by short inter-glacials.

The last ice sheet was in retreat 15,000 years ago when the climate warmed, interrupted by a short, cold episode between about 12,700 and 11,500 years ago (the Loch Lomond Readvance). Thereafter, the climate warmed rapidly at the start of the current inter-glacial period.

### Geology

The landscape of the central Cairngorms massif is the outstanding feature of international importance in the Cairngorms area. Features of national importance include occurrences of rare minerals, and sites with metamorphosed sedimentary rocks, and igneous intrusions. There are four groups of igneous intrusions and examples of each are present in the National Park.

Some rare and unusual minerals occur in the Cairngorms. Cairngorm Crystal (smoky quartz) has been found in a number of areas, including Loch Avon. The Loch Avon area is also a nationally important locality for the occurrence

of blue topaz and rare minor minerals within the granite. To the south east of Tomintoul, the Lecht Mine is a former commercial iron mine.

### Landforms

The Cairngorm Mountains include a wide assemblage of landforms dating from different stages in the landscape's evolution. These include features of pre-glacial times such as the tors and deeply weathered rock on the summits in addition to features of glacial erosion. These include troughs such as Avon and Einich, corries, breached watersheds such as the Lairig Ghru and effects on drainage patterns. There are also important features of river processes including alluvial fans and meanders.

Patterns of climate change and vegetation development during the last 15,000 years are recorded in the sediments, plant remains and pollen grains preserved in loch basins and peat bogs. Such records provide an historical perspective on past environmental changes, such as the pattern of expansion and decline of the native pine forest, the spread of blanket bog, and increasing human impacts on the landscape, including acidification from atmospheric pollution over the last 100 years.

The Cairngorms area also has many landforms not formally designated. These include substantial thicknesses of deeply weathered bedrock, watershed breaches, shallow corries, large roches moutonnées, glacial and glaciofluvial deposits, small-scale meltwater channels, 'hummocky' moraines and terraces, solifluction features, ploughing boulders, postglacial slope modification and large-scale rock slope failures.

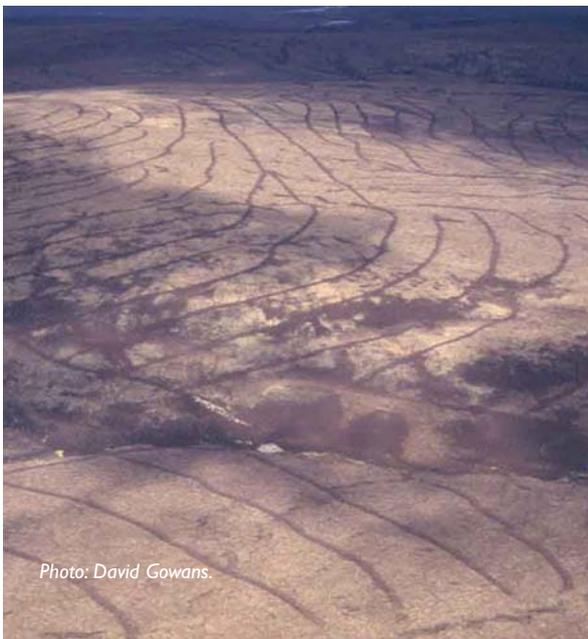


Photo: David Gowans.

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A number of recent activities and changes are known to affect the geology and geomorphology of the area including commercial afforestation and natural tree regeneration, footpath erosion, an increase in off-track vehicle use, overgrazing, river engineering for flood protection, fisheries management and local gravel extraction, debris flows, and local damage from mineral collecting.

Beyond the Cairngorms massif, there has been no systematic inventory or mapping of landforms and surface deposits or monitoring (apart from on Sites of Special Scientific Interest) of the state of geological and geomorphological features, nor of any changes arising as a result of natural processes and human activities and how the landscape is changing.

### Soils

The Park contains a large area of rare, undisturbed soils. Only about 2 per cent of the land area is cultivated, with a further 4 per cent of the land under improved grassland.

Many soil properties are derived from superficial deposits and the underlying solid geology. Most glens and straths have been in-filled with sand and gravel deposits, whereas the hills are covered by a relatively thin stony layer. Where this is sufficiently thick, various types of montane soils have developed. Elsewhere, only screes and ranker soils (under 10 centimetres deep) are present.

Natural soil-forming factors have favoured three principal soil groups – podzols, (50 per cent of the soils in the Park), alpine and sub-alpine soils at high altitudes (18 per cent of the soils above about 550 metres above sea level), and peat, where conditions are wetter, the ground is poorly drained and there is a slow rate of decomposition of dead vegetation (13 per cent of the soils). Soils where the soil drainage is disrupted, or 'gleyed', form 4 per cent of the soils in the Park.

There has been no systematic national assessment of soils against established criteria. No sites in Scotland are designated for their soil characteristics, but by supporting rare habitats on existing designated sites, soils are given some indirect protection. Eight Sites of Special Scientific Interest in the Park are considered to have soils of international importance, and 12 have soils of national significance.

### Trends and Observations

- There is little systematic information on current trends in the geological features, landforms and soils of the Cairngorms;
- No sites in the Park are designated for soils, and soil condition is not monitored systematically;
- Commercial afforestation and natural tree regeneration; footpath erosion; off-road vehicle use; overgrazing and peat erosion have affected soils in the Cairngorms;
- Climate change and atmospheric pollution could affect soils directly and indirectly.

### Monitoring

Site Condition Monitoring is carried out in Sites of Special Scientific Interest, but this is focused on the vegetation communities rather than the geological interests. There is no existing, consistent monitoring of the state of geological features.

### 2.2.2 Climate

The climate of Scotland as a whole is influenced by predominantly westerly depressions alternating with less frequent settled periods. A range of factors, including topography, latitude and altitude, affects these weather systems at a more local level.

The Cairngorms massif is located at latitude 57°N, with its easterly position resulting in a climate that is less oceanic, and therefore drier, than the west of Scotland. The mountains exert a noticeable 'rain shadow' effect that reduces



the amount of rainfall on the eastern side of the country. Within the Park, due to the variations in altitude, the weather on the Cairngorms plateau is often very different from that in the straths.

### Temperature

The coldest months are January and February. The lowest temperatures occur well inland, often in valleys. For instance, the average temperature in Braemar in January ranges from a maximum of 3.7° Centigrade to a minimum of -2.5° Centigrade, with a mean of 0.6° Centigrade (1931-1960). Measurements taken at the Cairngorm Chairlift (at 663 metres above sea level) between 1980 and 1998 show July and August were usually the warmest months (average minimum and maximum range from 8.1° Centigrade to 15° Centigrade).

### Precipitation

In the Cairngorms annual precipitation on the summits is over 2,250 millimetres, but below 900 millimetres in the Spey and Dee valleys, although these figures vary greatly between years. Deeside is in the 'rain shadow' of the Cairngorms and therefore generally drier. Unusually, the driest month in Strathspey is recorded as February or March, but on Deeside it is July.

Precipitation which falls as rain at low levels may fall as snow over higher ground. The average annual number of days with lying snow (at least 50 per cent cover) has been estimated as 60 days on low ground in the Cairngorms and up to 200 days on the summits.

### Wind

Wind direction and speed are influenced by individual weather systems, and the prevailing winds in the Cairngorms are from the south west. Gales are common on the plateau. The strongest gusts recorded annually on Cairngorm were between 177 kilometres per hour and 275 kilometres per hour (1979-1987).

### Cloud and Sunshine

Cloud cover is greatest in mountainous areas. Mean daily sunshine figures reach a maximum in May or June and are at their lowest in December.

### Growing Season

The Cairngorms massif is at latitude 57°N, resulting in a large difference between summer and winter day length and sunlight. The potential growing season decreases by 11-20 days for every 100 metre rise in altitude.

### Frost Heave

The freezing and thawing of frost in the ground can have a significant impact on soil structure and the stability of slopes. Greater fluctuations in temperature increase the frequency of freezing and thawing of the ground.

### Trends and Observations

- In Scotland, there is evidence of small climatic changes taking place between 1964 and 1993. Little equivalent data specific to the Cairngorms is available;
- A decrease in annual rainfall in the Cairngorms of around 10-15 per cent in the summer half-year and an increase of 5-10 per cent in the winter half-year (data from 1941-70 and 1961-90);
- In Scotland, a decrease in snowfall duration has been observed at 400-500 metres above sea level, but with smaller differences above 600 metres in recent years. The number of snow patches lying throughout the year has decreased significantly.

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### Monitoring

The UK Meteorological Office collects data on weather from a network of land surface observation stations. It is available through The British Atmospheric Data Centre. Automatic weather stations are positioned in the Allt a'Mharcaidh catchment (575 metres above sea level, and at 750 metres since 1999), Cairngorm (at 914 metres), Cairnwell (at 933 metres), Braemar (at 339 metres) and Balmoral (at 283 metres).

The Environmental Change Network site in the Allt a' Mharcaidh catchment simultaneously records climatic, pollutant and management data and biological, physical and chemical responses.

### 2.2.3 Landscape

The geology, landforms and land-uses have, over time, created a diverse landscape that gives the Park a distinctive character unlike any other in Scotland. The Cairngorms landscape is valued in many ways, as an economic, social, spiritual, community, environmental and cultural resource. Landscape forms the backdrop to living and working in the area, and is a key attraction to visitors. It derives from the relationships between people and place and between past and present, and will continue to evolve in response to natural processes and the changes in the way the land is managed. The historic environment is considered in more detail in the Cultural Resources chapter.

The processes that have shaped today's landscape and how we perceive it have acted over many millions of years. They result from interactions between the physical and natural environment (geological processes, soils, climate, flora and fauna) and social and cultural factors (land-use, settlement, enclosure, human activities). Relatively recent events, since the last glaciation (10,000-11,000 years ago), have added new layers to the existing landforms and shaped what we now value in the Cairngorms.

There is an important distinction between the physical landscape of a place, which can be described relatively objectively, and the conceptual landscape value of a scene which is determined by people's feelings and perception and is therefore more subjective.

### Landscape Character of the Cairngorms

Research in 1996 and 1999 identified the following landscape character types:

- Plateaux – the largest tracts of high ground in Britain, distinctive in their large-scale, smooth tops with weathered tors, corries and wildness;
- Uplands and glens – expansive and open heather-dominated hills, blanket bog and grassland, dissected by open glens and passes;
- Straths – associated with major rivers with extensive forests, farm land, floodplains and designed landscapes.

The effect of glaciation on the Cairngorms is more dramatic than anywhere else in Britain because of the high relief and sharp incision of the plateau by corries and troughs. An exceptional combination of circumstances, including altitude and climate exposing the summits to extreme wind and frost processes, has helped preserve the ancient glacial and pre-glacial landscape elements of the Cairngorms.

Landscape Character Assessment can describe the physical landscape types, but it is not able to capture the more subjective aspects of the way in which people experience and value landscape.

### Landscape Experience

Despite a general desire to protect and enhance the Cairngorms, there is often a lack of information on what particular elements of today's landscape are important to visitors and residents. Recent studies have attempted to gauge attitudes to landscape, but currently there is no consistent structured approach.

Recent market research has identified the Cairngorms features or experiences that are attractive to visitors (who may have included local residents on a day out). In 2002 most of the features liked by visitors coming to the Cairngorms related in some general way to the physical and conceptual landscape of the area.

The visually attractive landscape mosaics that are characteristic of the Cairngorms are also

important for numerous animals and plants, including a quarter of the UK's most threatened species. Many important habitats for these rare species contribute greatly to the character of the Cairngorms. For example, native Scots pine trees and woodlands set against a backdrop of heather moorlands and montane grasslands are an iconic symbol of the area.

**Table 2.2.3: Top 12 features most liked by visitors to the Cairngorms area**

<i>Cairngorms features identified by visitors</i>	<i>Percentage of respondents</i>
Beautiful views and scenery/spectacular	46%
The hills/wide spaces, rugged mountains	27%
Peacefulness and easy-going pace of life	25%
The trees and colours of the landscape	13%
The wildlife, plants and animals	11%
Nice walks, good hill-walking	11%
Fresh, clean unspoilt area	11%
Friendly people	9%
Picturesque, very beautiful place	9%
Lots of things/activities to do	9%
Large, open spaces without seeing anyone	7%
The water, lochs and waterfalls	6%

Source: Cairngorms National Park Visitor Survey 2004.



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### Tranquillity

Many people identify qualities of tranquillity with their experience of the landscape. For example, 25 per cent of visitors identified 'peacefulness' as an attractive feature of the Cairngorms in the Cairngorms National Park Visitor Survey. The notion of tranquillity relates to places that are sufficiently far away from visual or noise intrusion to be considered unspoilt by urban influences. It is subjective and based on the emotional state and experience of the individual, occurring in landscapes at a series of different scales.

The qualities of landscape and sense of place that attract people to the Park are vulnerable to the cumulative impacts of developments, and smaller changes that individually may seem of little importance but lead to incremental change, that together pose a long-term threat to local character and perceptions of tranquillity.

Intangible qualities in remote rural areas include solitude, space, scenery, clear night skies, and sounds of nature. Such qualities are increasingly rare and important to the visitor experience in the Cairngorms.

It is becoming increasingly difficult to find areas where our view of the night sky is unaffected by illumination, but much of the National Park still provides this opportunity. Light levels are partly a function of population density and expanses of land with low population levels are some of the few remaining areas where light pollution is minimal. The Cairngorms offer opportunities for night sky viewing and experiences like watching the aurora (Northern Lights).

### National Scenic Areas

There are two National Scenic Areas in the Park – the Cairngorm Mountains, and Deeside and

Lochnagar. These include the central mountain massifs and some of the main straths and glens. There are also a number of local authority landscape designations.

### Trends and Observations

- Work has been carried out and is underway to restore high altitude vehicle tracks;
- Landscape research increasingly emphasises the involvement of people and qualitative methods in planning and managing landscapes;
- Pressure for new housing has increased significantly in recent years, requiring greater emphasis on landscape capacity and design.

### Monitoring

Landscape monitoring is carried out at individual sites and through some natural heritage grant schemes. However, there is no consistent framework for monitoring landscape change across the Park.

### 2.2.4 Land-Use

With approximately 570 farm holdings covering over 70 per cent of the Cairngorms area, agriculture has a significant influence on the landscape and natural heritage of the National Park. By far the most extensive use of land is rough grazing and moorland management, which together shape much of the upland areas below the high plateaux. In the straths, livestock farming on improved grassland and some limited arable cropping are predominant.

Although many people automatically think of farms as the conventional agricultural land holding, crofting is a significant form of land-use in the west and north of the Park. There are 105 crofts in the area between Grantown and Laggan, as well as seven 'common grazings'.

Table 2.2.4a: Land-use cover in the Cairngorms

Source: Land Cover Map 2000.

Land Use Type	Percentage Cover
Upland heath and bog	44%
Montane area	25%
Woodland	12%*
Grassland	12%
Enclosed Farmland	5%
Built and other cover	2%

\* More recent surveys estimate woodland cover at 17 per cent.

Much of the character of the uplands in the Park is the result of management for red grouse and red deer, two of the principal sporting species. Approximately 42 per cent of the area is covered by heather moorland, although some of the area has been lost to an expansion of rough grazing.

Woodland is also a significant land-use in the Park, covering approximately 12 per cent of the area including both semi-natural and plantation woodlands. Table 2.2.4b shows the type of woodland cover in 1988 (from Scottish Semi-Natural Woodland Inventory). Woodland cover has since expanded by 2 per cent between 1991 and 2003.

Table 2.2.4b: Woodland types in the National Park

Source: Scottish Natural Heritage 2006

Woodland Type		Area (Hectares)
Semi-natural	Ancient	15,153
	Total	36,274
Mixed	Ancient	2,019
	Total	4,651
Plantation	Ancient	14,454
	Total	34,219
All woodland	Ancient	31,629
	Total	75,202

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A significant area of land is managed primarily for nature conservation. This includes whole landholdings managed by Non-Governmental Organisations including Royal Society for the Protection of Birds (Abernethy and Insh Marshes) and the National Trust for Scotland (Mar Lodge). Land within private ownership is also managed for nature conservation in places, including sites within agri-environment grant schemes.

There are a number of government schemes designed to encourage land managers to protect and enhance the natural heritage, including the Cairngorm Straths Environmentally Sensitive Area, now closed, and the more recent Rural Stewardship Scheme. The Environmentally Sensitive Area scheme attracted 90 per cent uptake by managers before it closed to new entrants, and by 2003 there were 43 Rural



Stewardship Schemes covering 63,000 hectares within the Cairngorms. These are two of the main mechanisms through which land managers can care for the habitats and species detailed in this chapter:

More information about the current state of the agricultural sector is contained in the Socio-Economic Resources chapter and the habitats associated with farmland, moorland and woodland are discussed in later sections of this chapter.

### *Trends and Observations*

- Woodland cover has expanded across the Cairngorms area from 11 per cent in 1946 to 17 per cent in 1988;
- Blanket mire decreased between 1940 and 1980, largely through drainage and tree planting;
- Heather moorland decreased between 1940 and 1980.

### *Monitoring*

The Macaulay Land Use Research Institute monitor and map land cover change. Some data has also been available through the National Countryside Monitoring Scheme.

### **2.2.5 Nature Conservation Designations**

Thirty-nine per cent of the Park area is designated for nature conservation, summarised in the following table:

**Table 2.2.5a: Number of designated nature conservation sites**

<i>Designation</i>	<i>Number of Sites</i>
Special Area of Conservation	19
Special Protection Area	12
Ramsar Sites	3
Sites of Special Scientific Interest	46
National Nature Reserve	6
Geological Conservation Review	30

*Source: Scottish Natural Heritage 2006*

**European and International Designations**

There are 19 Special Areas of Conservation in the Park and 12 Special Protection Areas. Together these sites form the Natura 2000 network which derives from the 1992 European Council Habitats and Species Directive and the 1979 European Council Wild Birds Directive. Special Areas of Conservation are sites that best represent the

range and variety of habitats and non-bird species in the European Union. Special Protection Areas represent the most important habitats for rare and migratory birds within the European Union.

There are also three Ramsar Sites, a designation of globally important wetlands classified under the Ramsar Convention.

**Table 2.2.5b: International designated sites**

<i>Special Areas of Conservation</i>	<i>Special Protection Areas</i>	<i>Ramsar Sites</i>
Ballochbuie	Abernethy Forest	Cairngorm Lochs
Cairngorms	Ballochbuie	Muir of Dinnet
Coyles of Muick	Craigmore Wood	River Spey – Insh Marshes
Creag nan Gamhainn	Cairngorms	
Dinnet Oakwood	Loch Vaa	
Green Hill of Strathdon	Lochnagar	
Insh Marshes	Muir of Dinnet	
Ladder Hills	River Spey – Insh Marshes	
Morrone Birkwood	Glen Tanar	
Morven and Mullachdubh	Caenlochan	
Muir of Dinnet	Creag Meagaidh	
Glen Tanar	Drumochter Hills	
Caenlochan	Kinveachy Forest	
Creag Meagaidh		
Drumochter Hills		
Kinveachy Forest		
Monadliath		
River South Esk		
River Spey		

Source: Scottish Natural Heritage 2006

**European Protected Species**

The following species are protected under the

Conservation (Natural Habitats, &c.) Regulations 1994 accompanying the Habitats Directive:

**Table 2.2.5c: European protected species**

<i>Common Name</i>	<i>Scientific Name</i>
Horseshoe Bats (all species)	Rhinolophidae
Typical Bats (all species)	Vespertilionidae
Wild Cat	Felis silvestris
Dormouse	Muscardinus avellanarius
Great Crested (or Warty) Newt	Triturus cristatus
Common Otter	Lutra lutra

Source: Scottish Natural Heritage 2006

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### Statutory National Designations

The Park has 46 Sites of Special Scientific Interest which are representative of the best examples of the UK's flora, fauna, geological or physiographical features. It also includes six National Nature Reserves. These are examples of the most important natural and semi-natural ecosystems in the UK and are managed for conservation, scientific study and public understanding.

### Non-Statutory National Designations

The Park contains 30 Geological Conservation Review Sites. These are identified by Scottish Natural Heritage as being of national or international importance due to their geology, paleontology, mineralogy or geomorphology.

There is one Biogenetic Reserve at Muir of Dinnet. This is part of a European network of 'living laboratories', representative of various types of natural environment found in Europe.

### 2.2.6 Information Gaps – The Area

- Effects of climate change in the Park;
- Landscape change over time;
- Condition of geological features of interest;
- Condition of soils.

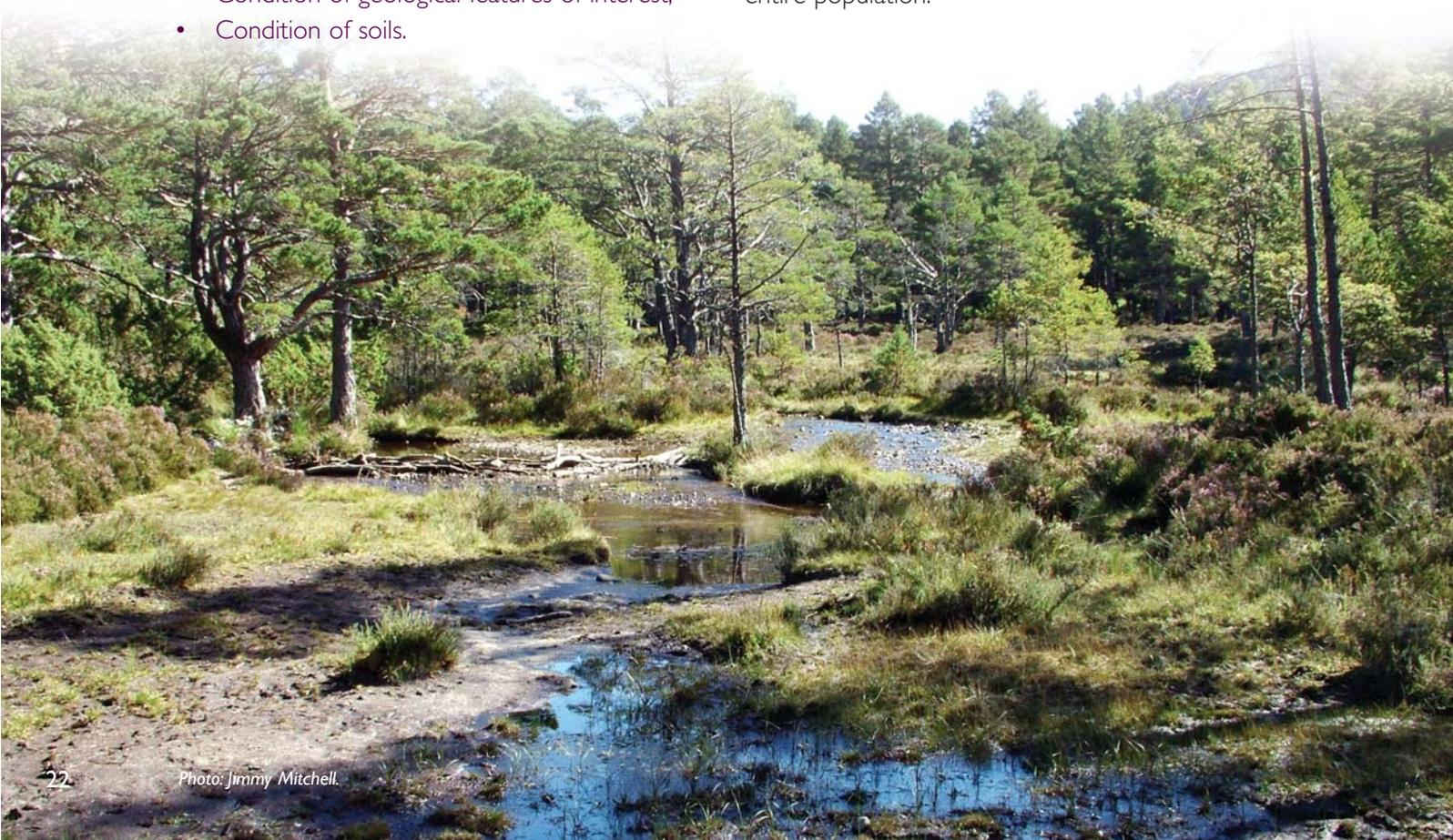
## 2.3 Habitats

### 2.3.1 Introduction

The Cairngorms has an important and unique habitat resource, whether viewed from a local, national or international perspective. There are four broad habitats in the Cairngorms:

- **Woodland;**
- **Wetland and Water;**
- **Farmland and Grassland;**
- **Upland and Mountain.**

Within these broad categories there are many different types of individual habitat. A large proportion of these habitats is listed as particularly important under national and international conservation designations. For some habitats, such as montane and native pinewoods, the Cairngorms holds a large share of the total UK resource. More than a quarter of the UK's most threatened, declining and rare species find a home in these habitats and for many, the Cairngorms holds a significant proportion of the UK population and range. In a few cases, it holds the entire population.





To many people the intrinsic value of the Cairngorms comprises the wide variety of good quality habitats and interesting species in such a relatively small geographic area. This proximity is important as habitats do not exist in isolation, but form mosaics with one another, creating rich edge habitats and networks.

### 2.3.2 Woodland

The term woodland can be used to describe all tree cover in the Cairngorms. It can be classified broadly according to predominant tree species, whether planted or self-sown, and by tree age and woodland site antiquity.

The woodlands of the Cairngorms are of national and international importance because they contain some of the largest remaining areas of semi-natural woodland habitats in the UK. In 1988 woodland accounted for 17 per cent of the Cairngorms area (a proportion similar to the whole of Scotland). The Cairngorms contains almost 12.5 per cent of the country's semi-natural woodland, but only 5.6 per cent of its plantation woodland. Its Caledonian pine woodlands form the greatest total area and some of the largest individual areas of Caledonian pine in Scotland. Native tree species comprise 79 per cent of the Cairngorms woodlands, and in recent years there has been a deliberate shift towards planting or regenerating native tree species in the Park.

The current extent, distribution, size and composition of woodlands have largely been determined by historical human activities. These include woodland clearance, planting, and prevention of natural tree regeneration by burning and grazing. Much attention has centered on the

ecological importance of the larger stands of trees as the only instances where natural processes can support a continuity of key micro-habitats (such as dead wood). However, recent discoveries (for example on aspen) have demonstrated the outstanding biodiversity importance of some small woodland stands and lone wayside trees for bryophytes, lichens and invertebrates.

The Cairngorms woodlands are concentrated in the main straths, below 600 metres elevation. As a result there are almost no woodland habitat links between different catchments. The historic loss of native woodland habitats has largely been halted or reversed in recent years, with the woodland habitat generally in a better state of management than at any time in recent history. However, there are areas of specific concern and some native woodland types have not fared so well and need particular targeted attention.

#### Native Pine Forest

The Cairngorms area represents the core of the distribution of native pinewoods, self-sown woodlands of great antiquity. Most (13,258 hectares) lie within the Forestry Commission's Caledonian Pinewood Inventory. These sites are considered to be remnants of the original Caledonian pine forest, which comprises relict, indigenous forests of Scots pine and associated birch and juniper woodlands.

Strathspey and Badenoch hold the largest area of native pine woodland in the Cairngorms, while most native pine woodlands in Deeside are smaller and more fragmented. Most remnant pine woodlands are well below the natural tree line and have been studied and mapped in detail. Planted conifer woodlands occur on the lower ground in most of the Cairngorm straths. Much of the planted conifer woodland is Scots pine (but not necessarily of local provenance), which produces seed that can give rise to self-sown woodlands resembling native Caledonian pine

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woodlands. To preserve the distinctive genotypes, so-called 'buffer zones' have been created around native Caledonian pine woodlands (those listed in the Inventory).

The native Caledonian pine woodlands are of disproportionate importance for biodiversity. They occur on infertile, strongly leached podzolic soils and do not support a large diversity of animals and plants compared with more fertile habitats. However, they possess a characteristic plant and animal community, which includes many rare, uncommon and highly distinctive species.

In the UK, native pine woodlands occur only in Scotland. The Park is very important for this habitat, holding between 60 per cent to 80 per cent of the UK total (depending upon definitions used). The significance of the remaining woodlands is reflected in the many conservation designations associated with the largest and most important sites.

### Oak/Birch Woodland

This is the dominant type of broad-leaved woodland in the Cairngorms, as it is across upland Scotland in general. In 1998 the Cairngorms area encompassed circa 17,110 hectares of oak/birch woodland. Although oak is widely distributed in the UK, oak dominated woodlands are relatively uncommon in the Cairngorms. Most are found in Deeside, some in Strathspey and others in the Angus Glens.

Most oak/birch woodlands are dominated by downy and silver birch, the former more common on wetter soils. Birch woodland is found throughout the Cairngorms, with extensive semi-natural woodlands in Strathspey, Deeside, Donside and the Angus Glens. A range of structural conditions are desirable within birch woodlands to provide appropriate habitats for many specialist species. These conditions include the presence of deadwood and contiguous mosaics of open space, regeneration thicket stages, mature and veteran trees.

Felling and under-planting with non-native conifer species was extensive from the 1950s to the 1980s, and conifers have now shaded out birch wood features in many cases. The historical loss of old birch woodland in the Cairngorms has generally ceased, with an increase in the overall area of managed birch. However, some stands have been greatly damaged and destroyed by heavy selective felling.

### Aspen Woodland

Although aspen is a widely distributed species in Great Britain, only 160 hectares of aspen woodland remains, mainly as pure woodland stands in north and east Scotland. Some of the largest remaining stands occur in the Cairngorms straths, with Strathspey and Deeside holding particularly important sites. The large aspen stands of the Scottish Highlands are a remnant of the ancient boreal woodlands that colonised the area after the end of the last glaciation. The reproduction of aspen in Scotland is mainly by vegetative root suckers leading to large areas of clones if grazing pressure is low. Aspen often grows with hazel on better soils, for example along the rivers Dee, Avon and Spey.

A community of saproxylic species associated with aspen are so localised in their distribution that their presence can be regarded as indicators of woodlands of international importance. The diverse saproxylic insect fauna has strong similarities with semi-natural forests found in Scandinavian countries, Finland and Russia.

### Bog Woodland

Scattered trees can occur across the surface of a bog as open woodland, without the loss of bog species. Although pine is the most frequent tree species, birch or willow may also occur. The trees are widely-spaced, slow-growing and stunted and may be of considerable age (up to 350 years). The Cairngorms hold the largest extent of bog woodland in Scotland.

### Juniper Woodland and Montane Scrub

Juniper often occurs as low scrub on heathland or acidic grassland. It may also form a clear woodland canopy, often with downy birch and rowan, and sometimes in Caledonian pinewoods. Creag Fhiaclach, in Strathspey, has the most natural altitudinal tree-line in the UK, and much of it is comprised of stunted Scots pine and juniper, giving way at higher altitudes to alpine juniper scrub. Montane scrub also occurs in the Cairngorms in small patches. The largest continuous stand is about 0.5 hectares in extent. Grazing has reduced and restricted its occurrence from most areas.

### Plantations

Large-scale forestry was introduced in the early 18th century and planting continued through the 19th and 20th centuries. Most planted forests are primarily of exotic species (spruce, fir, larch and pine). Even when Scots pine is present, the stand structure is usually very different from that of native pinewoods. Most plantations are even-aged and have a less diverse flora and fauna than native pinewoods. Young commercial plantations tend to have low natural heritage value, but some older plantations support scarce or endangered species.

### Trends and Observations

- Between 1991 and 2003, new woodland was established over 2 per cent of the Park, comprising 3,126 hectares of broadleaves and 4,718 hectares of conifers.

### Monitoring

The Forestry Commission Scotland monitors existing woodlands and new plantings across the Park.

### 2.3.3 Wetland and Water

The water resource includes all permanent, open water bodies; essentially the lochs, rivers and burns located within the Park. Wetlands are seasonally or permanently flooded, vegetated areas and would have once been more numerous and extensive in the Cairngorms than they are today. Less than 0.5 per cent of the Cairngorms are classified as wetland. Nevertheless, there is still a great variety of healthy wetland and water habitats in the area.

The Park's rivers and lochs are of great importance locally, nationally and internationally. They have numerous national and international conservation designations for their biodiversity and high quality of freshwater habitats. Compared with other water bodies in the UK and Europe, the freshwaters of the Cairngorms have a high degree of naturalness and are largely in good condition. Most of the area's water is considered to be of excellent quality. Many of these freshwaters are internationally recognised for their important habitats and species, and are used as a benchmark against which others are judged.

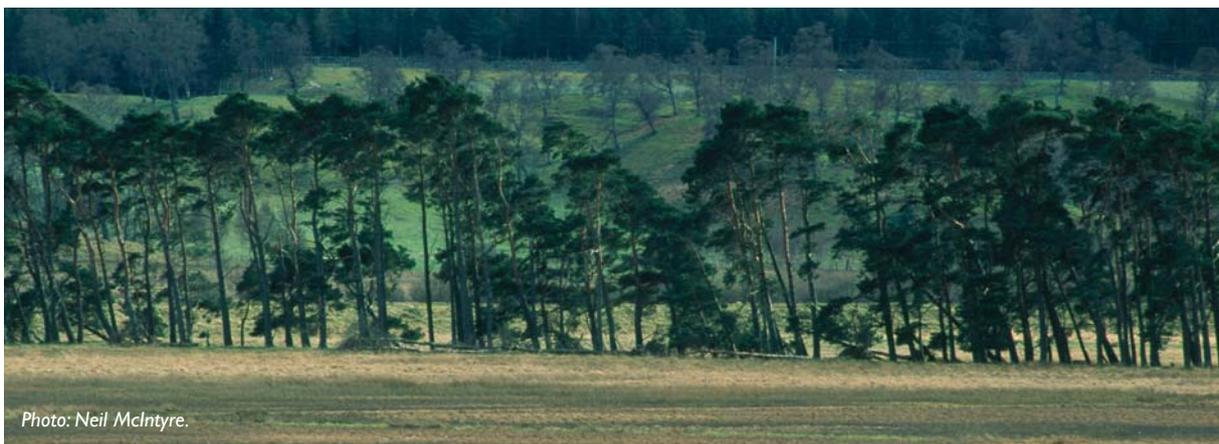


Photo: Neil McIntyre.

## 2. NATURAL RESOURCES...cont

There is continual movement of water through the wetlands, burns, rivers and lochs of the area, so the wetland habitats do not exist in isolation from one another. Typically, burns flow into rivers, which on flat ground have wetlands. These often drain into larger standing waters such as lochs. The natural basis of all wetlands is the catchment. While some of the smaller catchments lie fully within the Park, the lower catchments of all the larger rivers lie outside the Park boundary. Consequently, the water resource cannot be properly considered without considering the entire catchment.

### Lochs and Lochans

The Park contains 23 lochs. This figure does not include smaller water bodies such as lochans and peat pools, which provide important habitats for a wide variety of specialist aquatic flora and fauna. The characteristics of Cairngorms lochs vary greatly in terms of basin shape (including scoured depressions, kettleholes and high corrie lochans), chemistry, nutrient status and thermal regime. In total, standing waters account for 20 square kilometres (0.01 per cent) of the Park area, but contribute disproportionately to the Park's biodiversity.

Standing waters are usually classified according to their nutrient status and this can change naturally over time. There are four main nutrient classes of standing water that are used widely. These are oligotrophic (nutrient poor), eutrophic (nutrient rich), mesotrophic (nutrient intermediate) and dystrophic (peaty, highly acidic, with low levels of oxygen). Some gradations between these types occur. The majority of lochs in the Park drain from resistant rocks such as granite and are therefore oligotrophic and naturally acidic. There are approximately ten mesotrophic lochs in the wider Cairngorms area and several small dystrophic peaty lochans.

### Rivers and Burns

The rivers draining the Cairngorms are among the largest in Scotland and include the Dee, Don, Spey, and North and South Esk. They all drain

towards the North Sea (except for artificial catchment transfers to the Laggan system). The Park includes 3,362 kilometres of river habitat.

In their natural state rivers are dynamic systems, continually modifying their form. Few rivers in the UK are unmodified by humans, for example, by flood defence structures or impoundments. Those which are least modified are a very valuable resource. The plant and animal assemblages of rivers and burns vary according to their geographical area, underlying geology and water quality. The rivers in the Cairngorms are generally oligotrophic, with good water quality, and are relatively unaffected by human influences compared with many rivers outside the area.

The mosaic of features found in Cairngorms rivers and burns supports a diverse range of plants and animals. For example, riffles and pools support threatened aquatic species; and exposed sediments such as shingle beds and sand bars are important for a range of invertebrates, notably ground beetles, spiders and craneflies. Marginal and bankside vegetation supports an array of wild flowers and animals and often provides a wildlife corridor link between fragmented habitat patches. The swiftly-moving, upland, nutrient poor rivers support a wide range of mosses and liverworts but relatively few species of higher plants. Generally, the invertebrate fauna is dominated by stoneflies, mayflies and caddisflies, supporting important populations of salmonid fish.

### Wetlands

Various types of wetland occur in the Park including fens, marshes, swamps and reedbeds. Some sites, such as the Insh Marshes, are internationally important for their animal and plant communities. Water levels and active management, such as grazing, largely determine the composition of these Cairngorms wetlands. Fens, marshes, swamps and reedbeds are localised and often fragmented. Most sites show integration of the five wetland types.

Fens are peatlands which receive water and nutrients from a ground source as well as from aerial precipitation, which means they are minerotrophic. Groundwater lies close to the surface throughout the year. Fens can be subdivided into two main types, topogenous (water movement vertical) and soligenous (water movement lateral). They can be further sub-divided whether they are acidic/poor (predominantly upland) or calcareous/rich (predominantly lowland). Fens are generally more species rich than swamps and have short vegetation, which can be rich and varied. Up to 550 species of higher plants, a third of the UK's native plant species, are associated with fens across the country.

The UK is thought to have a large proportion of the fen surviving in the European Union. Throughout Europe fen vegetation has declined dramatically over the past century. Fen is rare in the Cairngorms area and the most important area, found at the Insh Marshes, is the largest continuous, intact 'poor fen' habitat in the UK. Despite being classified as 'poor fen', the Insh Marshes have a very diverse flora and fauna.

Swamps usually have taller vegetation than fens, dominated by one or two larger plant species. Water table levels are usually at or above that of the vegetation for most of the year. Fen and swamp habitats often occur together and may integrate, but can also be found separately. Both often grade into open water and sometimes occur in association with reedbeds.

Marsh is an ill-defined term but usually refers to vegetation occurring on mineral soil which has the water table close to the surface for most of the year.

Reedbeds are wetlands dominated by Phragmites reeds, where the water table is at or above the ground level for most of the year. There are few reedbeds in the Park and most of these are very small. A total area of circa 52 hectares, accounting

for circa 4 per cent of the Scottish total and 1 per cent of the UK total, lies in the Cairngorms. The distribution of reedbeds shows that some sites are found in Strathspey and middle Deeside, but otherwise are outside the southern boundary of the National Park.

#### **Trends and Observations**

- Water quality across the Park is generally good;
- Some eutrophication and acidification occurs;
- Many lowland wetlands have been drained;
- Increased management of wetlands through agri-environment schemes.

#### **Monitoring**

Scotland's watercourses and wetlands are monitored to make sure they reach 'good ecological status'. This is currently undertaken by the Scottish Environment Protection Agency and now follows guidance outlined in the European Union Water Framework Directive. Acidification is monitored through the UK Acid Waters Monitoring Network, which has two sites in the Cairngorms – Allt a'Mharcaidh and Lochnagar.

#### **2.3.4 Farmland and Grassland**

Agriculture has been practised for thousands of years in the Cairngorms. The physical environment largely limits and determines the range of farming activities that can be undertaken in the area. These constraints include climate, topography, soil conditions and remoteness from markets. Consequently large parts of the Cairngorms area are not farmed intensively, and the number of agricultural holdings in the area is smaller than most comparable sized areas in the UK. Nevertheless, agriculture is highly significant, both to the economy and the environment of the area. In 2002 it accounted for 5 per cent of direct employment and involved over 70 per cent of the land. Changes to the agricultural management have profound implications for natural habitats and landscapes.

## 2. NATURAL RESOURCES...cont

Livestock dominates agricultural land-use, particularly in the upland/hill areas, with the majority of farms specialising in sheep or sheep and cattle rough grazing. Grassland is therefore the most common farmland habitat. The type of grassland habitat is largely determined by the soil type and farm management regime. Most have been re-seeded or modified through the use of fertilisers, lime and selective herbicides, and many have been modified by mowing practices, for example silage and hay.

### Arable Land

Arable land is quite rare, comprising approximately 1 per cent of the Park area and tends to be found in the straths and lower glens. Farming has changed considerably in recent years with a decline in the number of upland farms and crofts through consolidation of holdings and changes to other land-uses such as woodland. Successive national agricultural policies have encouraged the increased use of silage, a reduction in mixed farming, and a move towards intensification and specialisation. This has resulted in a decline in cultivated and cropped land, an increase in permanent grassland and a switch to forestry on moorland and to a lesser extent on fields.

Spring barley is the main cereal crop, with smaller areas of oats and winter barley. Fodder crops such as turnips, swedes, rape, kale and cabbage are also grown for feeding stock. Several declining seed-eating bird species are associated with this habitat and the recent reduction in the overall area of cropped land is arguably the most significant change affecting species relying on arable land for a significant part of their winter diet.

### Grassland

Grassland provides habitats for a range of species. These include resident and migratory birds, mammals, invertebrates, fungi and plants, many of which depend upon the continuing traditional or modern farming methods for their survival. Generally, the farmland and grassland habitats in the Cairngorms have been managed in a less intensive manner than many other areas in the UK. From the nature conservation perspective, many traditionally managed farmland habitats mimic the natural grasslands that were once part of the area. Consequently, many of these areas are important or exceptional because of their historical human management, not in spite of it. For example, the grasslands of Badenoch and Strathspey are one of the most important breeding sites for farmland waders on mainland UK.



There are approximately 30,000 hectares of improved grassland within the Park. Unimproved, species rich grasslands, such as calcareous grassland, are also present. Many of these have been traditionally managed, without agricultural 'improvements' such as re-seeding or the application of fertilisers and herbicides.

### Boundary Features

Drystone dykes are the most common form of boundary features (not including fences) in the Park, particularly in Deeside. Although many dykes are in a poor state of repair in terms of holding stock, their value as a wildlife habitat and corridor remains significant. They provide a habitat for flowering plants, ferns, mosses and lichens. They also provide food, shelter and breeding sites for a range of invertebrates, reptiles, birds and mammals.

### Trends and Observations

- The Common Agricultural Policy has resulted in intensification and specialisation of agricultural production. The single biggest trend has been away from mixed farming towards monoculture production, with the resultant losses of habitats;
- Sheep numbers (and grazing pressure) increased during the 1980s-1990s and 1990-2003. This may change with policy reform and have a knock-on effect on grassland communities;
- Land abandonment is likely to be happening already and is predicted to increase under the Common Agricultural Policy reform.

### Monitoring

The Scottish Executive Environment and Rural Affairs Department monitors farmland use through the agricultural census, and land cover is monitored over a longer period of time in land cover mapping.

### 2.3.5 Upland and Mountain

The Park has the largest area of high ground and most extensive tracts of montane habitats above the natural tree-line in the UK. Much of this is in a very good condition. It includes the main plateau and summits with their associated corries, rocky cliffs, crags, boulder fields, scree slopes and higher parts of some glens and passes. The habitats found in this zone include rush, sedge and lichen rich heaths, snow-bed communities and mossy springs associated with snow melt.

The altitude, steepness of terrain, poor infertile soils and harsh climate has favoured extensive areas of dwarf-shrub heath, dominated by heather between 250 to 900 metres above sea level. On the wind-clipped ridges and summits, some of the UK's best examples of lichen rich heaths occur:

The largest and highest tracts of blanket bog also extend into the montane area and are widespread throughout the Park. The high altitude, rocky habitats (outcrops, crevices, scree) are important for many alpine plant species, particularly where base rich outcrops occur. In these areas, base-rich plant communities dominate including montane willow scrub, grasslands, dwarf-herb communities and base-rich mossy flushes. The Cairngorms is also one of only two areas in Scotland with serpentine rock and associated vegetation and it occurs at a range of altitudes.

The Cairngorms woodlands are concentrated in the main river valley areas, almost all of which lies below 600 metres elevation. As a result, there are practically no woodland habitat links between different catchments and very little montane scrub. Consequently, natural tree-lines are exceedingly rare and fragmented, with the best example at Creag Fhiaclach, Strathspey. Montane scrub is therefore the rarest and most threatened habitat in the Cairngorms. It is so impoverished that many people do not realise that the tree-line woodland habitat is missing from the Cairngorms high hills.

## 2. NATURAL RESOURCES...cont

### Montane

Montane habitats are found in areas above the natural tree level (variable, but approximately 600 metres above sea level). These alpine and sub-alpine plant communities represent some of the most natural and undisturbed habitats in the UK. The montane zone comprises many different kinds of habitat supporting a wide range of specialist plant and animal communities. It consists mainly of high plateaux, with steep sided corries, rocky cliffs, crags, boulder fields and scree slopes. The vegetation is particularly influenced by factors such as exposure, snow cover and soil type/depth. These montane habitats include high altitude instances of common heath communities, which occur across an altitudinal gradient, moss-heaths, grasslands, dwarf-shrub heaths, late snow patches, rock ledges, scree slopes, nutrient poor lochs and montane willow scrub.

More than half of the Cairngorms montane zone above 600 metres above sea level comprises other broad habitat types, mainly upland heath (heather moorland), blanket bog and some poor acid grassland. The montane zone includes four of the five highest mountains in the UK. Outside the main Cairngorms plateau, there are large tracts of montane habitat in the south of the Cairngorms

area, from the Monadhliath and Drumochter hills in the west to the Ladder Hills and Angus Glens in the east. Differences in defining the montane habitat make it difficult to ascertain the exact proportion of UK montane habitat in the Park. Nevertheless, the land above 600 metres above sea level represents a significant proportion of the UK total and the area is generally considered to be the most important montane area in the UK and one of the most important in a European context as well.

### Upland Heath/Heather Moorland

Upland heath and heather moorland are terms that are regularly used to describe the same habitat – an upland landscape dominated with vegetation containing at least 25 per cent dwarf-shrub heaths. It lies below the montane zone and above the upper edge of enclosed agricultural land. Upland heath in favourable condition is typically dominated by a range of dwarf-shrubs such as ling and bell heather, blueberry and crowberry. It is usually found in areas with relatively high precipitation, on nutrient poor acid soils.

Upland heath occurs regularly throughout the British uplands and is the most extensive habitat type in the Cairngorms area, frequently in mosaics



Photo: David Gowans.

with peatland/blanket bog. It occurs to a greater or lesser extent in most one kilometre squares in the Cairngorms area throughout Deeside, Donside, Strathspey and the Angus Glens. This habitat and its associated species are of international conservation significance, being largely confined to the UK and western seaboard of Europe.

The management of heather moorland in the Cairngorms is largely focused on two species: red grouse and red deer. Globally, heather moorland is virtually confined to Britain and Ireland, where large areas are principally managed through muirburn (rotational burning) and grazing for agriculture, fieldsports and amenity interests.

### Blanket Bog

Blanket bog is a globally restricted peatland habitat confined to cool, wet, typically oceanic climates. It is, however, one of the most extensive semi-natural habitat types in upland Britain. Peat thickness is very variable, with 0.5 to 3.0 metres being typical, and in excess of five metres thick not unusual. Blanket bog is very widespread in the Cairngorms area, except for lower ground areas in the east. It is the second most extensive habitat type in the area, after upland heath. Blanket bog grades into wet upland heath forming extensive heathland/peatland mosaics. The largest expanses of blanket bog are found in the Monadhliath, the Drumochter hills, the hills of Angus, the Ladder hills and large areas of Deeside.

The typical blanket bog vegetation includes heather, cross-leaved heath, deer grass, cotton grass and several species of Sphagnum moss. The blanket bog bird assemblage is rather species poor, but does have very high densities of breeding species such as dunlin and golden plover. The relative proportions of each of these species vary across Scotland from west to east, with altitude, topography, peat thickness and rainfall. Thick peat can even develop, and blanket bog with it, in areas of low precipitation and relatively high sunshine if drainage is impeded by topography and/or the development of impervious soil layers.

In recent years there has been a growing recognition of the role of peat in storing/absorbing carbon and for that reason, being important in terms of climate change. While blanket bog covers extensive areas of the Park, peat accumulates very slowly under conditions of water-logging and is consequently colonised slowly by many species. Thus, once any damage or exploitation happens, this habitat is very difficult and slow to restore due to the timescales involved. Therefore this sensitive habitat cannot be created or restored like others.

### Trends and Observations

- Climate change may alter the conditions suited to upland plant communities;
- Over-grazing by sheep and deer has prevented tree and scrub regeneration in some upland areas;
- There has been an increase in development pressure for infrastructure in the uplands.

### Monitoring

The Allt a' Mharcaidh catchment on the west side of the Cairngorms, is an Environmental Change Network site. Monitoring of the vegetation and plant species occurs at intervals, with the aim of building up a long-term dataset. Scottish Natural Heritage monitors the condition of vegetation in the Park's designated sites.

### 2.3.6 Information Gaps – Habitats

- Pattern of habitat networks.



## 2. NATURAL RESOURCES...cont

### 2.4 Animals

Animals are usually divided into two groups, vertebrates (with backbones) and invertebrates (without backbones). As elsewhere, vertebrates in the Cairngorms have received more attention and are better known than the invertebrates. In this chapter, the vertebrates are divided into mammals, birds, reptiles and amphibians, and fish.

**Table 2.4: Approximate number of animal species known in the Cairngorms**

<i>Invertebrates</i>	<i>Mammals</i>	<i>Birds</i>	<i>Reptiles and Amphibians</i>	<i>Fish</i>
1,000's	37	235 recorded, circa 150 breed	7	24

*Source: Scottish Natural Heritage 2006*

Although most of these species are native to the Cairngorms, an increasing proportion of the area's fauna is made up of non-native species that have been introduced deliberately or have escaped accidentally. For several of these alien introductions it is not known whether the species has established self-maintaining populations.

#### 2.4.1 Mammals

Of the 37 wild mammal species in the Cairngorms, 27 are native. The quality of the information available on their distribution, dispersal and numbers in the Park is variable. For most mammals there is good distributional data, but there is a lack of information on numbers and trends in populations for all but the most studied species (such as red deer).

The large-scale of different habitats in the Park provides important areas for a number of mammals. Pinewood species like red squirrel, pine marten, and red deer tend to have good populations in Rothiemurchus, Abernethy, Ballochbuie and Glen Tanar. Wetland and water mammals like otter and water voles are present in all the main Cairngorms catchments (Spey, Dee, Don, Esk), but water voles only survive in some of the headwaters and tributaries where the predatory non-native American mink is absent or present only in low numbers.

The Cairngorms are home to two mammal species classed as globally threatened: the otter, classed as vulnerable; and the red squirrel classed as near-threatened. An additional four species are listed as nationally threatened (soprano pipistrelle bat, common pipistrelle bat, brown hare and water vole). Wildcat is now regarded as probably the most threatened native British mammal, but it was not included in the national threat assessment in 1995.

Deer are a major resource in the Park. Grazing by deer can help to maintain important open habitats and, indirectly, the species that depend on these habitats. However, the pattern of range use of large numbers of deer can and does have negative impacts on the natural environment. Deer are commonly managed by estates for sporting and land management objectives. They also contribute to local tourism and provide a significant input to the local economy.

Red deer are the most important deer species present, because of their widespread distribution and numbers in the Cairngorms, their large body size and herding behaviour, and their impact on natural heritage features. There are few herds of truly wild-grazing animals left in Europe and the herds of red deer present in the Cairngorms are one of few opportunities visitors have of seeing such a spectacle.

Mountain hares are found throughout the Park, where they are naturally widespread on moorlands. The status of the following species present in the Cairngorms is unclear: hedgehog, mole, common shrew, pygmy shrew, water shrew, Natterer's bat, Daubenton's bat, soprano pipistrelle bat, common pipistrelle bat, Nathusias's pipistrelle bat, brown long-eared bat, bank vole, field vole, wood mouse, brown rat, house mouse, fox, stoat, weasel, American mink, feral cat and feral goat.

### **Trends and Observations**

- Red squirrels historically declined and recovered as a result of woodland expansion. The Cairngorms is now considered to be one to the most important 'core' areas for red squirrels in the UK;
- Grey squirrels are increasing in the UK and are expanding along Deeside, Donside, along the Aberdeenshire coast and up the Tay catchment;
- Badgers are common in the Cairngorms, and there appears to have been little change in numbers in the Cairngorms during the 1980s when they were studied;
- Otters are widespread and now present on almost all Cairngorms water bodies;
- Rabbit populations fluctuate dramatically and can be common in some areas and absent from areas they were formerly present. Myxomatosis and other diseases/viruses are thought to be responsible for such fluctuations;
- Wildcats have recovered their range in the Cairngorms since becoming extinct in Deeside in 1918. Inter-breeding with domestic and feral cats now threatens the genetic integrity of the remaining populations;
- Pine marten have recovered their range in Badenoch and Strathspey and most recently have begun recolonising upper Deeside;
- Red and roe deer numbers vary over the Park, and populations in some areas show an annual increase, some a slight decrease and others no substantial change between 1993



Photo: Neil McIntyre.

- and 2000. Sika deer appear to be expanding their range towards and into the Park;
- Water voles have declined from the main stems of all rivers, to such an extent that they are now present only in the upper tributaries of the Spey, Dee, Esk and possibly the Don. This decline continues;
- Nationally bats have declined in recent years, but it is unclear if this is happening in the Cairngorms. The loss of old trees, development of steadings and old buildings has been implicated in the nationwide bat decline.

### **Monitoring**

Monitoring of mammal populations has tended to focus on a few species of direct economic importance, such as red deer, and those of conservation concern. Much work is currently being undertaken and planned for red squirrels in the north of Scotland and the Cairngorms woodlands in particular. It is likely that both volunteer and professional recording of red squirrels will increase in the area as the species continues to decline nationally. Monitoring of designated interest species, such as otters on the rivers Dee and Spey Natura sites, takes place regularly.

## 2. NATURAL RESOURCES...cont

### 2.4.2 Birds

The Cairngorms are truly exceptional for their bird life. The altitudinal range and diversity of good quality habitats, from high Arctic tundra, boreal pine forests, northern wetlands, rivers and lochs to managed heather moorlands and traditionally managed farmland, means that there are a tremendous number of niches for breeding and wintering species within a relatively small area. As a consequence, many populations of the Cairngorms bird species are of national and international importance. One species of particular note is Britain's only endemic bird, the Scottish crossbill, which is closely associated with Deeside, Badenoch and Strathspey.

Up-to-date data on the distribution, dispersal and numbers of birds in the Park is often relatively

good because of the high level of interest and research carried out by both professionals and amateurs. Some groups of birds, such as breeding raptors and wintering wildfowl, are well studied by dedicated groups of volunteers.

Many birds use more than one habitat, for example ospreys nest in trees and woodland, but feed on lochs and rivers. Therefore, it is important to recognise that it may be the proximity of different habitats that is vital to some of the Park's special birds.

The Park is nationally important for at least 23 bird species. These are listed by habitat in Table 2.4.2. In addition, there are also a number of rare, often edge of range species that occasionally breed in the Park.

**Table 2.4.2: Bird species for which the National Park is considered nationally important**

<i>Lochs, Rivers and Wetlands</i>	<i>Woodland and Scrub</i>	<i>Farmland</i>	<i>Moorland</i>	<i>Montane</i>
Slavonian grebe	Capercaillie	Breeding waders e.g.	Hen harrier	Ptarmigan
Whooper swan	Black grouse	Lapwing, Curlew,	Golden eagle	Purple sandpiper
Wigeon	Crested tit	Redshank, Snipe &	Merlin	Dotterel
Goldeneye	Scottish crossbill	Oystercatcher	Peregrine	Snow bunting
Spotted crane			Ring ousel	
Osprey			Common gull	
Green sandpiper			Twite*	
Wood sandpiper				
Greenshank				

\* *Important breeding population suspected, but not confirmed on moorlands.*  
 Source: Scottish Natural Heritage 2006.



Photo: Neil McIntyre.

### Woodland Birds

The woodlands of the Cairngorms hold nationally important populations of two grouse species: capercaillie and black grouse. Both of these have recently suffered substantial declines across the country. The Park still holds relatively large populations of these declining species. A high proportion of Britain's capercaillie now reside in the Cairngorms and recent intensive conservation efforts with land managers have seen an apparent halt to species decline.

Two genetically distinct songbirds occur in the Park's woodlands. Crested tits are found in the pinewoods of Badenoch and Strathspey and parts of Morayshire and are an endemic race. The Scottish crossbill is found in conifer woodlands across the Park. The most numerous woodland bird is the chaffinch which is present in all woodlands.

### Mountain and Moorland Birds

The mountains and moorlands of the Park are home to nationally and internationally important populations of raptors (birds of prey). Economically important populations of red grouse drive the management of many moorland areas, which also hold significant populations of breeding twite, ring ousel and common gulls. The most numerous moorland bird is the meadow pipit, which is present on all but the highest mountains in the Park.

The high tops are home to relatively few birds, which include the ptarmigan, snow bunting, dotterel and purple sandpiper.

### Wetland and Water Birds

The clean freshwaters of the Park hold nationally important breeding populations of several rare species. Badenoch and Strathspey holds most of the UK's breeding goldeneye. This charismatic, hole-nesting duck has begun to breed in Deeside and appears set for further expansion in the eastern Cairngorms. The lochs of Badenoch and Strathspey are home in the summer months to

several breeding pairs of Slavonian grebes, a rare British breeder.

The osprey, once extinct in Britain, first re-colonised the Cairngorms in the 1950s before expanding to the rest of mainland Scotland and now England and Wales. This conservation success story is strongly linked with the area, providing an economic boost through tourism. A handful of greenshank, green and wood sandpipers and red throated divers breed on wetlands and lochans in the Park.

The cold winter weather in the Cairngorms means that water bodies can be frozen for many weeks or months making them unavailable to water birds. Consequently, the area is not renowned for its wintering wildfowl, although nationally important numbers of whooper swans occur on the Insh Marshes. The Cairngorms rivers hold nationally important populations of goldeneye and goosanders in the winter, but these birds range throughout whole river catchments and so cannot be simply looked at as solely 'Cairngorms' populations.



Photo: David Gowans.

## 2. NATURAL RESOURCES...cont

### Farmland Birds

The traditionally managed livestock grassland of Badenoch and Strathspey supports one of the densest concentrations of breeding waders (lapwing, redshank, curlew, oystercatcher and snipe) in mainland Britain. The farmland is important for breeding waders because of livestock management practices.

Increased specialisation has resulted in a huge decrease in the area of arable land grown for cereals and root crops. There has been a decrease in associated farmland birds. Recent work has highlighted the importance of even relatively small arable areas for seed-eating birds such as finches and buntings. For example, a single Strathspey farm holds one of the highest counts ever of the declining twite, which moves off the moorland during the winter.

### Trends and Observations

- There is no recent trend data for most bird species in the Cairngorms. However, it would appear that many populations of the common resident species are stable and that some of the migrant species, such as spotted flycatcher, ring ousel, are perhaps in decline. This matches national trends, perhaps due to problems at wintering or migratory sites;
- Woodland grouse (capercaillie and black grouse) have declined nationally during the 1990s. In the case of capercaillie its decline appears to have been halted, perhaps as a result of intensive conservation management of pine forests within its range;
- The population trends of most other pinewood species are poorly known, but are likely to increase as recent native woodland expansion begins to mature;
- While populations of some raptor species, such as buzzard, are on the increase, others like the hen harrier are severely limited by illegal killing;
- There is good information and data on several wetland and water birds, with some in

favourable condition, such as goldeneye, and others fluctuating significantly between years, such as Slavonian grebe and spotted crane;

- Trends in wild bird populations form one of the Quality of Life headline indicators published annually by the UK Government.

### Monitoring

Monitoring of bird populations has tended to focus on a few species of particular conservation interest/concern, such as capercaillie and Slavonian grebe. Volunteer raptor study groups monitor breeding raptors across the Park on an annual basis. The British Trust for Ornithology monitors some bird populations regularly, for example through annual surveys of wetland birds. Recently a swift nest survey has been undertaken in the Park. Fieldwork for the North East Scotland Bird Atlas is currently underway, but recording is focused on Morayshire and Aberdeenshire. Monitoring of species of interest takes place regularly in designated sites.

### 2.4.3 Reptiles and Amphibians

The Park has good widespread habitats for reptiles and amphibians. South east facing slopes and undisturbed habitat provide appropriate basking and hibernating sites for reptiles, and the relative lack of pollution of water bodies provide suitable breeding sites for amphibians. The remoteness of much of the area, the variety of habitats (altitude range 150 metres-1,200 metres above sea level) and the lack of disturbance suit species such as the adder.

Eight native amphibian and reptile species are found in the Cairngorms, three reptiles and five amphibians. There has been little systematic research or survey work on amphibians and reptiles in the Cairngorms.

### Reptiles

The slow-worm is the rarest of Scotland's three reptile species and has been recorded from only a few places in the Cairngorms. The population of



Photo: David Gowans.

common or viviparous lizard is small at the UK level, but important at the Scottish level and is probably under-recorded. It has been recorded from Badenoch and Strathspey, Deeside, Donside and the upper Angus Glens. Adders have been recorded in most of the Cairngorms area except the high tops. Along the Dee, some adder habitat has been lost to building and development, but it is still relatively common, for example at Muir of Dinnet.

### Amphibians

The great crested newt is the rarest Scottish amphibian and has been recorded at only two authenticated sites in Strathspey. Palmate newt, common frog and common toad are relatively common and widespread from lowland burns and lochs to upland burns and wet flushes.

### Trends and Observations

- There is no reliable trend data for amphibians and reptiles in the Cairngorms;
- Nationally, amphibians and reptiles have declined;
- The expansion of forestry since the 1950s may have benefited reptile and amphibian populations;
- Anecdotal questionnaire surveys of adder and slow-worm sightings in Scotland suggest that populations have declined slightly, but remained stable in the Cairngorms. There is no quantifiable data to verify this.

### Monitoring

Local volunteer groups were recently established to monitor the status of reptiles and amphibians in the Cairngorms. In 2005 a national adder recording initiative was launched and is likely to result in more records of this species from sites in the Cairngorms. The Highland Biological Recording Group is surveying sites for smooth newts.

### 2.4.4 Fish

The excellent quality waters of the Park are suitable for a range of fish species. Fish are naturally widespread in the Cairngorms, occurring in almost all running waters and many lochs and lochans, including the highest altitude water bodies with fish in Britain. Relatively few fish colonised the Cairngorms area naturally from the sea when the ice cap melted 13,000-15,000 years ago.

Twenty four species of fish are known to be present within the Cairngorms, of which only seven or eight are native. Species of particular conservation value are Atlantic salmon, Arctic charr, brook lamprey, river lamprey and sea lamprey. Most research and survey work has concentrated on species of economic importance.

Atlantic salmon are relatively widespread throughout the Park and are present in each of the river systems that drain the Cairngorms. Rivers notable for the size and diversity of their



Photo: Jimmy Mitchell.

Atlantic salmon populations are the Spey, Dee, Don, North Esk and South Esk. They contributed 44 per cent of the Scottish Atlantic salmon rod-catch and 36 per cent of the UK total during 2002. Atlantic salmon are not restricted to rivers and burns and are known to occur in a number of lochs within the Park.

## 2. NATURAL RESOURCES...cont

Brook lamprey are present in the River Don and its tributaries, the North Esk, the South Esk, the Spey and its tributaries, as well as many smaller burns. It is also highly likely that brook lamprey are present in the River Isla and in other tributaries of the Tay which extend into the Cairngorms area. River lamprey have been recorded in all of the major systems present in the Cairngorms area. The inability of these fish to ascend physical obstacles, such as waterfalls, may, however, restrict their distribution to the lower reaches of these catchments.

Sea lamprey are known to ascend the rivers Spey, Don, North Esk, South Esk and Tay, although again the distance travelled upstream is strongly dependent on the presence of in-stream barriers. It is unlikely that adult sea lamprey are able to penetrate the river systems of the Don and Tay as far inland as the Park.

The Arctic charr is an ice age relict fish that inhabits several high altitude lochs in the Cairngorms and Loch Insh on the River Spey. The Arctic charr populations of the Cairngorms have been isolated for so long that they have become genetically distinct and are unique.

There is a wide variety of forms of trout, differing in appearance, average size and migratory tendencies. Brown trout are almost ubiquitous throughout the wider Cairngorms area and are located within almost every burn and loch. One population is known to exist at an altitude of 843 metres above sea level in Dubh Lochan on Beinn a' Bhuird, possibly the highest altitude in Britain at which a self-sustaining population of fish exists. In areas of a river catchment where productivity is low and access to and from the sea is assured, brown trout may have adapted to smolt and become sea trout. The rivers Spey, North and South Esk are particularly well known for their sea trout.

The once common eel is now thought to be one of the fastest declining vertebrates in Britain.

Local Fishery Board biologists have noticed a dramatic decrease in the number of eels, when sampling rivers and burns in the Park. Important in their own right, eels are also an important component of the aquatic food-web. Detailed studies in Deeside identified eels as the main food item of otters. Thus, the loss of eels will have significant impacts on species like otters, which may have to switch food items or decline alongside its main prey.

In recent years there has been a tendency to artificially stock lochs and other water bodies with non-native fish for angling and ornamental purposes. Many non-native species are now present in the Cairngorms (Table 2.4.4), but it is unclear whether their populations are self-sustaining or not.

**Table 2.4.4: The breeding status of non-native fish present in the Cairngorms**

<i>Non-native species</i>	<i>Breeding status</i>
Minnow	Breeding
Dace	Uncertain
Perch	Breeding
Stone loach	Uncertain
Common/mirror carp	Uncertain
Crucian carp	Uncertain
Tench	Breeding suspected
Common bream	Uncertain
Golden orfe	Uncertain
Rudd	Breeding
Roach	Breeding
Dace	Uncertain
Rainbow trout	Uncertain
Asp	Uncertain
Brook trout	Uncertain
Pike*	Breeding

*Source: Scottish Natural Heritage 2006*

\* *Status as a native or non-native species in the Cairngorms uncertain. Pike has been introduced to several water bodies, but present in Scotland since at least 1790.*

**Trends and Observations**

- There are few reliable sets of trend data published for fish in the Cairngorms, other than economically important species such as salmon. Data on other species, such as eels (of conservation concern), has been collected but not analysed or published;
- There has been a steady increase in the number of non-native fish species in the Cairngorms and the number of water bodies in which they are present;
- Historical catch records, available since 1952, have shown that the number of Atlantic salmon caught annually increased until the 1960s, and has declined steadily since the mid-1970s. In rivers originating in the Cairngorms area, it is the decline in catches of multi-winter sea fish, such as spring Atlantic salmon, that have caused most concern.

**Monitoring**

Monitoring of fish species has tended to focus on a few species of economic interest, such as trout and salmon. Nevertheless, data on additional ecologically important species such as eels has been collected. Specific pieces of research have been undertaken on Arctic charr, and recently work has begun to monitor the presence and status of non-native fish in the Park.

**2.4.5 Invertebrates**

The Cairngorms is one of the most important areas for invertebrates in the UK, with a significant number of northern, boreal and montane species. However, there are also isolated populations of species that have their centres of population further south in the UK, resulting in an exceptionally high level of invertebrate biodiversity. Nevertheless, the poor state of knowledge of invertebrate populations means that their true status in the Park has yet to be properly assessed.

Although invertebrates are among the least known of all animals and current knowledge is biased in favour of groups such as insects, over 350 invertebrate species considered to be rare and/or of national importance have been found in the Cairngorms. A summary of the numbers of rare insects found in the Cairngorms is provided in Table 2.4.5a and the habitats where they occur in Table 2.4.5b



Photo: David Gowans.

**Table 2.4.5a: Numbers of rare insects known to be present in the Cairngorms**

Order	No. of rare species
Diptera – true flies	105
Coleoptera – beetles and weevils	97
Lepidoptera – butterflies and moths	30
Hemiptera – aphids, bugs and grasshoppers	9
Hymenoptera – bees, wasps and ants	15
Odonata – dragonflies and damselflies	3
Trichoptera – caddisflies	2
Ephemeroptera – mayflies	1
Plecoptera – stoneflies	1

Source: Scottish Natural Heritage 2006

## 2. NATURAL RESOURCES...cont

**Table 2.4.5b: Habitats of rare insects known to be present in the Cairngorms**

<i>Habitat</i>	<i>No. of rare species</i>
Montane	54
Wetlands	68
Grasslands	29
Heathlands	31
Woodlands – pine	36
birch	13
aspen	10
other	70
<b>Overall</b>	<b>129</b>

*Source: Scottish Natural Heritage 2006*

The number of insect species present in the Cairngorms is difficult to evaluate. Some groups and geographic areas have been studied more thoroughly than others, making meaningful comparisons difficult. Most information on invertebrates has not been obtained systematically, but is the result of ad-hoc collecting by amateur biologists during visits to the area or as a result of a specific study of one group of species in one particular area. Consequently, the recording of invertebrates in the Cairngorms would benefit from the development of appropriate survey techniques.

The Cairngorms is rich in insects and much is waiting to be recorded or discovered. For example, 387 species of butterflies and moths alone have been recorded in the Cairngorms National Nature Reserve. In the pinewoods around Loch Garten 868 species of beetle were discovered, and in 2005 a new species of wolf spider was discovered in Abernethy Forest.

One of the key features of these montane and northern species is that many take more than one year to complete their larval growth and development due to the cool, short, summer season. Many populations have also been isolated by geography and climate and as a consequence, have evolved into distinctive races and forms.

The recording of non-insect invertebrates is at best patchy and so for most species little

information is available. If it is, the wider context of the populations in UK terms is difficult to determine, although for some it is known to be significant. For example, the globally threatened freshwater pearl mussel is present in the rivers Spey, Dee and South Esk in internationally important numbers and has been the subject of detailed studies across the Park and Scotland. There are at least 64 endangered or critically endangered invertebrate species apparently confined to the Park.

### **Trends and Observations**

- There is no recent trend data for almost all invertebrates in the Cairngorms;
- Distribution data for 23 butterflies in the Park may be extracted from UK-wide surveys and compared over two study periods: 1970-1982 and 1995-1999. Some species, such as the large heath, showed a decrease in their range. Others, like the small pearl-bordered fritillary, showed an increase in range, while species like the small blue and the pearl-bordered fritillary, showed little change;
- Increased recording effort by volunteers is resulting in new sites for many moth and butterfly species, such as mountain ringlet butterfly and netted mountain moth.

### **Monitoring**

Outside designated sites with invertebrates as a noted feature, little systematic monitoring takes place. Some national monitoring schemes have

been developed for charismatic species like butterflies, but for most invertebrate species, anecdotal recording by amateurs is the only monitoring presently happening. The Highland Biological Recording Group has been recording the status and distribution of bees for 15 years and a new bee Atlas is expected soon. The Scottish Executive and bee-keeping groups are monitoring the spread of the varroa parasite, which is present next to and possibly now within the Park.

#### 2.4.6 Information Gaps – Animals

- Trend data for most birds, reptiles and a amphibians, fish and invertebrates;
- Distribution data for many species, particularly those not valued as part of economic activity;
- Population and breeding status for many species.

## 2.5 Plants

### 2.5.1 Bryophytes

The Cairngorms has a large and important bryophyte flora (mosses and liverworts). The extensive area, diversity of habitats and altitudinal/climatic range in the Park provide niches for almost two thirds of the UK's bryophytes. However, knowledge on the ecology, distribution and status of bryophytes in the Park is severely limited, with much still to discover.

The Park is set in one of the most 'continental' parts of Scotland and, compared with the renowned bryophyte flora of the Atlantic seaboard, has a lower number of bryophytes present. However, some 103 nationally rare species and 154 nationally scarce species have been recorded in the Park. Most of these are arctic-alpine or boreal-montane species, which have a very limited range in the UK.

The most important Cairngorms bryophyte areas in terms of the proportion of UK populations are those with late snow-lie, where patches of snow

persist into July. The limited snow-free period is considered too short for most flowering plants to persist, reducing competition in favour of specialist bryophytes. As with flowering plants, the longest lists of rare bryophytes come from exposures of calcareous or base rich rock at moderate to high altitude. Consequently, these important areas are confined to the few base rich areas in the Park.

A number of dry acid rock species are present throughout the Park. Favoured sites are large areas of block scree, associated with crag and other areas of broken rock. Upland peat-dominated areas with mires hold a range of sphagnum species. The large areas of native woodland have a well-developed ground flora, which contains an abundance, if not a great variety, of bryophytes. The native pinewoods have an interesting moss flora, including nationally rare species such as the green shield-moss. However, Cairngorms aspen stands have perhaps the greatest variety of interesting species, including several rare ones, some of which were thought to be very rare or extinct until recent work within the Park rediscovered them (such as blunt-leaved bristle-moss and aspen bristle-moss).



Photo: Jimmy Mitchell.



Photo: Neil McIntyre.

## 2. NATURAL RESOURCES...cont

### *Trends and Observations*

- The baseline data required for assessing trends is not available for bryophyte species;
- Historical assessments indicate that several species have been lost from the Cairngorms since the middle part of the 19th century;
- The distribution patterns of some rare species in the Cairngorms reflect the pattern of survey effort, rather than a true distribution;
- Comparisons of snow bed bryophyte communities between 1989 and 1999 showed no evidence of gross change, either in extent or species composition.

### Monitoring

Outside designated sites with bryophytes as a noted feature, little systematic monitoring takes place. Some national monitoring is now taking place for protected and Biodiversity Action Plan species. Recently work has begun to assess the status of protected Wildlife and Countryside Act (Section 8) and Biodiversity Action Plan Priority species.

### 2.5.2 Lichens

The Cairngorms has a rich, diverse and important lichen community, which forms an important component of many ecosystems. Lichens are often considered indicators of good environmental conditions, including habitat quality, clean air and water. As with bryophytes, the diversity of habitats and the altitudinal/climatic range in the Park provides niches for approximately half of Britain's lichens. However, knowledge of these lower plants is severely limited with much still waiting to be discovered.

The Park is set in one of the most 'continental' parts of the UK and so, compared with the renowned oceanic lichen flora of western Scotland, there are fewer lichen species. The total number of lichen species recorded from Britain and Ireland is around 1,750. Eighty five have over 50 per cent of their UK range within the Cairngorms area, and 35 are known in Britain only from the Cairngorms. Of 400 taxa with at least

10 per cent of their UK distribution in the area, over 180 are nationally rare and over 350 are nationally scarce species. These rare lichens are composed of arctic-alpine or boreal-montane species, which have a very limited range in the UK.

Very few areas in the Cairngorms have had their lichen flora investigated thoroughly. Of those species described as internationally or nationally important in the Park area, all have been recorded in fewer than five areas. Almost 75 per cent of the species have been recorded only once.

The northern edge of the Cairngorms and the mid-alpine heaths of the eastern Cairngorms are nationally important areas of alpine heath for lichens. Elsewhere, the lichen vegetation of alpine heaths is largely unremarkable, consisting mostly of widespread species. The most important habitats for lichens are native pinewoods, deciduous woodlands, sub-alpine and low alpine heaths, areas of base rich mica-schist and areas of late snow-lie. The late snow-lie habitat is rich in uncommon lichen species. The lichen vegetation of native pinewoods in Strathspey has been more thoroughly investigated than Deeside. Deciduous woods on Deeside have not been surveyed, but some of Strathspey's birch and aspen woods have been.



Photo: Jimmy Mitchell.

### Trends and Observations

- Trends in the abundance or range of lichen species are difficult to assess, due to a lack of baseline data;
- Recent work has begun to assess the status of lichen communities in designated sites, where lichens are a noted feature, but it has not been carried out long enough to report on any historical changes;
- The distribution patterns of many rare species in the Cairngorms reflect the pattern of survey effort, rather than true distribution.

### Monitoring

There are currently no active lichen research programmes at UK universities and all professional survey work is carried out on an occasional contract basis. Outside designated sites, what little survey work that there is, has been carried out by amateurs, most of whom do not publish their findings. Such work also tends to concentrate on single species, rather than on lichen assemblages. Some national monitoring is now taking place for protected and Biodiversity Action Plan species.

### 2.5.3 Fungi

The Park has an important fungal community, but it is probably the plant group on which there is least data in the area. Fungi play a crucial role in recycling animal and plant material and live in symbiosis with many higher plants. The fruiting

bodies themselves are undoubtedly an important part of biodiversity, visually attractive and a source of shelter and nourishment for a wide range of organisms from invertebrates to mammals. Little serious fungal survey work has been undertaken in Scotland, so limited comment can be made about the importance of the Cairngorms fungi in a national or international context. To compound this, there is a lack of expertise to undertake fieldwork and to identify important species.

Fungi are found throughout the area, and the limited work done to date suggests that semi-natural pine woodland within the Cairngorms supports the largest number of interesting or important fungal species. Semi-natural pine forest supports at least 87 species listed in the Provisional British Red Data List and a further 34 species either rarely recorded in Scotland or recently recorded for the first time. However, compared with similar areas elsewhere in Europe, wood-decomposing fungi are under-represented in Scottish pine forests, due to lack of fallen and standing dead wood. Birch and aspen woodlands are also home to many scarce species.

The high mountain plateaux contain populations of arctic-alpine species, including 29 species of conservation concern. For slime moulds (myxomycetes), 21 snowline species (2 globally rare) are recorded. Sixty species are known from the Alps, and the differences may be associated with the removal of high-level montane forest and scrub in Scotland. The snowline myxomycetes would be particularly vulnerable to climate change, as they require a minimum of three months of snow-lie to become established.

Old, semi-improved grasslands are an important habitat in Scotland as a whole. There are 32 grassland fungi species of conservation concern in the Cairngorms with waxcaps being perhaps the rarest and most well known. Based on a recent assessment of their unfavourable status across Europe, it is likely that some Cairngorms grassland sites are significant in European terms.



Photo: Jimmy Mitchell.

## 2. NATURAL RESOURCES...cont

Some species are thought to be of global significance, but the lack of much work done elsewhere makes it difficult to put comparisons of fungal importance into a broader context. Many fungi grow in association with a host plant or tree and are therefore bound to particular habitats. The management of these habitats can influence fungal diversity dramatically, but it is often unclear in what way. Patterns of fungal diversity and community composition are mostly unexplained by the variables measured.

The fruiting body of mycorrhizal fungi only appears occasionally, and for the rest of the year (or several years) there may be no outward sign that a particular species is present. Under such circumstances, it is better to manage or conserve a habitat, rather than try to 'protect' a single fungal species. It is believed that many fruiting bodies appear as a result of stress, which may not always be a good sign.

### **Trends and Observations**

- Baseline data, necessary for illustrating trends in population or range size, is not available for fungi. It seems likely that new species and new sites for rare species will be found, as focused fungal surveys gradually expand our knowledge to reflect true distribution patterns;
- Recent work has begun to assess the status of some rare fungi, particularly in designated sites. Without exception, it is clear that under-recording is a significant issue.

### **Monitoring**

Most of the Park has not been surveyed for fungi and professional survey work is carried out on an occasional contract basis. In order to provide useful baseline information, consistent monitoring procedures need to be developed. Some national monitoring is now taking place for Biodiversity Action Plan and other threatened species.

### **2.5.4 Vascular Plants**

Vascular plants are complex plants with conductive tissue, which means they can grow to larger sizes and support themselves more than lower plants. By virtue of the latitude, climate, altitude and varied landforms, the Cairngorms is the second richest area in Britain for scarce boreal and arctic-alpine vascular plants. For many vascular plants there is good 'presence or absence' distributional data in the Cairngorms, but a distinct lack of data on numbers or trends in plant populations for all but the most studied of rare species.

Although one in five of the Cairngorms vascular plant species are rare, relatively few have their British centre of distribution here. This is because most rare mountain plant species are not found on granite (the bulk of the Cairngorms), but on other rock types, which produce richer soils for plants. The vegetation of the Cairngorms strongly reflects its wide altitudinal range, diversity of glacial and peri-glacial landforms and its underlying geology. One legacy of the last glaciation is that Scotland has an impoverished native flora.

Of the 1,117 vascular plant species native to Scotland, almost three quarters (73 per cent) have been recorded in the Cairngorms area, along with 213 non-native species. The flora of the Cairngorm Mountains themselves is numerically low, comprising about 280 vascular plant species in all.

### **Woodland Vascular Plants**

Historically, most of the land below the treeline in the Cairngorms was occupied by downy birch, Scots pine and rowan. Other scarcer species such as alder, oak and aspen were, and still are, an important component of native woodland areas in the Park. The understorey of these native woodlands is often dominated by heather or blueberry heath or by juniper scrub. Rarities such as creeping lady's-tresses, one-flowered wintergreen and twinflower are mostly found in pinewoods.



### Mountain and Moorland Vascular Plants

Prostrate heath, dwarf heath, grass and moss heaths and rock and scree communities dominate the alpine or mountain vegetation in the Cairngorms. Blanket bog occurs on flatter areas and is dominated by species poor vascular plant (heather and grass) and moss plant communities. Destruction of original forest cover and muirburn created the moorland habitat present today at middle to low altitudes. Various species of grass and sedge, such as deer grass and stiff sedge, dominate some heathland areas, alongside the familiar heather and crowberry communities.

Heather-dominated heath communities also occur above the treeline (but in a dwarf form), and these tend to be replaced by other dominant species such as moor matgrass, blueberry and bog wortleberry, alongside deer grass and rushes in wetter areas. Above the limit of heather, exposure and snow-lie determine the occurrence of species. In the high altitude bare rock and rock debris dominated areas alpine species occupy various niches. Three-leaved rush, least willow, dwarf cudweed, moss campion, mountain avens, rock sedge, yellow mountain saxifrage and hermaphrodite crowberry occur. Wet flushes and calcareous intrusions may hold rarities such as alpine milk vetch, alpine saw-wort, alpine meadow-rue, alpine cinquefoil, yellow mountain saxifrage, mossy saxifrage and starry saxifrage.

### Wetlands and Water Vascular Plants

There are few still water bodies of any size in the Park that support rich vascular plant communities. Marsh clubmoss, slender pondweed and spring quillwort are notable rare species found in open water and on a few loch shores in the Cairngorms. Non-native ranunculus has become established in the River Spey and now is causing problems for angling interests and threatened freshwater pearl mussels.

Various types of wetlands occur in the Park including fens, marshes, swamps and reedbeds. Some sites, such as the Insh Marshes, are internationally important for their vascular plant communities. Water levels and active management, such as grazing, largely determine the vegetation composition of these Cairngorms wetlands. At least a third of the UK's native vascular plants are associated with fens and other wetland habitats. Some wetland habitats are less species rich and tend to be dominated by one or two plant species, such as reedbeds dominated by *Phragmites* reeds.

### Farmland and Grassland Vascular Plants

The grasslands that have formed in the deforested lowland areas are largely composed of small, relatively unpalatable species. The large palatable species, such as globeflower, melancholy thistle, wood cranes-bill, blue alpine sow-thistle and wild

## 2. NATURAL RESOURCES...cont

angelica, have mostly been pushed back to steep areas or cliff where richer soils are present, but grazing animals are not. Unimproved hay meadows are rare, but important fragments do occur alongside fenced rivers and burns. Grazing pressure and nutrient status are the dominant factors affecting grassland communities in the Park.

Rare plants occur in a wide variety of vegetation types, including woodland, mires, heaths, grasslands but particularly alpine habitats above the treeline (including cliffs and rocky outcrops), where they are usually confined to small discrete locations.

### **Trends and Observations**

- There is no reliable published information on trends in higher plant populations in the Cairngorms. The two national plant atlases provide a valuable picture of the distribution and trends nationally, but they are not accurate at the local level because of missing data.

### **Monitoring**

Half of the Park has been mapped using the National Vegetation Classification scheme. Approximately a quarter of these National Vegetation Classification mapped areas lie above the treeline, where most rare species occur. Locations of nationally rare plants have been collated and used to review their status in 1995-1997 by surveying all known sites to set a baseline against which future trends could be evaluated. Outside designated sites, what little survey work that there is has been carried out by amateurs, most of whom do not publish their findings. Some national monitoring takes place for nationally rare and Biodiversity Action Plan species.

### **2.5.5 Information Gaps – Plants**

- Baseline data for bryophytes, lichens and fungi;
- Higher plant population trends.

