

# **NATURE & CLIMATE CHANGE**

**IN THE NATIONAL PARK**



**National 4/5 & Higher  
Environmental science**

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## **Case studies available for Nature and Climate Change**

[Case Study 1: Habitat Networks in the National Park – Peatland](#)

[Case Study 2: Habitat Networks in the National Park – Water](#)

[Case Study 3: Habitat Networks in the National Park – Woodland](#)

[Case Study 4: Key Species in the National Park – Water voles](#)

[Case Study 5: Key Species in the National Park – Eurasian beavers](#)

[Case Study 6: Key Species in the National Park – Red squirrels](#)

[Case Study 7: Key Pressure in the National Park – Invasive non-natives species](#)

# 1. INTRODUCTION

This resource 'Nature & Climate Change in Loch Lomond & The Trossachs National Park' has been developed to support the Environmental Science curriculum:

## NATIONAL 4/5 & HIGHER: LIVING ENVIRONMENT, EARTHS RESOURCES AND SUSTAINABILITY

It contains background information on Loch Lomond & The Trossachs National Park, its special qualities, the main land uses, and provides examples of habitats and biodiversity, highlighting the role of the National Park Authority in mitigating the impacts of climate change.

Through using this resource students will learn about the effects of climate change on a National Park and the important habitats and species these special places provide. Each case study provides additional references and web links to encourage further reading and research, and makes suggestions for field visits to the National Park.

The final section highlights other resources available to support learning and visits to Loch Lomond & The Trossachs National Park.



# 2. CURRICULUM LINKS

## SQA OUTCOMES AND ASSESSMENT STANDARDS

### NATIONAL 5

#### LIVING ENVIRONMENT:

- 1. Investigating ecosystems and biodiversity**  
(b) Biodiversity in the context (one terrestrial ecosystem).
- 2. Interdependence**  
(g) Carbon cycle
- 3. Human influences on biodiversity**  
(b) Human activities which have a positive and/or negative effect on ecosystems, with a focus on species reduction or increase, extinction and loss of biodiversity.  
(c) The role of a named indicator species in environmental monitoring.  
(d) The impact of a named INNS on ecosystems.  
(e) Conflicts between land and/or water-based activities. At least two stakeholders using a single resource, with potential solution/compromise for shared use.  
(f) Relevant current national organisations (National Parks)

#### EARTH'S RESOURCES:

- 3. Hydrosphere**  
(b) Water cycle: run-off, groundwater flow, storage.  
(c) Main stores of water: freshwater (rivers, streams, springs), groundwater (soil moisture, rock pores and crevices)  
(e) Issues arising from availability of water resources in Scotland and the rest of the British Isles: drought and flooding.
- 4. Biosphere**  
(d) Energy from biological resources: biomass (peat).  
Process of fermentation in formation of biofuels: conditions required for formation of peat (acidic and anaerobic), and methane as the primary biogas.

#### SUSTAINABILITY:

- 5. Energy**  
(f) Impacts (social, economic and environmental) of climate change: habitat loss, reduction in biodiversity, changes in species distribution, rising sea levels leading to flooding, loss of agricultural land, and loss of business.

### HIGHER

#### LIVING ENVIRONMENT:

- 1. Investigating ecosystems and biodiversity**  
(b) Biodiversity in the context (one terrestrial ecosystem)
- 2. Human influences on biodiversity**  
(a) Human activities, in Scotland, through the Holocene period, which have affected ecosystems, from a positive and negative view-point. To include habitat destruction, species reduction and increase, changes in biodiversity and extinction (through afforestation and grazing)  
(b) Development of intensive agriculture (drainage of wetland ecosystems) and its impact on biodiversity.  
(h) The impact of climate change on biodiversity and species distribution.  
(i) The impacts of non-native species and methods to minimise these impacts. Impacts to include loss of native species through competition. Examples to include grey squirrel, and *Rhododendron ponticum*  
(j) Reintroduction to Scotland of nationally extinct species (beaver)  
(k) The need for legislation and policies, to include current conservation and land/marine management policies. Key role of SSSIs. Role of statutory agencies (National Parks)

#### SUSTAINABILITY

- 3. Energy**  
(c) Environmental, social and economic impacts of climate change, including changing weather patterns.

# 3. BACKGROUND

## NATIONAL PARKS IN SCOTLAND

In Scotland, National Parks are extensive areas of the very highest value to the nation for their scenery, wildlife and cultural heritage.

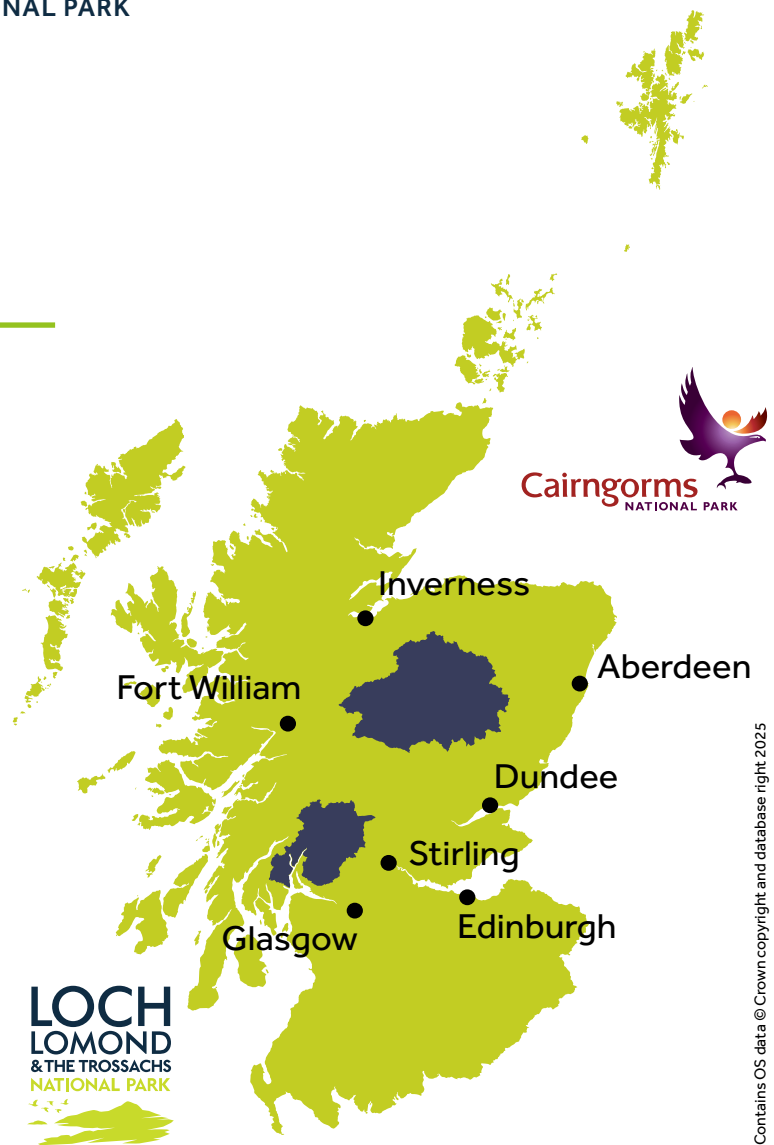
They provide an integrated approach to management and sustainable development to safeguard the special qualities of these areas for the long term.

They also provide opportunities for the public to enjoy the special natural and cultural heritage.

There are two National Parks in Scotland: Loch Lomond & The Trossachs and Cairngorms. For more information visit the official National Park websites:

➤ [www.lochlomond-trossachs.org](http://www.lochlomond-trossachs.org)

➤ [www.cairngorms.co.uk](http://www.cairngorms.co.uk)



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Loch Arklet



## LOCH LOMOND & THE TROSSACHS NATIONAL PARK

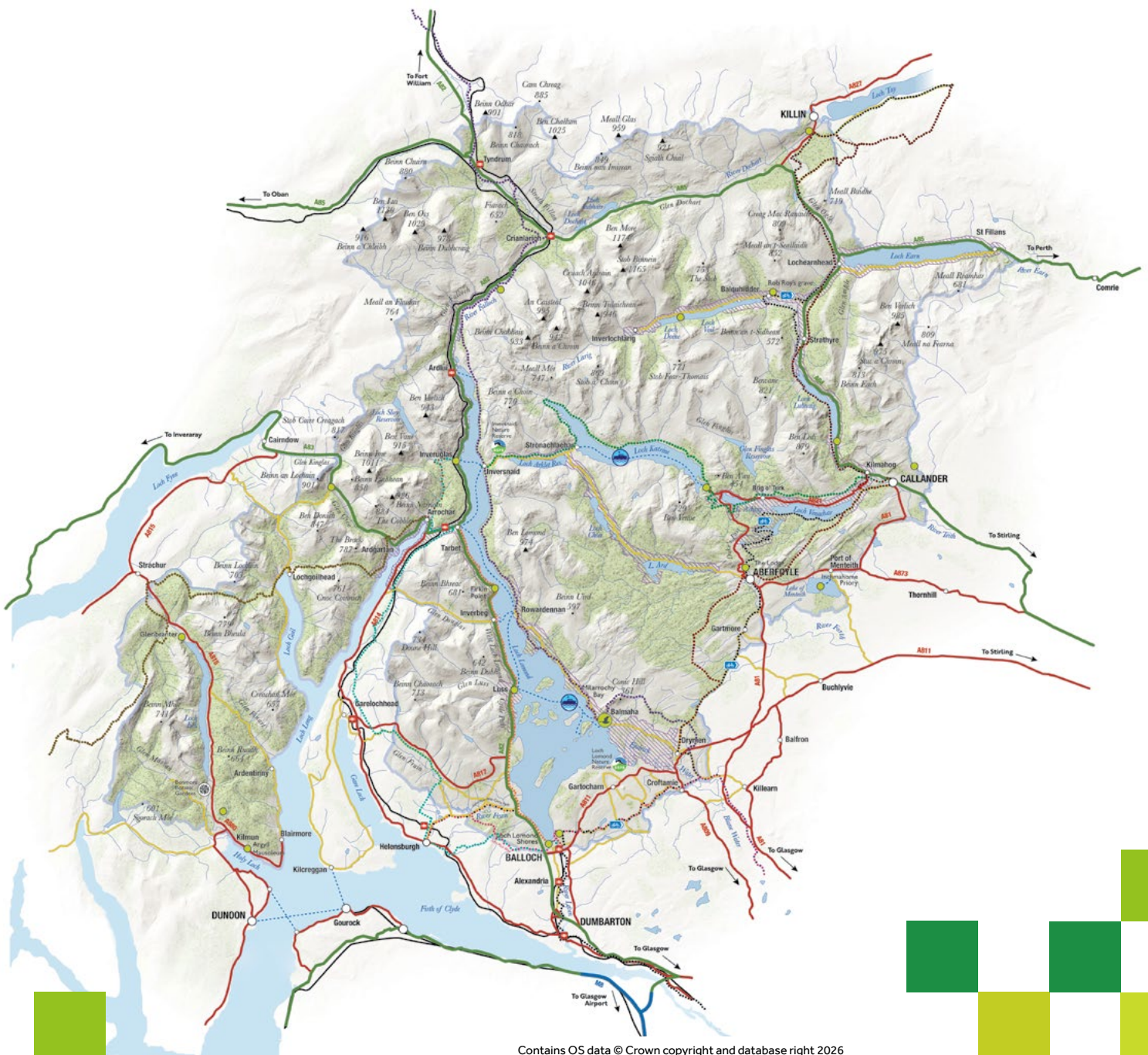
Loch Lomond & The Trossachs National Park became fully operational on 19 July 2002 and was officially opened by Princess Anne on 24 July 2002 and encompasses around 720 sq miles (1,865 sq km) of some of the finest scenery in Scotland.

It is a place of contrasts from rolling lowland landscapes in the south to high mountains in the north, and has many lochs and rivers, forests and woodlands. It is also a living, working landscape which has been influenced by people for generations and is visited and enjoyed by many for its recreational value.

The National Park includes Loch Lomond, the largest freshwater loch in Scotland, as well as nearly 40 miles of coastline around three sea lochs – Loch Long, Loch Goil and the Holy Loch.

It also contains The Great Trossachs Forest, which is the largest National Nature Reserve (NNR) in Scotland and will be the largest area of native broadleaved woodland in the UK.

The National Park is home to a rich variety of important wildlife including red squirrels, black grouse, otters, deer, eagles and powan – a rare freshwater fish native to only Loch Lomond and Loch Eck.



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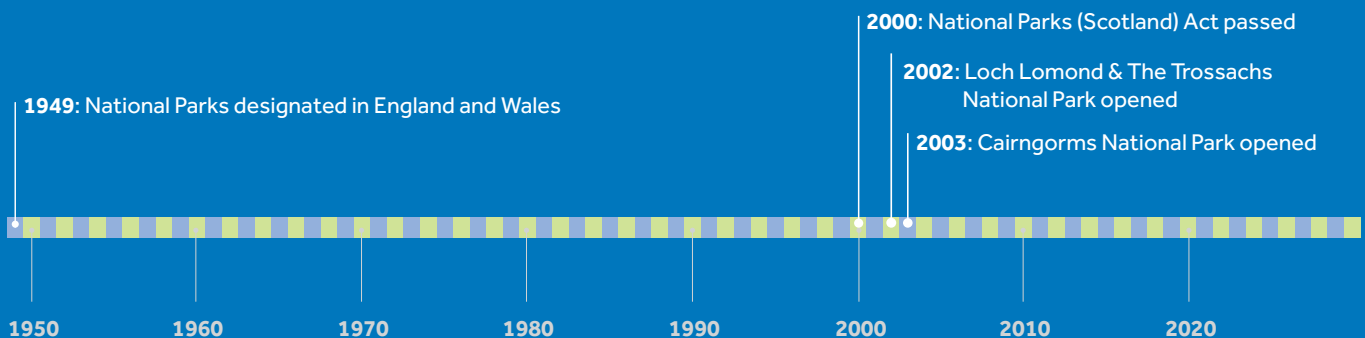
## LOCH LOMOND & THE TROSSACHS NATIONAL PARK FACT FILE

- The Park is 1,865 sq km (720 sq miles) and has a boundary length of 350km (220miles).
- 50% of Scotland's population lives within an hour's drive of the National Park.
- There are 21 Munros (mountains above 3,000ft) in the Park and the highest is Ben More at 1,174m.
- There are 19 Corbetts (mountains between 2,500ft and 3,000ft).
- There are 22 larger lochs, with numerous smaller lochs and lochans.
- About 50 rivers and large burns.
- 15,168 people live in the National Park (2011 census).
- There are two Forest Parks – Queen Elizabeth in the Trossachs and Argyll in Cowal.
- is crossed by long distance routes – including West Highland Way and John Muir Way
- contains 73 designated special nature conservation sites and 60 Sites of Special Scientific Interest (SSSI)



## HISTORY OF SCOTTISH NATIONAL PARKS - TIMELINE

Some of the key dates for designation of National Parks in the UK and Scotland:



## AIMS OF SCOTTISH NATIONAL PARKS

As set out in the National Parks (Scotland) Act 2000:

- To conserve and enhance the natural and cultural heritage of the Park
- To promote sustainable use of the natural resources of the area
- To promote enjoyment and understanding of the special qualities of the Park, including enjoyment in the form of recreation
- To promote sustainable economic and social development of the Park's communities



# 4. NATIONAL PARK PARTNERSHIP PLAN

## A STRATEGY FOR THE PARK

The Park Plan is the strategic guiding document for all public bodies operating in the Park and provides guidance and focus for our partners. It outlines the significant outcomes which can be achieved for the National Park area through the collaboration of the public, private and voluntary sectors as well as Park communities and local businesses.

 [View our National Park Partnership Plan here](#)

The challenge in managing a successful National Park is that of delivering all four aims together. The National Park combines an internationally important environment with a fragile rural economy and a renowned visitor destination. This brings inevitable tensions.

All of the above can result in problems/conflicts within the Park area. Loch Lomond & The Trossachs National Park Authority has a role to play in minimising this conflict and providing a resolution through bringing key partners together; increasing dialogue between them and developing policy to guide the future management of the Park.

Where there appears to be a conflict between the aims of the Park e.g. conservation versus economic development, the National Parks (Scotland) Act 2000 will give greater weight to conserving and enhancing the natural and cultural heritage. This is called the Sandford Principle.



# 5. CLIMATE CHANGE ACTION PLAN

Scottish Government's Climate Change (Scotland) Act 2009 set world-leading greenhouse gas emissions reduction targets, including a target to reduce emissions by 80 % by 2050 from emission levels in 1990/95.



In early 2017 the Government proposed a new Climate Change Bill with even more ambitious emissions reduction target of up to 90 % by 2050. The documents contain the key commitments for the Scottish Government and places Scotland at the forefront of global efforts to tackle climate change, to create a growing, sustainable and inclusive economy. (Scottish Government climate change timeline)

Within the 2024-2029 National Park Partnership Plan, it is clearly identified that the National Park can offer many benefits to Scotland's environment. In our role as the National Park Authority, we have both the desire and an obligation to protect and enhance the Loch Lomond & The Trossachs National Park. We recognise that climate change will have far reaching effects on Scotland's economy, its people and its environment and we are determined to play our part in rising to this challenge.

We will promote sustainable land use and management practices that better capture carbon and help mitigate against climate change. By taking an integrated approach to land use planning, we can also help deliver significant adaptation to and resilience against climate change for our communities.

As seasonal temperatures and rainfall patterns continue to rapidly change we will see some of our species put under the dual pressures of adapting to a warmer, wetter climate and the emergence of new plant diseases.

The impacts of climate change present very real challenges to National Park, such as:

- the increasing frequency of flood events across the area of the Park
- risk of major landslide event due to oversaturation resulting in significant disruption to strategic transport routes
- loss of biodiversity.

These threats require us to work to create more dynamic and resilient natural ecosystems where habitats are allowed to adapt to a changing world. As an organisation, we will work towards minimising our carbon emissions, working together with partner organisations to deliver much more comprehensive action plans, climate resilient services, processes and projects and raise awareness of the negative effects of climate change on the Park-wide scale.

➤ [Climate Change Action Plan](#)



# 6. HABITATS AND SPECIES

The National Park is home for a huge variety of biodiversity, including a number of rare species and habitats which are conservation priorities at a UK and Scottish level.

The National Park straddles the Highland Boundary Fault so the area contains both lowland and highland habitats. This variety of habitats means that the National Park supports a wide range of species. Across the Park, 67 sites are designated for their special nature conservation value and the Park holds strategically important populations of species, such as Atlantic salmon, golden eagle and native oak woods amongst others.



## WOODLAND

A significant proportion of the National Park is covered in woodland and forest. Woodlands within the Park really are some of our most valuable habitats. Some are recognised as Sites of Special Scientific Interest and Special Areas of Conservation. That means our woodlands and the species they support are so valuable they have international significance. Trees store carbon and so by maintaining our woodlands and forest cover in a sustainable way we are also helping to combat climate change.



## WATER

The freshwater lochs in the National Park are some of the best-loved landscape features within the area. Along with Loch Lomond, there are 21 other large lochs and numerous smaller lochs and lochans. There are also approximately 50 rivers and larger burns. The National Park also includes 39 miles of coastline around three sea lochs.

The National Park is also a source of two major river systems. One of the impacts of climate change is an increase in the number of heavy rainfall events which results in localised flooding when the rivers are in spate. We need to help our habitats adapt to increased flooding and also look at 'soft engineering' solutions which lowers the flood risk to land and houses.

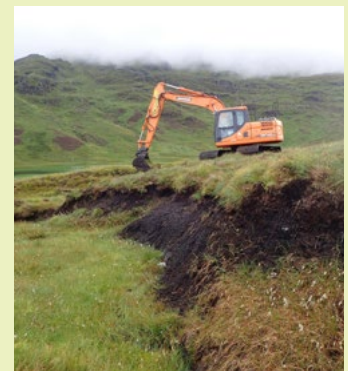
All this water is also a renewable resource and can be harnessed to generate hydroelectric power as a way to mitigate against climate change. Further information on this is available from our website:

➡ [Geography Case Study on Hydro Electric Power](#)

## MOUNTAIN BOGS & PEATLAND

Our wet, wild mountains are the perfect place to form a unique habitat – our mountain bogs. As the rain falls, a special kind of moss called sphagnum grows – it grows in deep layers. The layers gradually smooth out the features of the land like a blanket on a bed – we call it a blanket bog.

Deep peat is particularly important in locking up carbon. Collectively Scottish peat bogs hold ten times the carbon of the UK forests. Conserving our deep peat areas in the National Park is one way that we can help combat climate change and maintain our carbon stores.



# 7. LAND USE IN THE NATIONAL PARK

These landscapes have been created and shaped by both natural and human forces over millennia, and are continuously evolving as climate and the use of the land changes. In recent history significant land use changes have included the spread of commercial forestry, the abandonment of grazing land for livestock in some areas and the growth of renewable energy production such as

run of river hydro schemes in parts of the Park and wind farm developments just outside the Park boundary.

Most land within the Park is owned and managed by private individuals or businesses. The management of the land shapes the landscapes, the habitats and species and special qualities, as well as being an integral part of the economy and employment in the Park.

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## LAND USE

- 65% Agriculture – mainly extensive livestock farming (hill sheep and beef cattle), not much arable farming
- 27% Woodland cover – swathes of commercial forestry plantations, but also ancient broadleaves, wood pasture, farmland and policy trees
- 7% Water – lochs and rivers



## LAND OWNERSHIP/MANAGEMENT

- 56% private – farms and estates
- 38% Public – mainly Forestry & Land Scotland
- 5% Charities and Non Governmental Organisations – includes RSPB (Nature Reserves), The Woodland Trust, the National Trust for Scotland

The National Park has a range of species that are under pressure from land-use changes, climate change, recreational impacts and other issues. Focusing on having habitats and ecosystems in good health will benefit the largest number of species that are reliant on those habitats.

There are however a few species in particular for conservation management action include wading birds, Greenland white-fronted geese, black grouse, red squirrel, powan, salmon and water vole. Managing and protecting the Park's natural heritage, cultural heritage, land and water resources in a sustainable way is central to being a National Park.

## SUMMARY

In conserving our nature we need to understand the impacts that climate change will have on our habitats and species. Research that helps to inform us of predicted impacts will enable us to respond and adapt our land management to minimise the impact of climate change. In particular, ensuring that habitat networks are in good health and habitats are not fragmented will help some species to move through the landscape to locations with more favourable conditions.

# 8. OTHER RESOURCES TO SUPPORT FIELD VISITS TO THE NATIONAL PARK

## RESOURCE PACKS

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A teachers guide for visiting Inchcailloch is available for Loch Lomond National Nature Reserve (NNR). It provides guidance for schools and groups to help organise a visit to the island. [Download the guide here](#)

'Getting into National Parks and National Nature Reserves' contains advice and guidance for teachers and group leaders on planning a visit to National Parks and NNRs. [Download the pack here](#)

## EDUCATION SCOTLAND

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Education Scotland's [on-line resource](#) provides a wealth of information, guidance, advice and resources for taking learning outdoors.

## OUTDOOR LEARNING DIRECTORY

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[Scotland's Outdoor Learning Directory](#) aims to provide a portal to services supporting outdoor learning which are provided by a collaboration between Cairngorms National Park, Loch Lomond & The Trossachs National Park, Forestry Commission Scotland, Royal Botanic Gardens Edinburgh, Scottish Environmental Protection Agency and Scottish Natural Heritage.

## NATIONAL PARK RANGER SERVICE

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Make use of the National Park Ranger service to enrich your learning experience. [To book visit our website](#) or e-mail [education@lochlomond-trossachs.org](mailto:education@lochlomond-trossachs.org)

## NATIONAL NATURE RESERVES (NNRS)

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There are two NNRs in the Park, Inchcailloch and The Great Trossachs Forest which protect an amazing range of wildlife and landscapes, where you can base your visit and learning experience. [Find these NNRs here.](#)

## FORESTS AND WOODLANDS

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Discover the sights, sounds and experiences of the forest at Forestry and Land Scotland sites in the Park, including Queen Elizabeth Forest Park in Aberfoyle and Argyll Forest Park in Glenbranter, Argyll. [Find out more here.](#)

## TRAVEL GRANT

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A travel grant scheme is available to support schools and groups to make educational visits to the Park, offering up to £200 or 75% of transport costs. [Download the application form and guidance here.](#)

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**PUBLISHED BY**

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