

# DUMFRIES & GALLOWAY LOCAL BIODIVERSITY ACTION PLAN

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### Photographs

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Where possible, the photographs used in this publication have been taken in Dumfries & Galloway. All such photographs are captioned with the place and date that they were taken. Photographs not from Dumfries & Galloway are not captioned with place or date.



## Endorsement by the Dumfries & Galloway Biodiversity Partnership

The Dumfries and Galloway Biodiversity Partnership comprises of around 80 local groups, businesses, voluntary organisations and statutory agencies. There is no formal membership or written constitution; any organisation or individual that contributes to achieving the aims and objectives of the Local Biodiversity Action Plan is automatically deemed to be a partner. All partners are committed to understanding, safeguarding, restoring and celebrating biodiversity within the Dumfries and Galloway Council area.

The Partnership is co-ordinated by a Steering Group consisting of around 15 key partners, though membership of the Steering Group is open to all partners. The purpose of the Steering Group is to provide guidance and support to the Biodiversity Partnership in order to make progress on the key strategic biodiversity issues in Dumfries and Galloway. It meets on a quarterly basis, is chaired by an elected chairperson and serviced by the Council's Biodiversity Officer. It has no budget of its own.

The Partnership convenes smaller Working Groups as necessary to address specific issues arising from the Dumfries and Galloway LBAP.

### Our Aims

The aims of the Dumfries and Galloway Biodiversity Partnership are:

- To identify and address strategic and/or pan-Dumfries and Galloway biodiversity issues.
- To review and monitor biodiversity actions contained within the LBAP, with reference to the Scottish Biodiversity Strategy Implementation Plans.
- To provide a link between local groups and national biodiversity strategies, action plans and reporting procedures.
- To raise awareness and promote biodiversity by championing individual actions and biodiversity issues generally

### Our Commitment

In recognition of the above, we the undersigned pledge our co-operation, commitment and support to the implementation of the Dumfries and Galloway Biodiversity Local Biodiversity Action Plan and undertake to use our best endeavours to:

- Take cognisance of the Dumfries and Galloway LBAP in the day-to-day business of our organisations.
- Identify sources of funding to deliver Dumfries and Galloway LBAP.
- Provide guidance and support to other biodiversity partners.
- Monitor and report on progress with the Dumfries and Galloway LBAP.



*Roger B. Grant*

Roger Grant, Chair Planning,  
Housing & Environment Committee



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John Dougan, Conservator  
Rob Soutar, Galloway Forest District Manager  
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**The Scottish Government**

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Marcus Maxwell, Chair Dumfries & Galloway



*Chris Rollie*

Chris Rollie, Area Manager



*Colin Mitchell*

Colin Mitchell, Chairman



*Gordon Mann*

Gordon Mann, Chairman



**Scottish Natural Heritage**  
All of nature for all of Scotland

*Chris Miles*

Chris Miles, Area Manager



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Dumfries & Galloway has as great a range of biodiversity as you are likely to find anywhere in the UK. With two hundred miles of coastline lapped by the warming influence of the gulf stream, its central position in the British land mass and remarkably varied topography and habitats, the region holds the northernmost of some 'southern' species and the southernmost of some 'northern' species. This 'best of both worlds' bonus applies across a broad spectrum of flora and fauna, including plants, insects and birds. Moreover, this interest encompasses the whole year, with the region being particularly noted for its migrating and wintering waterfowl, including the entire world population of Svalbard barnacle geese, which spend the winter on the Solway - mainly in Dumfries & Galloway.

The term biodiversity was given special significance and prominence at the 1992 Rio 'Earth Summit' where the UK and 150 other countries pledged, through the Convention on Biological Diversity, to take local action to look after wildlife and thereby ensure its global sustainability. The resulting publication in 1994 of the UK Biodiversity Action Plan stimulated a plethora of local action plans, including the Dumfries & Galloway Local Biodiversity Action Plan (LBAP). Launched by our partnership in 1999, this was the first comprehensive plan of its kind in Scotland, winning both national and UK awards, and setting a benchmark example for others to follow in the local conservation of biodiversity.

Other sectors and industries had had their plans and strategies for years, but here for the first time was a comprehensive initiative and action plan focusing on maintaining, enhancing and promoting our wonderful wildlife for its own sake, and for the benefit of local people and visitors alike, whilst at the same time contributing to this wider national and international effort as envisaged in Rio.

The achievements of the LBAP are many and varied, but include a superb Environmental Resource Centre, launched by Deputy Minister for Environment and Rural Development Allan Wilson in 2004. This truly first rate community resource receives hundreds of thousands of records and delivers high quality information, training and volunteering opportunities across the region. More than 45 Local Wildlife Sites have been designated and landowners given information and advice to incorporate into their decision making. There has been a significant increase in the restoration of native broadleaves, including riparian planting to benefit salmon. Habitat enhancement has also been undertaken for black grouse and nightjar, whilst there has been significant creation of reedbed and restoration of raised bog. A 'best practice project' has enabled local farmers to establish demonstration sites of good practice in managing for wildlife, whilst biodiversity has been integrated into roadside management by the local authority and the idea picked up nationally, too. Research has been undertaken on merse (saltmarsh) and sparling (a rare fish), whilst vendace, and red kites have been reintroduced into the region.

The LBAP has also benefited wildlife viewing and nature based tourism, with new facilities at Wigtown Bay and the establishment of an annual wildlife festival attracting over 2,000 participants per year. The Galloway Kite Trail was established in 2003 and has made a significant contribution to the local economy as well as encouraging people to enjoy the fantastic spectacle of kites around Loch Ken. These are just some of the achievements of the LBAP; there are many others.

The new LBAP builds on existing achievements and sets out a challenging programme of new actions, reflecting some changes in the national status and priority of species and habitats. For example, the number of priority species found in Dumfries & Galloway is now over 400, and whilst there are existing plans for some of these, naturally they can only be referred to in a document of this size, with more information being available on the web site. Biodiversity remains at considerable threat from land-use and climate changes, and a key challenge for this plan will be to optimise opportunities to maintain and link habitats in ecologically robust networks that can minimise adverse effects on our wildlife in the future.

One of the innovative and exciting aspects of this new plan is recognition that habitats are more than simply collections of species, but also include the physical aspects of the landscape, and what a varied landscape that is! From the grassy heather moors of Langholm and the whaleback hills of Moffatdale, to the shimmering sands of the Solway and increasingly rocky Stewartry coast, back-dropped by the famously rugged grandeur of the Galloway Hills, especially the granite massifs of Criffel, Cairnsmore and the Dungeon Hills. Beyond these to the west lie the magical Machars, Moors and Rhins of Wigtownshire, which have an almost Hebridean quality, bounded as they are by stunning lichen-cliffs and shining seascapes. The new LBAP reflects the importance of these physical aspects in a new section on geodiversity, which it is hoped will help to protect and raise awareness of these physical riches upon which our wonderful biodiversity depends.

It is now a statutory duty upon all public bodies to have regard to the protection and enhancement of key biodiversity in the undertaking of their work, and various legislative instruments and processes require rigorous environmental assessment of proposed new developments to ensure this. However, it is local pressure and local action that will deliver the desired halt in biodiversity loss and generate habitat enhancement, and this can only be achieved by continually engaging communities and young people in the wonder and needs of their wildlife. This document plays a key role in this and should therefore be used by everyone, from individuals to large companies and other organisations, as a starting point in learning more about our biodiversity and as a guide in finding out what we can all do to protect and enhance it for future generations to enjoy.

Chris Rollie  
RSPB Area Manager



The first edition of the Dumfries & Galloway Local Biodiversity Action Plan (LBAP) was published in June 1999. It was one of the first LBAPs in Scotland and went on to win the Royal Town Planning Institute's Scottish Award for Quality in Planning and the Scottish Silver Green Apple Trophy for Environmental Best Practice.

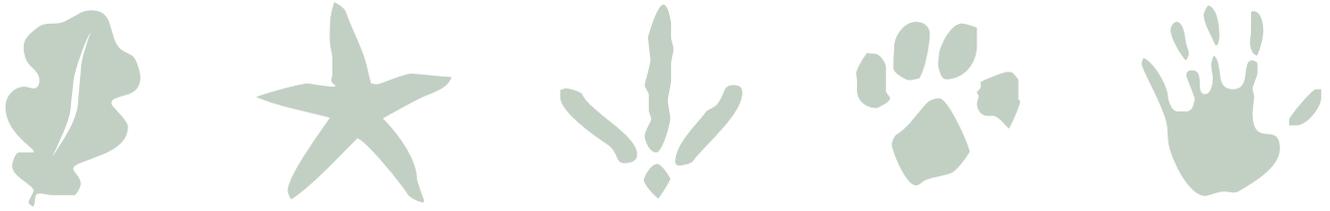
Since 1999, more than 80 organisations have become part of the Dumfries & Galloway Biodiversity Partnership, and have taken positive action towards LBAP targets. Individuals, land managers, communities, businesses, voluntary environmental groups and statutory agencies have all contributed successful projects, large and small, that have helped protect and enhance the special biodiversity of Dumfries & Galloway.

But much has changed since 1999. This document updates the Dumfries & Galloway LBAP and provides new targets for the years ahead that will enable everyone to further the conservation of biodiversity in the region.

### **What is Biodiversity?**

Biodiversity is short for biological diversity. It simply means the variety of life - the great richness of living things in the natural world, everything from the smallest insect to the largest whale, from tiny toadstools to huge ancient trees. Biodiversity is more than just a few rare animals and plants; it includes the huge array of species and habitats, the genetic variation contained within these, and it includes people.





## Making best use of the Dumfries & Galloway Local Biodiversity Action Plan

The Dumfries & Galloway Local Biodiversity Action Plan is intended as a working document to be used by a wide cross section of people to take positive steps to conserve and enhance biodiversity. Different people will use it in different ways, and not all sections will be relevant to everyone. Rather it should be used as a tool to guide conservation action in those areas where the reader can make the greatest difference. For many people this might mean relatively small-scale improvements in the garden; for foresters, farmers, engineers and other land-managers biodiversity improvements will affect greater areas of land; whilst planners and decision-makers will be able to build biodiversity into wider strategic issues. In order to assist with this, the LBAP has been laid out with the following sections:

- **Key Issues** are large-scale issues that will exert a significant influence on biodiversity and its management throughout the lifetime of the plan.
- **Overall Aims** are the key outcomes that the LBAP aims to achieve.
- **Central Objectives** are overarching objectives that will, if implemented, result in significant benefits for all biodiversity across the whole of Dumfries & Galloway. These will be achieved by specific **Central Actions** and/or actions contained in Local Habitat Action Plans.
- **Local Habitat Action Plans** present detailed actions for individual habitats. Semi-natural habitats are classified largely by ecological criteria, whilst highly modified habitats are grouped primarily by different land-uses. However, this is not a scientific classification. Whilst all land in Dumfries & Galloway is covered by at least one action plan, relevant information for some types of habitat may be found in more than one plan. The plans are cross-referenced to facilitate this. Those habitats considered of greatest important for biodiversity are termed Local Priority Habitats.
- **Species Statements** provide an overview of the status, distribution, threats and opportunities for each of the species groups. Unlike the first edition of the LBAP, there are no new detailed Species Action Plans, as the majority of species actions are best achieved through habitat actions. However, the published Species Action Plans from the first edition are still available and will continue to be relevant for much of the lifetime of this second edition. Existing Species Action Plans will be updated and new Species Action Plans published in the future as necessary. Those species considered of greatest importance in the region are termed Local Priority Species.
- **Lead Partners** are identified next to all Central and Habitat Actions. The role of a lead partner is to co-ordinate implementation of an action, but it is expected that other partners will have a role to play in virtually all of the listed actions. As with all local biodiversity action plans, this document is not a statutory requirement and therefore takes a voluntary rather than compulsory approach. Lead partners have committed their support and co-operation to the plan, but uncertainty about future resources and other commitments means that they may not be able to complete all actions.





## KEY ISSUES

Since the first edition of the Dumfries & Galloway Local Biodiversity Action Plan in 1999, a number of issues have increased in importance. Each will exert a significant influence on management for biodiversity during the lifetime of this LBAP, and probably well into the future.

## Climate Change

### 1. Background

Climate change is undoubtedly a reality. Climate is the 'average weather', including variables such as temperature, rainfall and wind, over a period of time at a particular location. Climate change refers to a significant variation in the average climate, persisting over decades or more. Over the 20th century, global temperatures rose by around 0.7°C and 1998 was the warmest year since records began in 1861, with 2005 almost as warm.

Some climate change is the result of natural processes, but changes in global climate have also arisen due to human activities that have altered the gaseous composition of the earth's atmosphere. Gases such as water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), and ozone (O<sub>3</sub>) naturally trap the sun's heat in the earth's atmosphere. In doing so they warm the earth's surface by over 30°C to a level at which humans and other living things can survive. This is known as the '**greenhouse effect**'. Evidence now points to climate change well in excess of natural trends resulting from increased concentrations of greenhouse gases in the atmosphere since the industrial revolution, primarily from the burning of coal, oil and gas.

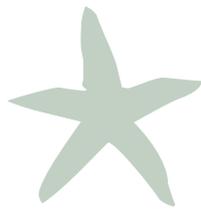


*Snow may become a rare occurrence in future winters. Dalveen Pass March 2008 (Peter Norman)*

The extent to which human and natural systems across the world will be affected will vary greatly from place to place. The government funded Climate Change Scenarios for the United Kingdom was published in 2002. In Scotland it is predicted that:

- Annual temperatures averaged across Scotland will rise. In the worst case scenarios this could be by as much as 3.5°C in the summer and 2.5°C in the winter.
- Summers will become generally drier. There may only be a slight reduction in rainfall in the northwest but as much as a 40% reduction in the south and east.
- Winter rainfall will increase by 20-35% in the south, east and northeast.
- Average snowfall amounts will decrease, perhaps by up to 90% depending on location, and snowless winters may become normal in some parts.
- Scotland's sea levels will rise, perhaps by up to 600mm.
- Sea-surface temperatures will increase around the entire Scottish coastline.
- Scotland will have more severe extreme rainfall events, with rainfall from storms in 24 hours up by 25%, expected to occur on average every 2 years, especially in the east.

The impacts of climate change are already being observed in a variety of sectors and some biodiversity changes in Dumfries & Galloway can already be tentatively linked to climate change.



## 2. Implications

Two approaches to climate change are needed – reducing the net emissions of greenhouse gases into the atmosphere, and adapting to the changes that are already inevitable.

**Reducing greenhouse gas emissions** is essential to prevent massive losses of biodiversity. The Scottish target is to reduce emissions by 2.7MtC (million tonnes of carbon or carbon equivalent) per year by 2010. We all have a part to play. For example, one tonne of carbon is emitted by every household in Scotland leaving a 40W light bulb on for 6 minutes, or emitted by around 20 return journeys by plane from Edinburgh to London.

The management of land can act as a source of greenhouse gas emissions, but also a carbon sink or store. **Carbon sequestration** is a process or activity that removes carbon from the atmosphere through the uptake of carbon by growing plants - a **carbon sink**. A **carbon store** locks up this carbon in organic matter.



*Keeled Skimmer, one of several new dragonfly species to move into Dumfries & Galloway in recent years, probably as a result of climate change. Knockman Wood, July 2007. (Pete Robinson).*

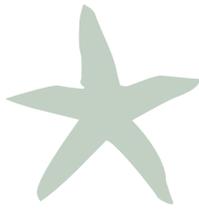
On a global scale, the greatest stocks of carbon are stored in rocks and soil (65,000,000 gigatonnes of carbon) and the oceans (39,000 GtC). That stored in forests (550GtC) and other vegetation (1400GtC) is small in comparison. However, some 4000GtC are stored in fossil fuels and are being released (at the rate of 6.3GtC per year in 2003). In the short-term, land-use activities have the greatest capacity to remove some of this additional carbon from the atmosphere.

In Scotland, forestry and other land-uses (excluding agriculture) are currently net carbon sinks. Although they emit greenhouse gases (some 8% of total Scottish emissions in 2003), they absorb much more. Furthermore, the size of this carbon sink has increased from 0.8MtC in 1990 to 1.3MtC in 2003, primarily through forest growth. However, the carbon sink function from forestry can be temporary and dependent on the subsequent use of forest products. Absorbed carbon can be released again through forest fires, diseases, and soil disturbance by forestry operations, including planting. Burning wood fuel results in carbon emissions but the net result can be neutral or positive if the carbon absorbed during its growth is taken into consideration, and the wood fuel substitutes for fossil fuels. Substituting timber and wood products for energy-intensive building materials such as concrete and steel can also result in a neutral or positive net balance of greenhouse gases.

Agriculture is less effective in reducing greenhouse gases than other land-uses (12% of total emissions in Scotland in 2003). The main emissions are nitrous oxide from organic and inorganic fertilisers and methane from livestock, with only a small amount of CO<sub>2</sub> from energy use.

Further contributions to minimising climate change could be achieved by a range of land-use modifications:

- Creating new woodlands on soils of low organic content.
- Establishing woody crops, such as short-rotation coppice, as a renewable energy source.
- Expanding the use of wood as a substitute for energy intensive building materials.
- Reducing timber and food miles.
- Encouraging more permanent ground cover such as species rich grassland, heather moorland, and wood pasture.



- Reducing methane emissions from livestock.
- More efficient use of organic and inorganic fertilisers through better application techniques and nutrient management.
- Providing advice to farmers through the Farm Soils Plan, the TIBRE Handbook (Target Input for a Better Rural Environment), and the PEPFAA Code (Prevention of Environmental Pollution from Agricultural Activity).
- Restoring peat bogs.
- Conserving soil organic matter through erosion control, cover crops, crop rotation, and incorporation of crop residue.
- Installing alternatives to so called 'hard engineering' for flood protection, such as natural flood attenuation, which results in fewer greenhouse gas emissions during construction, and sequestration during operation.



*Peatlands lock up more carbon per hectare than any other habitat.  
Barend Moss, near Laurieston, May 2008. (Peter Norman)*

All of the above have the potential to produce significant biodiversity gains, as well as other environmental benefits, if they are correctly located and implemented.

**Adapting to the predicted impacts** will require many different forms of action, including changes to the planning system, a different response to flood risks, new building design and construction techniques, and the modification of business activities. The net effect of climate change on the biodiversity of Dumfries & Galloway remains uncertain, but the likelihood is that many more species will be lost than gained unless measures can be put in place to allow species to adapt to the anticipated changes.

A few species are capable of rapid movement and adaptation and have become common, but many others occur only in very low numbers over a wide area, even if ideal habitat is available. These species rely on occasional genetic exchange over a large area (the metapopulation concept). Areas of unsuitable habitat act as a barrier to this exchange, resulting in small and isolated colonies that are unsustainable in the long term.

Should climate change produce environmental conditions that are no longer suitable for a particular species, then this scenario will be greatly exacerbated. Many species will be prevented from moving by areas of unsuitable countryside, even if new areas with suitable environmental conditions are created elsewhere. To counteract this, action is needed at two levels. Firstly, the conservation and enhancement of key biodiversity hotspots is essential to strengthen the ability of species and habitats to withstand a changing climate. Secondly, restoration of substantial areas of the countryside between these hotspots will allow species to move from place to place and successfully adapt to climate change.



## Continued Biodiversity Loss

### 1. Background

Biodiversity is naturally dynamic. Natural processes lead to fluctuations in populations, and periodically to extinctions. Since the arrival of Mesolithic man, biodiversity has also been affected, both positively and negatively, by human activities. Our current diversity of species reflects millennia of interactions between people and nature.

In the 18th and 19th centuries, and especially in the 20th century, the rate of change dramatically increased. The net result of intensification of land use and other development pressures in both urban and rural areas was a reduction in semi-natural land, estimated at 17% in the 40 years or so up to 1988. As a consequence of fragmentation or degradation of the remaining semi-natural habitats, populations of many species declined to non-viable levels; others were directly destroyed.

In the last two decades, some declines appear to have been arrested or reversed through habitat restoration or species management. This will not be possible for all habitats and species. Restoration of seabed life for example to some, mostly unknown, pristine condition that pertained prior to exploitation is unachievable. For others, it may take a considerable amount of time to reverse adverse trends, though progress is being made in many cases.

Of the 45 priority habitats and 391 priority species covered by the first UK Biodiversity Action Plan, monitoring in 2005 identified the following trends:

- 22% of priority habitats and 11% of priority species were increasing.
- 39% of priority habitats and 27% of priority species were declining, but the decline was slowing for 25% of all habitats and 10% of all species.
- The UK trend was unknown for 24% of priority habitats and 13% of priority species.
- Habitat loss/degradation (particularly due to agriculture and infrastructure development) and global warming were the current or emerging threats of significance to the highest proportion of priority species and habitats.

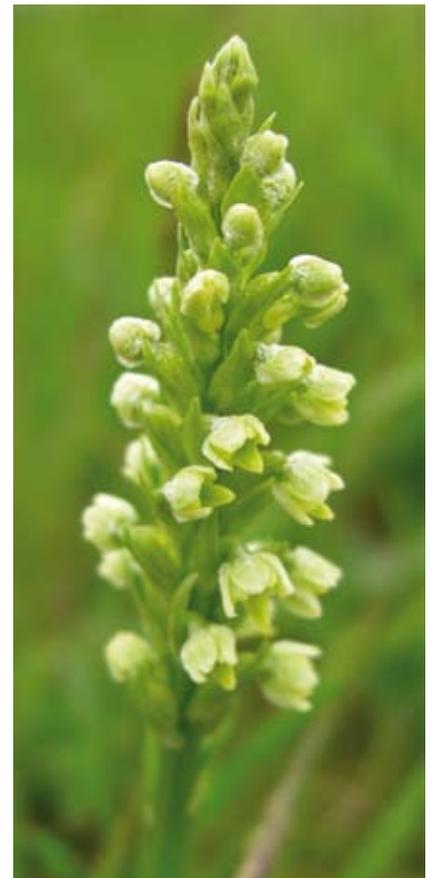
Whilst at global level, the target is 'to achieve a significant reduction of the current rate of biodiversity loss', the one addressed at European Union level, is even more ambitious - to halt the loss of biodiversity by 2010. Overall, whilst some signs are encouraging, there is still more to do to meet the 2010 target.

### 2. Implications

Many favourable trends in biodiversity have been brought about, or assisted, by political or other strategic level intervention, regulation and the promotion and funding of better land and water management practices. Biodiversity Action Plans have identified vulnerable habitats and species for targeted action, but must continue to tackle the many problems that remain, recognising that new concerns will emerge through time.



*Pearl-bordered Fritillary butterfly, once widespread in Dumfries & Galloway but now very rare. (Peter Norman)*



*Small White Orchid, nearing extinction in Dumfries & Galloway. (Peter Norman)*



## Environmental Inequalities

### 1. Background

Biodiversity offers many opportunities and benefits to people, but there are inequalities in the sharing of these benefits.

Nationally, environmental inequalities are now recognised to affect both urban and rural areas. The most deprived communities are often those most vulnerable to the pressures of poor local environments. They tend to have the poorest access to environmental information and the fewest opportunities for people to participate in decisions affecting their local environments. Much of the research to date has centred on air and water quality as affected by industry, energy and transport, but biodiversity benefits are also unevenly spread throughout society. Environmental inequality studies have also been centred in areas of high population, but inequalities of biodiversity are just as likely to apply in sparsely populated areas such as Dumfries & Galloway.



*Easily accessible greenspace is not evenly distributed. Dock Park, Dumfries, July 2008. (Peter Norman)*

A study by the Scotland & Northern Ireland Forum for Environmental Research (SNIFFER) in 2005 identified the following issues:

- For industrial pollution, derelict land and river water quality there is a strong relationship with deprivation. People in the most deprived areas are far more likely to be living near to these sources of potential negative environmental impact than people in less deprived areas.
- For landfills and quarries and open cast sites the patterns of relationship between deprivation and population proximity is less distinct, with no evidence at a national scale that deprived populations are more likely to live near to landfill sites, and limited evidence for quarries and open cast sites.
- People living in deprived areas are less likely to live near to areas of woodland. However, areas of new woodland have tended towards deprived populations.
- For greenspace, the analysis showed that both the least and most deprived areas in Scotland have high percentages of people living near to a local designated wildlife site, indicating that there is no simple relationship.
- People living in the most deprived areas are more likely to experience the poorest air quality. Levels of nitrogen dioxide are especially concentrated in the most deprived areas.

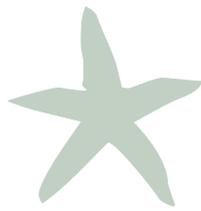
### 2. Implications

**Environmental justice** aims to secure a fairer future, enabling all individuals and communities to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generations. It is concerned both with local-level environmental problems and larger-scale sources of pollution, and with both the built and natural environments.

Environmental justice in the biodiversity sector should be achieved through quality of life improvements:

- Tackling problems on the ground leading to improvements in local biodiversity.
- Building biodiversity objectives into regeneration.
- Improving biodiversity in greenspaces and the places people live and work.
- Providing access to biodiversity information and biodiversity learning opportunities for all.

Addressing issues of biodiversity inequality should assist in reducing the social and health disparities, and the spreading of biodiversity awareness and education throughout society will result in significant biodiversity gains.



## Agricultural and Forestry Change

### 1. Background

Farming and forestry are the dominant land-uses in Dumfries & Galloway. They are key contributors to the environment, biodiversity and sustainable development, as well as to the well being of rural communities and local economies.

Historically, the land has been farmed and wood products harvested from it for more than 5,000 years. Both activities have always been subject to constant change. Initially they were practised on the same land - only since the 18th century has there been a clear distinction between farming and forestry and an obvious demarcation of land for one purpose or the other. However,



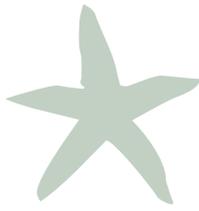
*Forest operations. Garrogill, near Moffat, March 2007. (Richard Mearns)*

the mid-20th century saw a rate of change for both land-uses never experienced before, largely driven by a desire to yield more food and timber. This resulted in an intensification of production, often at the expense of natural ecosystems, which was exacerbated by entry to the European Economic Community in 1973 and the adoption of the **Common Agricultural Policy** (CAP), together with tax incentives that encouraged large scale conifer afforestation. One result of this was that Dumfries & Galloway became the most heavily forested region in the UK, whilst the numbers of sheep on the remaining open ground increased by around 50%. The late 20th century heralded a further change in both international policy and trade, and increasing environmental concerns.

Since publication of the first edition of the LBAP in 1999, changes to both industries have continued at a rapid rate. **Reform of CAP** in 2003 resulted in the 'decoupling' of agricultural support subsidies from production subsidies, removing the incentive to maximise production. Farmers receive Single Farm Payments in return for meeting an agreed standard of agricultural and environmental practice, but they may also qualify for payments in recognition of work done to deliver additional public benefits such as environmental enhancement, better recreational access or improved animal health and welfare. These are delivered through a system of **Rural Development Contracts**. Since 2007 subsidies for the forestry industry are also part of Rural Development Contracts system.



*Ploughing. Dumfriesshire, April 2008. (Richard Mearns)*



A range of additional issues will result in further changes for both agriculture and forestry:

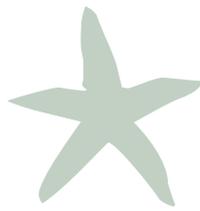
- A requirement to contribute towards mitigating climate change. This may lead to, for example, the production of energy crops and conversion of by-products into energy; making more effective use of renewable resources; managing land to minimise carbon loss; managing methane emissions; reducing other greenhouse gases from transport and other activities, and becoming more energy efficient.
- Due to climate change and competition with land used for energy production, there may be greater demand for land to produce food. This may impact on semi-natural land of high biodiversity value.
- Changing international trading arrangements arising from World Trade Organisation agreements. This may have a major impact on prices, whilst increased market access to the European Union may have further consequences for some sectors.
- Financial pressures resulting from the enlargement of the European Union. This may lead to reductions in the level of subsidies and consequent changes to land management.
- New animal and plant diseases, perhaps exacerbated by climate change and globalisation of trade, requiring higher levels of biosecurity.



*Traditional breeds, such as Longhorn cattle, are particularly suitable for grazing many semi-natural grasslands. Colvend, July 2007. (Richard Mearns)*

## 2. Implications

Agricultural and forestry change will continue to provide many challenges, but it will also provide new opportunities to influence farming and forestry practices for the benefit of biodiversity. For the foreseeable future, Rural Development Contacts will provide the single largest financial input into biodiversity conservation, affecting the greatest area of land in Dumfries & Galloway.



## Higher Priority for the Marine Environment

### 1. Background

Marine and coastal waters are high in biodiversity. They also provide food, recreation and the potential for energy production.

Nationally, marine policy has a history of haphazard development, presenting a confusing and fragmented management framework to those involved in marine activities. Marine biodiversity and its management have been especially neglected, both in terms of research and public awareness. In Dumfries & Galloway, in comparison to the land, little is known about marine biodiversity and trends. There have been few projects specifically aimed at managing and enhancing marine biodiversity.



*Mauve Stinger Jellyfish. (Paul Naylor)*

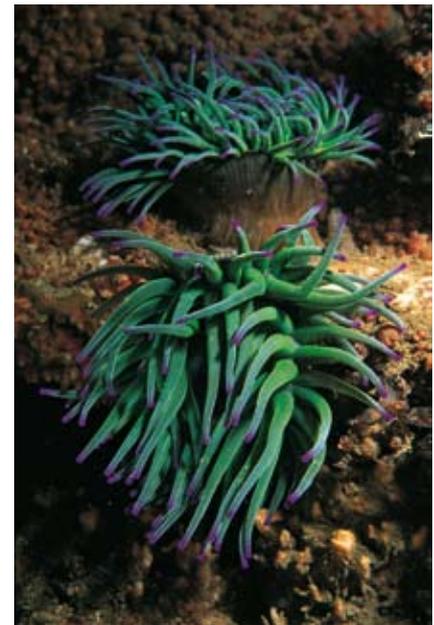
Recent initiatives have begun to address these issues, examining how activities interrelate, and aiming to strike the right balance between social, economic and environmental considerations. These initiatives have been driven by the increasing range of potential impacts, including climate change, sea-level rise, renewable energy, commercial fisheries/aquaculture, exploitation of mineral resources, shipping, coastal/marine development, waste disposal and tourism and recreation.

### 2. Implications

At a UK and Scottish level new management framework options for the sustainable development of marine resources have been discussed, including a draft Scottish Marine Bill, published in 2008. This is likely to result in policy and legislation changes within the lifetime of this LBAP.

Future changes to marine policy and legislation may result in:

- The establishment of a larger network of nationally important marine protected areas. Locally, Dumfries & Galloway has two marine areas protected under European legislation, at Luce Bay and in the inner Solway. Options for establishing a coastal and marine national park have also been explored.
- The introduction of a marine spatial planning system that guides how and where we use and exploit the sea including fishing, oil and gas exploration, offshore wind development, shipping and coastal development, to avoid conflicts between different users and prevent damage to marine biodiversity.
- Reforms in the laws governing inshore fisheries to provide a viable and sustainable future for fish stocks and fishermen.
- Strengthened laws to protect vulnerable marine species and habitats. For example, a marine wildlife watching Code of Practice has recently been introduced under the Nature Conservation (Scotland) Act 2004.



*Snakelocks Anemone, mainly restricted to the west coast of Britain including The Rhins. (Paul Naylor)*



*Flabellina pedata, one of several colourful sea slugs found in coastal waters. (Paul Naylor)*



## Higher Standards of Water Quality

### 1. Background

Good quality water is of fundamental importance to biodiversity.

Prior to the rapid agricultural and industrial changes of the 1800s, Scotland's rivers were generally of very good quality. The deterioration of river water quality throughout the 19th and 20th centuries was mainly caused by the discharge of sewage and changes in agricultural and industrial practices that accompanied the economic lifestyle of the time. Significant efforts to restore Scotland's rivers did not occur until the 1960s. Reductions in heavy industry, the enforcement of new legislation and heightened environmental awareness all contributed to improvements in water quality.



*The aquatic larvae of stoneflies are good indicators of clean water.  
(Peter Norman)*

In Galloway, acidification of freshwaters increased during the early and mid 20<sup>th</sup> century. High levels of acidifying pollutants, including oxides of sulphur and nitrogen arising from the burning of fossil fuels and ammonia from intensive livestock rearing, were deposited from the atmosphere. The thin soils overlying hard, slow-weathering rocks had little capacity to neutralise the acidity, and the problems were exacerbated by extensive forestry, as mature coniferous forest filters pollutants from the atmosphere which are then washed into surrounding watercourses. This resulted in acidification of surface waters and significant damage to aquatic ecology. From the end of the 1970s reduced levels of pollutants resulted in a substantial decrease in acidic deposition, followed by more stable concentrations from the 1990s. Attempts have been made to mitigate the effects of acidification, for example by liming of Loch Dee, though such measures cannot provide long-term solutions to the problem. Modifications to forest practice have also reduced the impact, but parts of Galloway remain affected by acidification.

Eutrophication, or nutrient over-enrichment, affected soils and watercourses in Dumfries & Galloway during the 20<sup>th</sup> century and remains a problem in many freshwaters. Soils have become overloaded with phosphates as a result of nutrient inputs from slurry and fertiliser, together with nutrient-loading from other sources such as sewage treatment works and rural dwellings. These nutrients reach waterbodies through point discharges, such as sewage outfalls or farm waste pollution incidents, or more insidiously by percolation through soils, often referred to as diffuse pollution. Eutrophication causes loss of critical water quality resulting in reductions in biodiversity. The development of farm nutrient budgeting is beginning to address such issues.



Since publication of the first edition of the Dumfries & Galloway LBAP in 1999, there has been continued pressure for further water quality improvements. This pressure will be maintained throughout the period of this plan, driven by the requirements of the European Water Framework Directive. This seeks to achieve good water quality across the European Union by 2015, and applies to coastal waters, estuarine waters, inland surface waters and groundwater.

## 2. Implications

The Water Framework Directive requires the preparation of River Basin Management Plans that have a programme of measures designed to:

- Prevent further deterioration, protect and enhance the status of aquatic ecosystems, and have regard to their water needs and terrestrial ecosystems.
- Promote sustainable water use based on long-term protection of available water resources.
- Protect and improve the aquatic environment, in relation to a progressive reduction in priority hazardous substances.
- Ensure the progressive reduction of pollution of groundwater and prevent its further pollution.
- Contribute to the mitigating the effects of floods and droughts.



*Common Reed is increasingly being used to clean water.  
(Northeastwildlife.co.uk)*