



GLASGOW

LOCAL BIODIVERSITY ACTION PLAN



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VISION

Glasgow has a thriving natural environment of connected, vibrant green spaces, providing places for wildlife and people. Citizens and visitors have improved health through increased relaxation, active travel and education opportunities.

The loss of Glasgow's natural resources has been halted and reversed, with habitats and species more resilient and better adapted to change.

Everyone in the city understands why the natural environment is important, everyone contributes and everyone benefits. With colourful, wildflower meadows, tranquil woodlands and abundant wetlands, Glasgow is a great place to work, live and play.



INTRODUCTION



INTRODUCTION

Biodiversity is the variety of living things on Earth, from the smallest insect to the largest mammal and tree. It encompasses the variation within a species and the complex ecosystems, or habitats, where they are found. It is not just restricted to rare species or threatened wildlife sites, but includes the whole of the natural world.

At the national level, there are around 90,000 different species in Scotland and all of these have a role to play directly or indirectly in the lives of Scottish people. They contribute to many of the essentials of our lives – our oxygen, food, clothing, health and relaxation.

Plants and animals play a major part in our traditions and culture. The thistle is Scotland's national emblem and the bonnie purple heather and Scots pine are internationally renowned. However, biodiversity is not just an esoteric term to be used by those enjoying countryside pursuits, it is also important from an economic point of view. The government acknowledges that environmental quality is increasingly a key consideration in industrial and business

investment decisions. Watching wildlife is also developing into an important factor in the tourist industry with the subsequent requirement for firms to manufacture, supply and sell a wide range of items such as water proof clothing and shoes, rucksacks, wildlife books and photographic and optical equipment. All of our farm crops are descended from the wild and many wild plants are being used in research to find cures for various diseases.

At the local level, the name Glasgow is thought to be derived from the Brythonic Celtic 'Cleschu' meaning 'dear green place', whilst the 'fish' (salmon), 'bird' (robin) and 'tree' (originally hazel and now oak) are all an integral

part of Glasgow's 'coat of arms'. However, in the City these days, our lives function around buildings, roads and transport whilst biodiversity can appear to be less visible. Nevertheless, water voles, otters and many types of birds and interesting plants can still be found in the City, if you know where to look.

Glasgow's open spaces with wild plants and native animal species contribute to the health and wellbeing of its citizens. Trees can absorb some pollutants and provide oxygen whilst also providing an attractive, pleasant outlook. In many parts of the City open spaces help to control/absorb water particularly during times of heavy rainfall and help to limit flooding.

To sum up, biodiversity is as much about the quality of our lives, economic development and local distinctiveness as it is nature conservation. A healthy local biodiversity is a reflection of a healthy and sustainable community. It is in our own interests to act now, to preserve our green heritage and also enhance the biodiversity of our City.

Unfortunately, biodiversity is under threat all around us, largely through lack of awareness. However, steps are being taken to help ensure our City's precious resource is protected and our appreciation of biodiversity enhanced.





BACKGROUND



BACKGROUND

International

In 1992, the Convention on Biological Diversity¹ was signed in Rio de Janeiro by 159 world leaders including the UK Government. By doing so, they pledged to help stop the global loss of species, habitats and genetic resources by 'developing national strategies, plans or programmes for the conservation and sustainable use of biodiversity'.

NATIONAL

The UK Government produced the UK Biodiversity Action Plan² in 1994 and in 1996, a Scottish Biodiversity Group was established to take forward those habitat and species action plans specific to Scotland. This Group became the Scottish Biodiversity Forum.

The Nature Conservation (Scotland) Act 2004³ places a duty on Scottish public bodies to further the conservation of biodiversity in the exercising of their functions. It also requires public bodies in complying with the duty to have regard to the Scottish Biodiversity Strategy.

The Strategy currently consists of two documents, 'The Scottish Biodiversity Strategy It's In Your Hands'⁴ and 'The

2020 Challenge for Scotland's Biodiversity'⁵.

The Wildlife and Natural Environment (Scotland) Act 2011⁶ came into force on 01 January 2012 and further places a requirement for all public bodies to make publicly available a report on their compliance with the Biodiversity Duty.

The Scottish Biodiversity List⁷ was published in 2005 to satisfy the requirement under Section 2(4) of the Nature Conservation (Scotland) Act 2004. The purpose of the list is to help public bodies carry out their Biodiversity Duty by identifying the habitats and species which are the highest priority for biodiversity conservation in Scotland. The List has been updated to take account of

changes to the UKBAP priorities list. The list can be found on the Biodiversity Scotland website:

www.biodiversityscotland.gov.uk.

A new document 'Scotland's Biodiversity, a Route Map to 2020'⁸ has been produced to support progress towards the 2020 Challenge and detail how the outcomes and key steps can be achieved through taking six 'Big Steps for Nature'. Under each big step, there are a number of priority projects listed. The work of the Glasgow LBAP will help to achieve the steps and priority projects at a local level up to 2020.

SIX BIG STEPS FOR NATURE

1. Ecosystem restoration
2. Investment in natural capital
3. Quality greenspace for health and education benefits
4. Conserving wildlife in Scotland
5. Sustainable management of land and freshwater
6. Sustainable management of marine and coastal ecosystem

LOCAL

In 1996, Glasgow City Council established a Biodiversity Action Plan Steering Group consisting of officers from various Council Services, outside agencies and interested groups, in order to prepare a Local Biodiversity Action Plan (LBAP) for the City⁹. The LBAP was initially launched in September 2001 with additional habitat and species plans being approved in 2002 and 2005.

The aim of the Glasgow LBAP is to conserve and enhance natural habitats in the city, and to address the decline in biodiversity with a focus on species of national and local conservation concern.

The Glasgow Local Biodiversity Partnership, formed from the original Steering Group and additional interested parties, currently consists of approximately 16 organisations whose aim is to progress the biodiversity process in Glasgow.

The Objectives of the Partnership are to:

- promote the concept and importance of biodiversity in the City to as wide an audience as possible.
- facilitate the implementation, monitoring and review of Glasgow's Local Biodiversity Action Plan.
- ensure that a wide range of organisations, community groups and individuals, particularly children, are able to participate in the biodiversity process in the City.

This document describes the aims, objectives and actions for the LBAP in the period 2017 to 2027. The core objectives remain the same, to protect and enhance biodiversity in Glasgow and to raise awareness of biodiversity to local communities through education, engagement and promoting access to parks, Local Nature Reserves and other urban green spaces.

The LBAP will support the aims and objectives of the Route Map to 2020 and thereafter will support further Scottish Biodiversity Strategies as these are introduced. New LBAP actions and projects will be developed every 3 to 5 years as required.



WHAT HAS CHANGED SINCE THE PREVIOUS LBAP?



WHAT HAS CHANGED SINCE THE PREVIOUS LBAP?

The third tranche of LBAP Action Plans ran until 2010. From 2010 until 2015 there were interim action plans for projects, delivery and lead partners to implement.

In 2010, there were 7 Local Nature Reserves (LNRs). In 2016 there are now 12 LNRs with a further list of potential LNRs identified.

The Wildlife and Natural Environment Act (2011) now places a duty on public bodies to report every three years to Scottish Government on the biodiversity duty.

The new LBAP will take an ecosystems approach to biodiversity protection and enhancement. The ecosystems approach aims to protect individual species and habitats by conserving the whole of the environment in which they are found. Thus there is a focus on broad habitats rather than individual habitats and species (see below, sections 14 and 21).

KEY ACHIEVEMENTS 2001-2017

There are now 12 Local Nature Reserves. These are managed as places for people and nature, to provide thriving local greenspaces.

- 500 hectares of woodlands have been brought in to active management, helping to ensure that the woodland remains a valuable resource for Glasgow's people and nature. This work has included several new and upgraded paths and over 70 hectares of Rhododendron ponticum control.
- Over 2 kilometres of new, species rich hedgerow has been planted at farmland throughout the city; many hedgerows now receive sympathetic management and have been diversified by species enrichment planting.
- Wildflower meadows are colourful, attractive and full of life. Over 22 hectares of park grasslands have been enhanced and are now managed as meadows.
- 80 hectares of species rich wildflower meadows have been enhanced and managed on farms in Glasgow.
- Ponds and wetlands are crucial for a whole range of wildlife, both on the surface and hidden below. 13 park ponds have been naturalised, 22 ponds enhanced and over 55 new ponds created. Glasgow has received 3 awards for wetland creation projects.
- Over 12,000 days of volunteer conservation work have been carried out creating, restoring and managing habitats for wildlife; providing vibrant greenspace in the urban environment for people to enjoy.

- 99% of schools in Glasgow are now registered as Eco Schools.
 - Over 6000 species have been recorded in Glasgow.
 - 14,000 locally grown wildflowers of Glasgow provenance have been planted at sites in the city.
 - Over 700,000 people have attended events that have been held to inspire people to enjoy the outdoors and find out more about biodiversity in their local area. Outdoor activities are fun, free and provide mental and physical benefits.
- Key partnership projects have included the very successful BIG project, developing Friends of Parks/Local Nature Reserves, Allotments and Biodiversity, Wildlife Counts Project, Aren't Birds Brilliant, Bird Friendly Schools, Forest Schools, Eco Schools, Glasgow's Living Waters Project, Wildflower Meadow Creation Trial, WIAT woodland management, Glasgow's Buzzing, Commonhead Moss Bog Restoration project and Farmland Birds. Glasgow has participated in national initiatives including the BBC Breathing Places Springwatch event that attracted over 25,000 people to Kelvingrove Park.



THE NATURAL ENVIROMENT OF GLASGOW



THE NATURAL ENVIRONMENT OF GLASGOW

The landform and geology of Glasgow shaped the natural habitats that are present today. The River Clyde situated in a broad and shallow 'valley' is a central feature of the City. As it flows west towards the sea, it is fed by several tributaries, notably the North and Rotten Calder Waters, the River Kelvin and, eventually, the White Cart Water. These extensive river corridors form the framework of Glasgow's rich network of wetlands, woodlands and grasslands. Greenspace makes up 26% of the City.

The topography is generally low-lying, with land below 10m OD (Ordnance Datum) occurring along a broad band following the Clyde. Only in the far south, as the land rises to the Cathkin Hills, does the altitude reach 200m OD. The low-lying landscape relief is punctuated by a large number (approximately 180) of small hills, called drumlins, that were derived from glacial activity.

GEOLOGY

The majority of Glasgow's bedrocks are of sedimentary origin such as various sandstones, shales, limestones and the Coal Measures. These were laid down as marine deposits or formed in freshwater or wetland swamps.

All date from the Carboniferous Period (360 to 290 million years ago). Igneous rock also occurs interspersed with, and dating from the same period as, the sedimentary rock. Two types can be found: basalt, forming the Cathkin Hills to the south, and more local dolerite intrusions exposed at various locations in the east of the City.

Overlaying the bedrock are superficial deposits, most laid down by glacier ice or meltwater in the last million years. They comprise mostly clays, sands and gravels, and are an important influence on the development of soils. The glacial tills, derived from sandstones, shales and limestones of the Clyde Valley, have encouraged the formation

of a range of brown earth and gley soils throughout the City. On rocky exposures and steep slopes, shallower soils called 'rankers' have formed. However where the land is low-lying and/or poorly draining, alluvial fine sands, silts and clays have been deposited. A special feature of the northeast of the City is the formation of organic peats supporting important fen and raised bog communities.

SOILS

In contrast with much of the rest of Scotland, the local soils tend to be less acidic, falling within a narrow pH range of 4.5 – 6. The type of soils found is a very important factor influencing the type and range of plant species and vegetation occurring within the City. In the 10,000 years or so since the last Ice Age, vegetation naturally recolonised the Glasgow area, firstly by low growing herbs

and shrubs, that are now confined to the high mountain tops further north, but soon after by a range of trees. By the time the first Stone Age hunters arrived the landscape was dominated by natural, broad-leaved woodland (e.g. of oaks, ash and elm) on drier ground, with wet woodland (alder, birch and willows) and open water or wetlands, including developing peat bogs, on low-lying, poorly draining ground.

HISTORY

Glasgow did not begin to rapidly expand to the densely populated conurbation known today until the 18th and 19th Centuries. However the natural landscape had been altered dramatically over the preceding years, since the first human settlers arrived. Medieval Glasgow would have presented a largely pastoral environment with cultivated

farmland and a dramatically reduced woodland cover, as can be readily seen from early engravings and maps of the 17th and 18th Centuries.

Even more dramatic changes to the natural or semi-natural habitats have occurred over the last 150 years or so. The increased urbanisation of industrial and residential developments, and associated pollution, have all tended to impact negatively on the City's natural heritage. However, even though undoubted serious losses have occurred, the City still supports a surprising richness of habitats and species.

WOODLANDS

Glasgow's woodlands today only account for about 2.5% of the total land cover of the City. Of this total only about 80% of the woodlands have been defined as Ancient, Semi-natural or Long Established. It is in examples of such older woodlands that the more natural features of woodland structure and associated plants and animals are found. Many of the more natural woodlands survive on steeper ground, such as on the Cathkin Braes or local sites such as Garscadden Wood, but several valuable woodlands have also survived on the less accessible slopes along the local water courses.

The City has inherited a number of old estate woodlands, many now publicly owned, which form an important backdrop to housing and other developments or are incorporated into public parks. A number of the woodlands form part of a designed landscape and

have important cultural significance. These woodlands include a number of now familiar, exotic species such as sycamore, beech, limes, larches and pines, as well as undershrubs such as rhododendron, cherry laurel and snowberry and various introduced plants in the herb layer.

Low growing scrub also contributes to the woody cover, providing important habitat for animal species, notably invertebrates and birds. Thorny scrub (e.g. gorse, hawthorn, blackthorn and roses) occurs in rural areas, but can extend into urban areas, although waste ground in the latter often supports scrub of birch, willow, elder and, in recent times, buddleia.

GRASSLANDS

Grasslands are an important natural resource but also make a valuable contribution to the landscape, notably on the urban fringe of the City. All grasslands are very much dependent on human activity and traditional management, such as grazing and meadow cutting, helped in the evolution of a range of species rich, unimproved grasslands. However in recent times, intensive agricultural treatments have resulted in the loss of much of this diversity, and today only small, often 'seminatural' patches survive. Grasslands can be important urban features, particularly where a large number of species have colonised waste ground, thus providing a valuable refuge for wildlife. However at such locations active management is usually absent, and over time diversity can decline, as tall grasses, herbs or scrub invades and/or development takes place.

WETLANDS

The City supports a number of standing open water bodies such as Hogganfield, Bishop, Possil and Frankfield Lochs, and various smaller ponds, often in parks, and occasionally on farmland and waste ground. The Forth and Clyde Canal is also a key area of linear open water with an extensive fringe of emergent swamp vegetation. A number of water bodies known from maps and the literature of previous centuries have long since been lost along with any associated mire and swamp vegetation communities. However, the remaining wetlands form some of the most important wildlife sites in the city with rich swamp, fen and bog communities supporting many locally rare plant species and hosting a rich diversity of associated fauna.

FARMLAND

Agricultural activity has greatly influenced the rural fringe of the city and the farmed landscape, despite recent years of intensification, still remains an important resource for wildlife. Arable fields or improved pastures are important, often seasonal, habitats for a variety of bird species such as geese, lapwing and snipe. The associated farm buildings, dykes, field margins, hedgerows, boundary trees, shelter-belts, tracks, ponds and ditches all provide niches for a range of wildlife to utilise.

BUILT ENVIRONMENT

In a large conurbation such as Glasgow, the built environment cannot be ignored when assessing the natural resources of the city. The stonework and roof material particularly of older buildings provide a habitat for lower plants such as mosses, ferns and lichens as well as providing breeding or nesting space for many invertebrates and birds such as house sparrow, starling, house martin, swift and kestrel. Gardens and associated landscape planting can be even more valuable for wildlife, especially if consideration is given to the needs of wildlife during planting and maintenance regimes.

Valuable open spaces do occur, even near to the centre of the city. Some of these are heavily managed for their amenity value, but the short grasslands and parkland trees, some quite old, are important for a number of commoner wildlife species. Open waste ground sites, many the result of industrial

changes in recent years, have proved to be surprisingly rich in botanical diversity; a number of species, including many exotic aliens, can produce rich and colourful displays brightening up waste ground in the heart of the city. Disused and live railways often support diverse fringes of wildlife habitat and can serve as valuable corridor links, allowing species movement between the urban centre and rural fringes. This valuable corridor function is also provided by the rivers, canal, road, cycle and path networks and also small burns and drainage ditches.





THE ACTION PLAN PROCESS



THE ACTION PLAN PROCESS

In 1991, a 'habitat survey'¹⁰, commissioned by the City Council and the (then) Nature Conservancy Council was published. This survey completed the mapping of the vast majority of habitats occurring within the City and confirmed the need for a series of Sites of Importance for Nature Conservation (SINCs). The Council's Natural Environment Team, has continued to monitor and review the environmental resource and this means that the habitats existing within the City are well recorded.

Information on 'Species' is of variable quantity and quality. Records for flowering plants have been well established through the Flora of Glasgow Project. Similarly, birds are well recorded through the local bird recorder of the Scottish Ornithologists' Club (SOC) and the SOC's annually produced 'Clyde Bird Report.' Published information on other animals, particularly invertebrates, and lower plants and fungi is not so comprehensive.





HABITATS AND SPECIES OF NATIONAL CONCERN WHICH OCCUR IN GLASGOW



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A number of the UK BAP Habitats in the SBL can be found within the City as follows:

Eutrophic standing waters	Lowland dry acid grassland
Lowland fens	Lowland heathland
Lowland raised bog	Lowland meadows
Mesotrophic lakes	Open mosaic habitats on previously developed land
Ponds	Purple moor-grass and rush pasture
Reedbeds	Lowland mixed deciduous woodland
Rivers	Wet woodland
Arable field margins	Wood pasture and parkland
Hedgerows	

Ecosystem Statements have been prepared which include the habitats listed, along with an Urban Ecosystem Statement to cover the human environment.

The Scottish Biodiversity List also contains species of varying degrees of rarity, threat or in decline, a number of which occur in the City. For example:

- nationally endangered key bird species such as skylark, song thrush, linnet, reed bunting, spotted flycatcher, tree sparrow and bullfinch can still be found.

- endangered mammals such as brown hare, water vole, pipistrelle bat and european otter; fish such as atlantic salmon; and butterflies such as the small pearl-bordered fritillary are all known to occur.
- The rich plant diversity includes bluebell, river crowfoot and several types of Sphagnum bog-moss.

Priority species will be protected through actions in the relevant Ecosystem Statements. The ecosystems approach aims to protect individual species and habitats by conserving the whole environment in which they are found. Thus the LBAP will focus on broad habitats rather than single species plans.

There is a clear and obvious need to tackle species that are in decline, including those which may be declining in the city context although not nationally. However, we also need to ensure that we continue to address the needs of common species as well. Feeding blue tits and other common garden birds is as important an action as safeguarding a rare bird's nest - both actions reflect the need for everyone to contribute, no matter the scale or impact. Both actions add colour and variety to our lives and to the quality of our environment.

There is a detailed 'Audit of Habitats and Species' which lists all of the 'nationally threatened' habitats and species found in the City. Further information is available on request by emailing les@glasgow.gov.uk.





LBAP ECOSYSTEM STATEMENTS



LBAP ECOSYSTEM STATEMENTS

The Ecosystem Statements are short documents that bring together relevant information on particular habitats or species.

Each statement presents summary background information, including ecological data, followed by a description of current threats but also recent actions aimed at conservation management or protection.

Key objectives and targets for relevant habitats are listed for each Ecosystem Statement (see page 25). It is through the co-ordinated implementation of projects and activities that the statements objectives and targets will be delivered over a ten year period (2017-2027). Actions for habitats and species are detailed in the accompanying LBAP Implementation Plan ([hyperlink to document/webpage](#)).





GLASGOW'S PROTECTED SITES



GLASGOW'S PROTECTED SITES

Glasgow has a suite of statutory and non-statutory protected biodiversity sites within the city boundary.

Sites of Special Scientific Interest (SSSIs) are notified by Scottish Natural Heritage under the Nature Conservation (Scotland) Act 2004. Sites previously notified under the Wildlife and Countryside Act (1981)¹¹ have been carried forward under the 2004 Act. Glasgow has five SSSIs – Fossil Grove, Possil Marsh, Bishop Loch, Waulkmill Glen and Cart & Kittoch.

Local Nature Reserves (LNRs) are designated by Local Authorities using their powers under Section 21 of the 'National Parks and Access to the Countryside Act (1949)¹² as amended. Glasgow currently has twelve LNRs – Bishop Loch, Hogganfield Park, Dawsholm Park, Robroyston Park,

Commonhead Moss, Cathkin Braes, Linn Park, Garscadden Wood, Cardowan Moss, Dams to Darnley, Hamiltonhill Claypit and Malls Mire.

Sites of Importance for Nature Conservation (SINCs) are locally designated non-statutory sites. There are currently 95 SINCs. The sites are considered to be the best areas for wildlife in the city with ecological, scientific, recreational and educational value. Wildlife corridors are included as SINCs to help ensure an integrated habitat network throughout the city. Many of the SINCs are within parks and all LNRs are also SINCs.

Much of our baseline knowledge of the biodiversity value of the SINC's derives from the original 1991 Habitat Survey. There is a need for a review of SINC's which will require an updated Habitat Survey based on revised SINC assessment criteria. A key aim of the intended SINC review will be to provide a citation for each site to explain clearly and succinctly its biodiversity value in terms of habitats and species, links to the integrated

habitat network of the city and ease of public access for education and enjoyment. The SINC citations will be included in a future iteration of the Natural Environment Supplementary Guidance prepared to support the City Development Plan with the aim of protecting these sites for the future.





LNR VISION



LNR VISION

LNRs are important to the City as they provide the following benefits:

- Protection to areas of local natural interest where there is a good variety of biodiversity.
- Opportunities for people (of all ages and abilities) to learn about, study and research the natural environment including its biodiversity, geology and landform.
- Further quality managed greenspace for health and education benefits throughout Glasgow.
- Opportunities to provide working best practice for the natural environment that can be demonstrated to others.

Declaration of LNRs is done jointly between the Council and Scottish Natural Heritage (SNH) –Under Section 21(6) of the National Parks and Access to the Countryside Act 1949 (as amended). SNH must be consulted by the local authority when undertaking designations of LNRs. In most instances the LNRs declared, up to May 2016, have been on Council owned ground and thus have only involved consultation with SNH.

In recent years there has been widespread acknowledgement by Scottish Local Authorities that nature doesn't stop at administrative boundaries and therefore these site designations increasingly involve joint local authority declarations. Dams to Darnley LNR became the first joint Local

Authority LNR declaration in 2013, when designation of this LNR was completed in partnership with East Renfrewshire Council. To facilitate the future integrity of ecological networks it is likely that more cross local authority boundary LNRs will be declared in the future. This is in line with Scottish Planning Policy 2014 (para 194)¹³ guidance on green/habitat networks and connectivity and their relevance to local development plans.

By May 2016 the declaration of land as LNR in Glasgow had resulted in a total of 12 LNRs, making Glasgow (as Scotland's largest city) the local authority with the most LNRs in Scotland. Glasgow currently has an LNR area of 0.86 hectares per 1,000 population of the city, which far exceeds the original 2013 target of 0.75 hectares of LNR per 1,000 population of the city set in 2008 as part of the Council's SOA (Single Outcome Agreement).

The table lists the LNRs declared up till May 2016 and their size. Currently these LNRs account for almost 5km² of the city area or nearly 3% of the total land area of the city.

Table 1: Local Nature Reserves declared by 04 May 2016 and area

Local Nature Reserve	Date of Designation	Area (ha) in Glasgow	Outside
Bishop Loch	03/11/1995	24.8	
Hogganfield Park	20/03/1998	50.3	
Cardowan Moss	07/04/2006	52.6	
Garscadden Wood	07/04/2006	44.2	
Robroyston Park	07/04/2006	34.2	
Dawsholm Park	16/05/2007	26.9	
Commonhead Moss	17/02/2009	17.6	
Linn Park	04/07/2012	56.1	
Cathkin Braes	27/03/2013	148.6	
Dams to Darnley	28/03/2013	35.0	1.6
Malls Mire	27/02/2015	7.0	
Robroyston Park (extn North)	09/03/2015	2.0	
Robroyston Park (extn South)	04/05/2016	7.1	
Hamiltonhill Claypits	04/05/2016	6.7	
Total by 04/05/16		513.1	

Current SNH guidance on designation states that 'a Local Nature Reserve (LNR) is a protected area of land designated by a local authority because of its local special natural interest and/or educational value'. For these reasons most of the sites declared have either been locally designated sites (Sites of Importance for Nature Conservation) or sites with a predominantly native flora and fauna which have existing community use and/or involvement in the sites' management and promotion for education.

There are still many additional Sites of Importance to Nature Conservation (SINCs) that are in Council ownership and have continued value to biodiversity along with good public access, thus these sites could be considered as candidate LNRs. There is also the potential for other privately owned SINCs, currently being managed for nature conservation, to be included and this would

also assist in creating a network of sites with clear long term management priorities for nature conservation. This wider network of LNR managed habitat would have the added benefit of creating a robust habitat network in the city (and beyond), that includes LNRs, as well as maintaining the value that LNRs have as outdoor educational resources. It would therefore seem prudent to further increase the area of land declared as LNR in the city, especially where this furthers the establishment of functional habitat networks and promotes easy access (i.e. the LNR is within 1km of a built up area) to the LNR.

We are increasing the quantity of LNRs citywide to meet the Access to Natural Greenspace Standard (ANGSt) of 1 hectare of LNR per 1000 population.





CITY DEVELOPMENT PLAN AND ASSOCIATED SUPPLEMENTARY GUIDANCE - NATURAL ENVIRONMENT



CITY DEVELOPMENT PLAN AND ASSOCIATED SUPPLEMENTARY GUIDANCE – NATURAL ENVIRONMENT

The Scottish Planning Policy 2014 introduces a presumption in favour of development that contributes to sustainable development and that policies and decisions should be guided by a number of principles including 'protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment' (para 29).

The Policy indicates that the planning system should 'conserve and enhance protected sites and species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities', 'protect and enhance ancient seminatural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value, and 'seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats'.

Glasgow's City Development Plan¹⁴ (CDP) policy 7: Natural Environment is intended to help with these outcomes. The CDP Supplementary Guidance (SG) is intended to provide further detailed guidance and to be read in conjunction with other CDP policies and associated SG, particularly those on 'Placemaking: the Water Environment' and 'Green Belt and Green Network'.

Amongst other things, policy CDP7 aims to:

- Ensure that Glasgow's natural environments, including its ecosystems and protected species, are safeguarded and, wherever possible, enhanced through new development; and

- Help enhance biodiversity and protect the health and function of ecosystems.

The Natural Environment SG sets out how the biodiversity, landscape and geodiversity of Glasgow will be taken into account when considering all development proposals. Developers are advised to take early note of the guidance for the information on potential wildlife, habitat, landscape and geodiversity requirements it contains, along with constraints and opportunities for new development.

The SG refers, and provides links, to the most up-to-date records of designated nature conservation sites, both statutory and non-statutory, details protected species, invasive species, licensing requirements, mitigation and other biodiversity issues which need to be considered in any development proposal. It makes clear the need for design which ensures that ecological links are not broken but are maintained, repaired or enhanced where possible as part of a green network or integrated habitat network.

SG6 states that 'where a protected or otherwise important (eg Local Biodiversity Action Plan) species or habitat has been identified on, or adjacent to, the site, planning applications shall be supported by an appropriate level of information'.





ECOSYSTEMS APPROACH



ECOSYSTEMS APPROACH

The Ecosystem Approach is a concept that integrates the management of land, water and living resources and aims to reach a balance between three objectives: conservation of biodiversity; its sustainable use; and equitable sharing of benefits arising from the utilisation of natural resources. This translates as: involving people; valuing nature's services; understanding how nature works. It is the primary implementation framework of the Convention on Biological Diversity (CBD).

The ecosystems approach aims to protect individual species and habitats by conserving the whole of the environment in which they are found. In the LBAP we will focus on the conservation and enhancement of broad habitats. By managing the broad habitats for biodiversity, the associated species of that habitat should be protected and enhanced too. Ecosystem statements will include associated habitats and species.

The ecosystems approach works best at a large scale and, in Glasgow, the Seven Lochs Wetlands Park is the main ecosystems demonstration project.

Bringing together 20 sq. km of lochs, parks, nature reserves and woodlands between Glasgow and Coatbridge the Seven Lochs

Wetland Park has vast potential to provide for biodiversity and people. Encompassing seven lochs, five local nature reserves, a country park and one of Glasgow's oldest buildings at Provan Hall, the park's miles of walking and cycling routes provide for active and passive recreation. The Park is home to populations of fossorial water voles, the only site for green hairstreak in Glasgow, key populations of small pearl-bordered fritillary and other special species and habitats.

Glasgow City Council, North Lanarkshire Council, Scottish Natural Heritage, the Forestry Commission Scotland and The Conservation Volunteers have formed a partnership and participate in the Board of Management to develop the park as a place for people, nature and heritage.



INTEGRATED HABITAT NETWORKS



INTEGRATED HABITAT NETWORKS

The fragmentation of habitats is a major cause of biodiversity loss. Fragmentation occurs when a large contiguous area of habitat has been broken apart into smaller pieces, usually by development such as the building of new housing or unsympathetic agricultural practices. Fragmentation can have a devastating effect on species, limiting or preventing their movement and causing the loss of some species entirely from an area.

The Integrated Habitat Network (IHN) Model is a GIS based tool which maps five habitat types and assesses how 'functionally connected' habitat patches are based on the permeability of the intervening landscape for different species. The habitat types are:

- Broadleaved Woodland
- Neutral Grassland
- Acid Grassland
- Heathland
- Fen, marsh and Swamp

The IHN Model can be used as a decision support tool to inform the creation of new habitat in locations which will have the greatest impact in restoring habitat connectivity.

The model can also be used to identify critical links which would have a detrimental impact on connectivity if they were lost.

The Glasgow and Clyde Valley Green Network Partnership has responsibility for facilitating and co-ordinating delivery of the Green Network across the Glasgow city region and has developed a range of tools and guidance to aid this objective. The IHN Model is one of these tools and the Partnership strongly advocates its use to inform the targeting of resources and effort for habitat creation and in master planning for new development and regeneration.

Use of IHN analysis can help identify the location, size and types of habitats needed to complement and mitigate against development impacts, and to protect and enhance biodiversity across Glasgow and the Clyde Valley.

The Glasgow LBAP can help by providing accurate local knowledge of habitats and species for modelling and by identifying where links to the green network are required to be retained or created.

The need for provision, conservation and enhancement of integrated habitat networks throughout the city are detailed in the City Development Plan Supplementary Guidance for Glasgow.





NATURAL CAPITAL



NATURAL CAPITAL

Natural capital is the stock of ecosystems which provides us with a flow of valuable 'ecosystem services'. These services include vital resources such as fresh water, pollination, soil formation and clean air. Nature is essential to our quality of life but it is being lost as it has, until now, not been economically counted and valued.

The ecosystem services can be divided into four groups: provisioning services, regulatory services, cultural services and supporting services.

Provisioning services: these are the products sourced from ecosystems such as fruits, fish and game, fresh water and timber.

Regulatory services: these include climate regulation through carbon capture in peatlands and other habitats, flood protection via wetlands and air quality.

Cultural services: these are the aesthetic, spiritual, recreational and other cultural benefits that people gain from ecosystems.

Supporting Services: these are the processes essential for maintenance and function of ecosystems, such as soil formation, water recycling and photosynthesis.

'Scotland's Biodiversity a Route Map to 2020' considers that a big step for natural capital needs to be taken: 'Investment in natural capital – to ensure that the benefits which nature provides are better understood and appreciated, leading to better management of our renewable and non-renewable natural assets.'

One of the key steps for natural capital (2020 Challenge for Scotland's Biodiversity) is to 'undertake a major programme of peatland conservation, management and restoration'.

In Glasgow, peatland conservation and management is being carried out at Commonhead Moss and other sites to help protect habitats and aid carbon capture and retention. The aims, objectives and actions of the LBAP will help to conserve and enhance the city's natural capital.





CLIMATE CHANGE



CLIMATE CHANGE

Climate change is expected to have a significant impact upon biodiversity in the future. It is considered to be the single greatest threat to Scotland's habitats. There are expected to be temperature increases, drier summers and milder, wetter winters with an increase in overall precipitation and an increase in extreme storm events.

Habitats will be altered in a variety of ways by climate change. Rising sea levels may cause loss of habitats. Changes in temperature will alter the ecological balances that allow particular animals and plant species to survive and thrive in specific habitats and these habitats may be lost or moved, especially those that are already at extremes such as montane areas.

Species with limited dispersal abilities, or which are isolated by habitat fragmentation, may be unable to colonise more suitable areas if habitat becomes unsuitable. Some invasive non-native species will be able to outcompete existing species and will have serious impacts for native habitats and species.

There may be changes in the timings of seasonal events causing changes in synchronicity. For example the time lag between the hatching of birds, in response to warmer temperatures, and the peak populations of insect prey.

Changing rainfall patterns will result in rivers flooding more regularly. Similarly, the risk of more extreme storms will cause flash floods. Local habitats can play a part in flood defences and water storage areas and any habitat management and habitat conservation should take this into consideration.

The LBAP can play a part in mitigating for climate change locally by aiming to reverse habitat fragmentation and to create new, high quality habitat networks which will enable species dispersal. The creation of new ponds (including sustainable urban drainage systems (SUDS)) and maintenance of existing wetlands can aid water storage after flooding incidences. Protecting and enhancing

woodlands, meadows and raised bogs, which act as carbon sinks, will help to reduce the amount of greenhouse gases entering the atmosphere. The Glasgow Invasive Non-Native Species policy will help to prevent the spread of non-natives throughout the city's habitats.





GLASGOW'S POLLINATORS



GLASGOW'S POLLINATORS

Pollination of plants is an essential element of nature and of healthy ecosystems as well as of agricultural crops. Some plants are wind or self pollinated but many are pollinated by animals. Insects play a major role in this and insect pollinators include bees (bumblebees, honeybees and solitary bees), flies, butterflies, moths and beetles.

However many pollinators are declining and there is a need for urgent action to halt and reverse the decline to conserve these species. Key threats include habitat destruction and fragmentation, use of pesticides, diseases and climate change. Scottish Natural Heritage has produced A Pollinator Strategy for Scotland 2016 - 2026 (draft consultation)¹⁵ which details the aims and actions needed to do so. The production of a Glasgow Pollinator Strategy, which focuses on our local pollinators' needs, is an action within the Urban Ecosystem.





WATER VOLE PLAN



WATER VOLE PLAN

Glasgow has always been a stronghold for water voles within the central belt with populations recorded in wetlands including ditches, marshes, ponds, rivers and canals.

In 2008, water voles were discovered living away from water and since then large populations have been recorded in the east end of the city living in long grassland in parks, road verges, gardens and derelict land. These terrestrial water voles are termed 'fossorial' which means mole-like as they spend more time underground. This behaviour

in an urban environment is unique and the population is of national significance.

A water vole plan is being prepared which details how the council, along with others, intends to protect and enhance this special population. Website link.



BIODIVERSITY AUDIT



BIODIVERSITY AUDIT

A biological audit of the city was produced in 2001 as a step towards preparing the original LBAP and to determine what wildlife we have in Glasgow. Records of the city's wildlife have been systematically archived by a number of organisations over the years, including the Glasgow Natural History Society, the Botanical Society of the British Isles, Butterfly Conservation and the Scottish Ornithologists' Club. The biological records are constantly updated by both amateur and professional naturalists. Monitoring of the city's habitats and species is also carried out by the Council's Natural Environment Team.

The records are sent to, and catalogued by, the Glasgow Biological Records Centre which is based at Glasgow Museums Resource Centre and run by Glasgow Life. These records are then generally made available to anyone wishing to access them.

The biological audit has been updated to coincide with the refresh of the LBAP. The 2001 audit document listed 3545 species of animals, plants and fungi recorded in Glasgow (pre and post-1950). The new 2013 audit lists over 6000 species for Glasgow. This is an increase of over 2500 species since 2001 and continues to change as new records are added to the database.

A good knowledge of which species occur, or are known to have formerly occurred within the city is fundamental to

understanding and conserving our wildlife. There is still potential for lots of species to be found. For example, records from sources which state 'common everywhere' but for which there are no specific records are not included in the list, even though that taxon could reasonably be expected to be found here. This applies even to some relatively well-recorded groups such as beetles and hoverflies where coverage of records is patchy, and to higher plant species in the years since the Changing Flora of Glasgow survey. These can be targeted for future action. Some lack of records is due to a lack of local experts in some of the less popular or 'difficult' taxonomic groups.



INVASIVE NON-NATIVE SPECIES



INVASIVE NON-NATIVE SPECIES

The Department for the Environment, Food and Rural Affairs (DEFRA) (2009) has defined invasive non-native species (INNS) as 'Any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health or the way we live.' There are many well documented cases of notorious species which are, or are perceived as being, problematic. For plants, such cases mainly relate to tall and vigorous growing high profile species such as Giant Hogweed. However there are many more species which are not viewed as problems and many species which people think of as being part of the native flora, are in fact non-natives.

To put things into context, the Audit of Alien Species in Scotland report (2001)¹⁶ suggested that 988 non-native species were established in Scotland. Studies for the flora of Glasgow show that out of some 1560 species recorded as 'growing wild' in the city, more than half were non-native.

The WANE Act (2011) brought in new provisions governing the introduction of non-native species in Scotland. In Glasgow we have a 'Policy on invasive non-native plant species in Glasgow' but currently no specific non-native animal policies.

Glasgow City Council runs a Japanese Knotweed annual treatment programme which uses herbicide spraying and stem injection to control the species. Giant Hogweed is controlled locally where it is considered a threat. There have been large scale Rhododendron ponticum removal from key sites such as Pollok Country Park (2007-08), Dawsholm Park LNR (2008, 2010), Castlemilk and Linn Park LNR (2012).



BIODIVERSITY SURVEY AND MONITORING



BIODIVERSITY SURVEY AND MONITORING

Wildlife surveys and monitoring are essential to inform the biological audit and to establish the ongoing state of habitats and priority species in the city.

Annual monitoring includes the national wetland birds survey (WeBS) co-ordinated by the British Trust for Ornithology (BTO) which is carried out at 15 wetland sites. Common Frog population surveys are carried out annually by volunteers which help assess not only the state of the Common Frog but also the overall health of our water bodies. Butterfly transects are run on several parks and LNRs to assess the butterfly populations across various habitats.

SNH carry out Common Standards Monitoring on the SSSIs in the city while the Countryside Ranger Service keeps data on the level of engagement of the public and local communities and the number of volunteer hours annually.

Various projects may have an element of biodiversity surveying (for example bioblitzes) and records generated are sent to the Glasgow Biological Records Centre and to the National Biodiversity Network.

Monitoring of the LBAP will be carried out annually and an Annual Monitoring Report produced.



COMMUNITY ACTION FOR BIODIVERSITY



COMMUNITY ACTION FOR BIODIVERSITY

There are many ways in which individuals and organisations can help biodiversity, from making gardens wildlife-friendly to volunteering with conservation groups or joining wildlife charities.

GARDENS AND ALLOTMENTS

There are a variety of simple actions which can be taken to improve gardens and allotments for wildlife. These include creating a pond, having areas of long grass, native plants and log piles, planting a small wildflower meadow or window box to attract butterflies and bees and putting up bird and bat boxes.

Website link

PARKS AND GREENSPACES

Many parks have a 'Friends of' group who play an important role in protecting and enhancing the park environs. To find out whether a park has an existing group, or to find out how to start a group, visit <https://www.glasgow.gov.uk/index.aspx?articleid=5267>

VOLUNTEERING

Environmental volunteering is an important way to get people to engage with nature.

<http://www.tcv.org.uk/volunteering>

<http://www.sevenlochs.org/get-involved>



ECOSYSTEM STATEMENTS



ECOSYSTEM STATEMENTS

The following table shows the relationship between the Glasgow Ecosystems, Glasgow LBAP Habitat Action Plans, the UK Broad Habitat Action Plans and the UK BAP Habitat.

Ecosystem	Habitat Action Plan	UK Broad Habitat	UK BAP Habitat
Farmland	Boundary Features	Boundary and Linear Features	Hedgerows
		Arable and Horticultural	Arable Field Margins
Grassland	Acid Grassland	Acid Grassland	Lowland Dry Acid Grassland
	Neutral Grassland	Neutral Grassland	Lowland Meadows
	Dwarf Shrub Heath	Dwarf Shrub Heath	Lowland Heathland
Urban	Built-up Areas and Gardens	None	None
	Open Mosaic Habitats	Inland Rock	Open Mosaic Habitats on Previously Developed Land
Wetland	Fens	Fen, Marsh and Swamp	Lowland Fens
			Purple Moor-grass and Rush Pasture
	Marsh	Fen, Marsh and Swamp	Lowland Fens
			Purple Moor-grass and Rush Pasture
	Raised Bogs	Bogs	Lowland Raised Bog
	Reedbeds	Fen, Marsh and Swamp	Reedbeds
	Rivers and Streams	Rivers and Streams	Rivers
	Standing Open Water	Standing Open Water and Canals	Oligotrophic and
			Dystrophic Lakes
			Ponds
			Mesotrophic Lakes
	Swamp	Fen, Marsh and swamp	Eutrophic Standing Waters
			Reedbeds
Woodland	Broad-leaved and Mixed Woodland	Broadleaved, Mixed and Yew Woodland	Wood-Pasture and Parkland
	Wet Woodland		Lowland Mixed Deciduous Woodland
			Wet Woodland

An Ecosystem Statement has been prepared for each of the five identified Ecosystems in Glasgow: Grassland, Woodland, Wetland, Urban and Farmland.

Each Ecosystem Statement lists the associated key habitats and species. The actions to be undertaken to conserve and enhance them are found in the associated LBAP Implementation Plan.

The general Objectives and Targets for all the Ecosystem Statements are similar.

- Objective 1: Ensure no net loss of the habitat within the City.
- Target 1: Retain all existing habitat.
- Objective 2: Promote sympathetic management of habitat.
- Target 2: Establish favourable management at identified key sites.
- Objective 3: Increase the total area of high quality habitat within the City.
- Target 3: Create or restore high quality habitat at selected sites or locations.
- Objective 4: Encourage awareness and appreciation of habitat.
- Target 4: Involve community and education groups and land managers in habitat management and creation initiatives.



ECOSYSTEM STATEMENT: GRASSLANDS



Associated Biodiversity Priority
Habitats:

Acid Grassland, Neutral Grassland,
Dwarf Shrub Heath

ASSOCIATED SPECIES:

Badger (foraging), Brown Hare,
Fossorial Water Vole, Skylark,
Common Frog, Common Toad, Small
Pearl-bordered Fritillary, Pollinators
(butterflies, moths, bees, hoverflies
etc), Burnet-saxifrage, Orchids,
Sheep's-bit

*More information about Glasgow's
biodiversity and the full LBAP can
be found at:*

www.glasgow.gov.uk/biodiversity

INTRODUCTION

Grasslands range from the now very rare sight of colourful long established wildflower meadows buzzing with life to the much more widespread short mown sports pitches and recreational areas. Grasslands with key biodiversity interest in Glasgow are those which have been long established and are mainly found on land of farmland origin at the periphery of the city and in some parks, although other urban grassland types offer some biodiversity value too.

There is a large variety of grasslands and grassland terminology. Grassland Table 1 provides a summary of grasslands found in Glasgow and an indication of the biodiversity value.

BACKGROUND

The amount of lowland semi-natural grassland declined in England and Wales by 97% between the 1930s and 1984 while 65% of UK grassland species also declined – a greater proportion than in any other habitat (State of Nature report 2013). Habitat loss has slowed since the late 1990s but grasslands are still at threat and newly created grasslands and meadows do not yet have the same value as those that were centuries old.

The loss is attributed to agricultural intensification to produce more home-grown food, and through wider development of housing, transport infrastructure and industry. These flower-rich areas are vital habitats for a range of wildlife species, particularly pollinating insects such as bees, butterflies and hoverflies. The loss of wildflower meadows across the UK has resulted in a massive decline in pollinators as well as other invertebrate species. Over 250 species of pollinating insects in the UK are in danger of extinction and are on the UK Biodiversity Action Plan (UKBAP) priority species list.

Grasslands provide important ecosystem services including primary production, soil formation and nutrient cycling, food crops, climate change adaptation, amenity, sense of place, and are particularly important in urban areas for health and recreation benefits. Carbon sequestration in grasslands is an often overlooked ecosystem service but research shows that grasslands can sequester more carbon than woodlands in terms of soil carbon¹⁷.

NATIONAL PRIORITIES SCOTTISH BIODIVERSITY STRATEGY

The protection, enhancement and management of Glasgow's grasslands helps to deliver the Six Big Steps for Nature (Scotland's Biodiversity Route Map to 2020) to improve the state of nature in Scotland.

Under Big Step 1:

Ecosystem Restoration (Scotland's Biodiversity Route Map to 2020) the Challenge Outcome is: Scotland's ecosystems are restored to good ecological health so that they provide robust ecosystem services and build our natural capital. Although grasslands are not mentioned under the Priority Projects specifically, this outcome is relevant to grassland habitats.

Under Big Step 3:

Quality greenspace for health and education benefits the Challenge Outcome is to ensure that the majority of people derive increased benefits from contact with nature where they live.

Under Big Step 4:

Conserving wildlife in Scotland.

Under Big Step 5:

Sustainable management of land and freshwater.

GLASGOW'S GRASSLANDS

Grasslands in Glasgow are neutral or acid in type. Neutral grasslands occur on soils whether are neither strongly acidic nor alkaline. They are further defined as being improved, semi-improved or unimproved depending on the degree of agricultural intensification. In Britain, traditionally managed unimproved neutral grasslands are very rare. The habitat survey of Glasgow (1991) shows areas coded as semi-improved, rough or unqualified neutral grassland. Secondary grasslands have developed on brownfield sites such as former industrial sites and mine spoil and these can support species-rich grassland. Grasslands also gradate into inundation or marshy grassland. Neutral grassland is also found on roadside verges but these are often adversely influenced by salt applications, chemical sprays and unsympathetic mowing regimes.

Acid grasslands typically support a lower diversity of vascular plants than some neutral grasslands but contain bryophytes and lichens. In Glasgow most of the remaining acid grasslands are associated with the upland fringe pastures such as at Cathkin Braes. A few areas are found in lower lying sites associated with sandy soils such as at Garscadden Burn and near Tollcross and Sandyhills.

Grasslands also include Dwarf Shrub Heath, which is characterised by vegetation dominated by members of the heather family (Ericaceae). Typically they occur on acidic soils of a low nutrient status. There are a number of different vegetation types recognised in Britain, but in general there are two main sub-divisions: dry and wet heaths. Both types share strong affinities with a parallel range of acidic grasslands, which are often derived from heathland precursors.

FOSSORIAL WATER VOLE AND GRASSLAND MANAGEMENT

In 2008, water voles were discovered living away from water and since then large populations have been recorded in the east end of the city living in long grassland in parks, road verges, gardens and derelict land. These terrestrial water voles are termed fossorial (mole-like), as they spend more time underground. This behaviour in an urban environment is unique and the population is of national significance.

Water voles are protected under schedule 5 of the Wildlife and Countryside Act, 1981 (as amended) and their presence, although a biodiversity asset, has implications for grassland management in the east of the city.

At present it is an offence to intentionally or recklessly:

a) Damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection, and;

b) Disturb water voles while they are using such a place.

For more information see the Water Vole Strategy/consult SNH.

GRASSLAND MANAGEMENT

Symptomatic management is key to preserving and enhancing the biodiversity value of wildflower meadows and semi-natural grassland. In general wildflowers thrive on nutrient poor soil and any enrichment encourages the growth and dominance of grass species reducing the diversity.

To keep nutrients low wildflower meadows should be cut and the material removed off site. This was part of the tradition of hay making, with bales of hay being used as animal feed. The timing of the cut and lift is also critical and late summer or early autumn is recommended to allow wildflowers to bloom and seed and at sites with breeding birds harvesting must be carried out after the young have fledged.

Grazing is another management option for grasslands and flower rich grasslands can be

maintained through careful consideration of species, stocking density and timing of grazing.

In both management options it is important to retain uncut areas of grassland to provide overwintering habitat for invertebrates and small mammals.

Grassland Diagram 1 (page 74) summarises the biodiversity value of different management regimes.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Grasslands are under threat from development pressures, unsympathetic amenity grassland management cutting regimes, neglect or abandonment causing scrub encroachment. Large losses of grassland have occurred through agricultural intensification such as ploughing, draining, heavy fertiliser treatment, over-grazing and slurry application. They can also be at threat from woodland planting schemes when their intrinsic value is not recognised.

RECENT ACTION

Many of Glasgow's key grasslands are protected as Sites of Importance for Nature Conservation (SINCs) or within Local Nature Reserves (LNRs) and Sites of Special Scientific Interest (SSSIs). LNRs and SSSIs give statutory protection and there is a presumption against development affecting SINCs unless reasonable biodiversity enhancement and mitigation is provided. The City Development Plan Supplementary Guidance details the steps potential developers must take in any planning application which may affect biodiversity.

Since 2001, grasslands and wildflower meadows have been created in the city at a wide variety of sites. In parks, generally these are areas of amenity cut grass which has been allowed to grow long and often enriched by wildflower plug planting. At other sites, meadows have been created by sowing wildflower meadow mixes onto nutrient poor

soils to establish habitat. Large areas of grassland habitat have been created using these methods, some at high profile urban parks as demonstration sites to encourage further projects. In addition, GCC has been working with local farmers in the Carmunnock area to manage active farmland for biodiversity including large areas of species rich grassland ([link to Farmland](#)).

The current focus has been to preserve and enhance existing key grasslands and create new wildflower meadows as part of an integrated habitat network. Wildlife corridors and stepping stones are also essential parts of the network as they form the connections allowing species movement. The main wildlife corridors in Glasgow are rivers and transport routes, with road verges providing the greatest opportunity for grassland habitat enhancements. The M8 is the main arterial route into Glasgow and Transport Scotland has already identified key areas for biodiversity management.

The Glasgow's Buzzing project ran from 2012 to 2015. The project was a partnership between Glasgow City Council and Buglife and involved creating and enhancing wildflower meadows across the city, carrying out invertebrate surveys and raising community awareness of biodiversity. Since their creation and enhancement, these wildflower meadows have been identified through pollinator surveys as being important for a range of invertebrates as well as small mammals, birds and amphibians. A total of 139 species of invertebrate have been recorded during the project and includes at least 17 that are new to Glasgow.

The Conservation Volunteers (TCV) Habitat Restoration Project was a partnership between Glasgow City Council and TCV involving a large number of volunteers in improving the city's biodiversity habitats at a variety of sites city-wide, including grassland management.

Community groups in all areas of the city have been actively involved with wildflower meadow creation and enhancement projects through sourcing funding and materials and carrying out wildflower planting and sowing seed.

GCC has initiated many positive changes for biodiversity in parks and greenspaces. Creation and management of wildflower meadows is now mainstreamed and incorporated into park management plans. Grassland management is carried out on GCC land by parks staff, volunteers and at large sites GCC engage agricultural contractors with specialist cut and lift machinery. Amenity grassland cutting regimes are reviewed on a regular basis offering scope for future wildflower meadow creation.

GCC has recently relaxed cutting regimes across large areas of council-owned grassland.

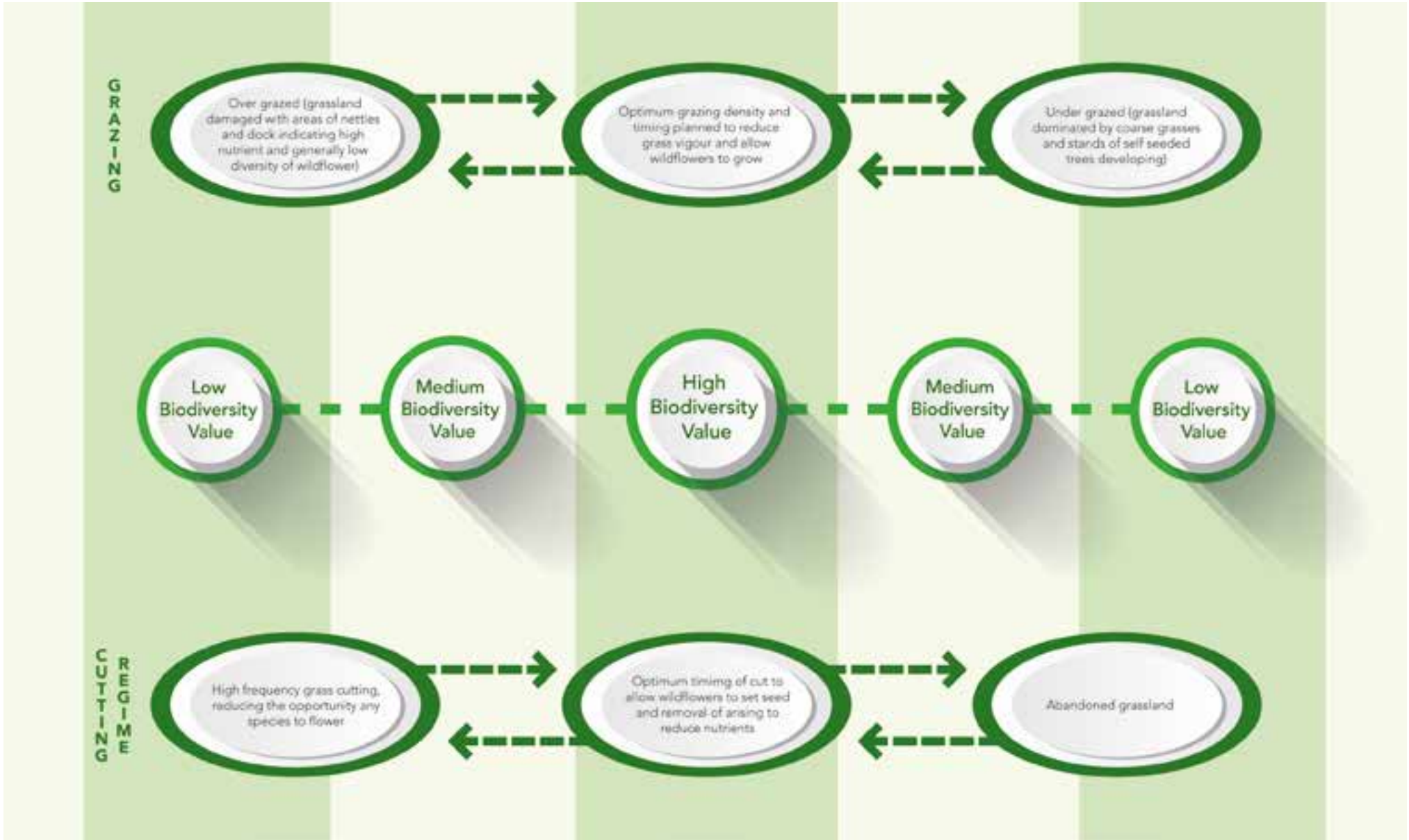
GCC has temporarily ceased grassland management at sites with water voles present until management guidelines or protocols have been developed. GCC, SNH and the University of Glasgow have been working on a Water Vole Project to carry out research which will help produce these guidelines. Since 2008, grassland habitat has been taken out of management specifically for water voles.

GCC encourages sustainable land management on all its holdings and through agri environment schemes manages wildflower meadows on farmland in the south of the City (see farmland).

GRASSLANDS TABLE 1

NAME	GRASSLAND TYPE	DESCRIPTION	POTENTIAL BIODIVERSITY VALUE
AMENITY GRASSLAND	Improved Grassland	Short mown sports pitches, recreational areas and lawns which are regularly cut.	Low. Occasional flowering herbs between cuts of low growing species such as dandelion which is an early season nectar source and daisy.
LOW MAINTENANCE GRASSLAND	Improved Grassland	Areas that are cut on a low frequency but arisings not removed.	Low-medium, depending on the frequency/ timing of cut and species composition. Several uncommon wildflowers can survive, as well as low growing species which provide nectar.
UNMOWN GRASSLAND	Semi-natural Grassland	Grassland that has not been mown or grazed in recent years.	Low-medium. Dominated by a few tall herbs and grasses, but providing valuable habit for small mammals and over wintering sites for invertebrates.
UNMOWN GRASSLAND (WATER VOLE AREAS IN EAST OF GLASGOW)	Semi-natural Grassland	Grassland that has not been mown or grazed in recent years.	High (UK biodiversity priority species). Provides habitat for fossorial water voles.
EXOTIC MEADOW	Flower Meadow	An annual or perennial mixture of predominantly non native plant species designed for colour, impact and/or nectar provision.	Variable depending on species composition, and location.
HEATHLAND	Dwarf Shrub Heath	Vegetation dominated by plants of the heather family, growing mainly on low nutrient acid soil.	High (UK biodiversity priority habitat)
ACID GRASSLAND	Semi-natural Grassland	Generally a less vigorous meadow with heath bedstraw and tormentil as well a fine grasses.	High (UK biodiversity priority habitat)
NEUTRAL GRASSLAND	Wildflower Meadow	A diverse mix of grasses and wildflowers including iconic wildflower meadow species such as meadow buttercup, ox-eye daisy, knapweed and grasses.	High (UK biodiversity priority habitat)

GRASSLAND DIAGRAM 1



ACID GRASSLAND

CURRENT STATUS

Acid grasslands are probably one of the most extensive semi-natural habitats in Britain, but there is very little information on true extent or conservation management. Estimates suggest 1,200,000 ha in the uplands but in the lowlands it is unlikely to exceed 30,000ha. However much of the upland type comprises low diversity swards, considered to be the product of poor management of heathland or mire precursors. Species rich acid grasslands are mostly associated with lowland communities developing on skeletal soils, where a number of nationally rare, often annual species occur.

Acid grasslands develop where the underlying rock is acidic such as sandstone and some types of igneous rocks, or on superficial deposits such as sand and gravel. They are often called bent-fescue pastures and typically they support a lower diversity

of vascular plants than some neutral or calcareous grasslands, although bryophytes and lichens may provide some compensation. Typical indicative species include grasses such as Sheep's-fescue (*Festuca ovina*) and Wavy Hair-grass (*Deschampsia flexuosa*), Tormantil (*Potentilla erecta*) and Heath Bedstraw (*Galium saxatile*). Heather (*Calluna vulgaris*) and Blaeberry (*Vaccinium myrtillus*) may be present at low frequencies but their presence tends to reflect affinities and close association with heathland habitats (see Dwarf Shrub Heath HAP). Other species, some indicative of higher diversity grassland (and more base enriched), include Bird's-foot Trefoil (*Lotus corniculatus*), Heath Milkwort (*Polygala serpyllifolia*), Mountain Pansy (*Viola lutea*), Mouse-ear-hawkweed (*Pilosella officinarum*), Eyebright (*Euphrasia* spp.), several sedges (*Carex* spp.) and a number of bryophytes.

In the Glasgow area most of the remaining acidic grasslands are associated with the upland fringe pastures, although where these occur on shallow basaltic or other rocky outcrop soils, such as the Cathkin Braes, their biological diversity can be high. A few low-lying areas, associated with sandy soils or some waste areas, occur at Garscadden Burn and near Tollcross and the Sandyhills area.

Distinguishing between acid grasslands and neutral or base rich sites can be problematical, especially if the swards have received some agricultural enrichment. Earlier habitat surveys may have coded semi-improved bent-fescue grasslands as neutral types and some of the localities in the Cathkin Hills have affinities to calcareous grassland types. This plan therefore includes such transitional types, particularly calcareous ones, and has some overlap with the neutral grasslands HAP.

Acidic grasslands (and associated vegetation mosaics such as heaths and rush pastures), provide important breeding grounds for a number of waders, and also support populations of small mammals and birds, which in turn provide a resource for raptors. Invertebrates can also be well represented at areas of unimproved grassland.

Table 1 Main sites supporting acid grasslands

SITE NAME	AREA (HA)
Garscadden Burn	1.0
Cleddans Burn	0.5
Cowglen GC	4.0
Levern Water, Nitshill	0.4
Crookston Castle area	0.3
Lainshaw Drive	2.0
Cathkin Braes	c. 22
Millerston	0.1
Robroyston Park	0.2
Possil Marsh	0.5
Ruchill GC	0.2
Petershill	3.0
Littlehill GC	0.8
Garthamlock	0.3
Commonhead Moss	3.5
TOTAL	30.6

CURRENT FACTORS CAUSING LOSS OR DECLINE

Unimproved or traditionally managed acid grasslands have declined in recent years although there is very little hard data to support this; undoubtedly large areas have been improved by agricultural treatments or conversion to ley pastures. However a number have also been lost to urban developments and, particularly to the urban fringe, management for golf courses (although roughs at the latter can be an important resource). Factors leading to loss or decline include agricultural intensification – particularly fertilisation, ploughing or drainage and over-grazing– heavy grazing can deplete herbs and is usually associated with stock feeding. Woodland planting schemes often target the lower productivity, unimproved grasslands while neglect can encourage the spread of scrub, notably birch or gorse, and bracken. Built developments cause direct loss of sites, both to urban

fringe and local central sites such as old sand quarries and waste ground. Unsympathetic management such as the intensive treatment of grasslands in parks and golf courses reduces potential sward diversity.



NEUTRAL GRASSLAND

CURRENT STATUS

Neutral grasslands occur on circumneutral soils that are neither strongly acid nor very alkaline. They can be further defined as being improved, semi-improved or unimproved depending on the degree of agricultural intensification. Unimproved grasslands are managed through grazing and hay cutting, often in combination, and are characterised by supporting a rich diversity of grasses and herbs, and a rich associated fauna. However with modern agricultural treatments such as ploughing, draining, seeding and the heavy use of artificial fertilisers, the diversity of the sward can be very much reduced. The focus of this plan is on the conservation of unimproved and semi-improved neutral grasslands.

In Britain, traditionally managed unimproved, neutral grasslands are now very rare. It has been estimated that between 1934 and 1984 the amount of semi-natural neutral grassland in England and Wales had declined by 97%. It is estimated that there are less than 15,000 hectares of these valuable grasslands surviving in the UK, with only 2,000 to 3,000 hectares left in Scotland, much in crofting areas of the northwest.

The habitat survey of Glasgow shows a number of areas coded as being semi-improved, rough or unqualified neutral grassland, but details are limited. However it appears unlikely that any traditionally managed, unimproved pastures or meadows remain within the City area. Secondary grasslands that have developed in urban areas, notably former industrial sites or on mine spoil, can support species rich grasslands. There are also a number of grasslands which have affinities to, and

grade into, inundation or marshy grasslands. Neutral grasslands are also commonly found on roadside verges where they have escaped agricultural intensification but are often influenced by winter applications of salt and unsympathetic mowing regimes.

Table 1: Main locations of unimproved or semi-improved neutral grasslands

SITE	
Darnley/Brock Burn	Levern Water, Nitshill
Hurlethill	Haugh Hill
White Cart, Crookston area	Auldhouse Burn
Pollok C.P.	Carnbooth Pasture
White Cart, Netherton Braes	White Cart, Linn Park
Lainshaw Drive	Cathkin Braes
Cadder	Kenmure Marsh
Auchinleck	Hogganfield Park LNR
Todds Well	Lochwood Wetlands
Cleddans Burn	

CURRENT FACTORS CAUSING LOSS OR DECLINE

Over the years large losses of permanent grassland have occurred through agricultural intensification such as ploughing, re-seeding, draining, heavy fertiliser treatment, slurry application, over-grazing, conversion to arable and a shift from hay-making to silage production. These threats still remain and areas are still being lost to agricultural improvement, however with problems in the agricultural sector, there is a danger from neglect or abandonment leading to rank growth and scrub encroachment.

On the urban fringe the chief threats are from development pressures but also neglect of traditional management or by the application of unsympathetic amenity grassland management cutting regimes. Many of the diverse secondary grasslands are threatened through the lack of cropping regimes, leading to an increase in coarser grasses and tall herbs or to scrub encroachment.

DWARF SHRUB HEATH

CURRENT STATUS

Dwarf Shrub Heath is characterised by vegetation dominated by members of the heath family (Ericaceae). Typically they occur on acidic soils of a low nutrient status. There are a number of different vegetation types recognised in Britain, many restricted to geographical areas (including upland or coastal locations), but in general there are two main sub-divisions: Dry and Wet Heaths. The former is characteristic of lowland areas, usually on freely draining, often sandy or gravelly soils, or rock outcrops. Wet Heaths are more typical of upland areas (moorland) with high rainfall or impeded drainage, and are associated with shallow peat formation. Both types share strong affinities with a parallel range of acidic grasslands, which are often derived from heathland precursors, (Acid Grassland HAP).

Typically heathlands support a range of other habitats including acidic grasslands, mires

and flushes (including rush pastures) and scrub (notably gorse) or scattered trees (e.g. birch and rowan). Heather (*Calluna vulgaris*) and blaeberry (*Vaccinium myrtillus*) are the main shrubby dominants. However a number of grassland species are also to be found such as Sheep's-fescue (*Festuca ovina*) and Wavy Hair-grass (*Deschampsia flexuosa*), Tormentil (*Potentilla erecta*) and Heath Bedstraw (*Galium saxatile*) with a range of bryophytes (typically *Hypnum cupressiforme* s.l., *Pleurozium schreberii* and *Dicranum scoparium*) and lichens (notably *Cladonia* spp.). Wet heaths are distinguished by the presence of species such as Crossed-leaved Heath (*Erica tetralix*), Purple Moor-grass (*Molinia caerulea*), Deergrass (*Trichophorum cespitosum*) and bog-mosses are usually present (e.g. *Sphagnum capillifolium* and *S. compactum*). Heathlands are also important for the associated fauna, notably invertebrates and birds, (and in the south, reptiles).

In this plan for the City area, all areas supporting heather dominated vegetation are included, except where on deep peat (see Raised Bog HAP), although some occur in mosaic with acidic grasslands (see Acid Grassland HAP). There is a national plan for lowland heathland (areas below 300m) which is relevant to this plan, although some heathlands within the City, such as on the Cathkin Hills, are better described as wet heaths (or upland heath). Lowland heathland is a priority for nature conservation because it is a rare and threatened habitat. In England, which has the largest cover in the UK (55%), over 80% have been lost since 1800. The UK supports one fifth of the international total of this habitat.

In the City heathlands are represented by a number of scattered sites most below 1 ha, and in total cover only approximately 8 hectares; this figure includes both wet and dry types (see Table 1). Many sites are associated

with rocky outcrops or embankments, and two are notable for persisting on golf courses. Most however occur with acidic grasslands and their respective frequencies presumably reflects cropping regimes.

Table 1 Main sites supporting heathland

SITE NAME	AREA (HA)
Linn Park Cemetery	0.2
Cathkin Braes	1.5
Cathkin Braes	0.6
Ruchill G.C.	0.2
Garscube Colliery	0.3
Laigh Kenmure	0.1
Littlehill G.C.	0.6
Robroyston Park	0.1
Millerston	0.5
Commonhead Moss	0.4
Cleddans Burn	2.5
Garscadden Burn	1.0
Possil Marsh	0.1
TOTAL	8

CURRENT FACTORS CAUSING LOSS OR DECLINE

Information is limited on the former coverage of heath in the City area. The long history of agricultural management of rural areas over the years may have reduced the coverage (or quality of relicts), but in more recent times, intensive agriculture and urbanisation, are likely to be the cause of further loss. Many of the surviving remnants are on marginal ground, some in urban areas, which has escaped intensification or development. Agricultural intensification, particularly fertilising, ploughing and drainage is damaging to this habitat as is over-grazing– heavy grazing favours grasses and can contribute to nutrient enrichment. Woodland planting schemes often target the lower productivity marginal habitats while neglect encourages the spread of scrub,

notably birch or gorse, and bracken. Built developments cause direct loss of sites, both to urban fringe and local central sites such as old quarries. Recreational pressure can lead to the intensive treatment of relic heaths in parks and golf courses while heavy burning, although encouraging heather, can reduce heath diversity (not an issue in the City).

ECOSYSTEM STATEMENT: WOODLANDS



ASSOCIATED HABITATS

Broadleaved and Mixed Woodlands, Hedgerows, Parkland, Scrub, Transport Corridors, Tree-lined Streets, Upland Ash and Oak woodland, Wet Woodland, Wood Pasture.

ASSOCIATED SPECIES

Badger, Bats, Fox, Roe Deer, Common Toad, Purple Hairstreak, Bluebell, Toothwort, Wood Crane's-bill and numerous lichens, bryophytes and ferns.

More information about Glasgow's biodiversity and the full LBAP can be found at:

www.glasgow.gov.uk/biodiversity

INTRODUCTION

Woodland is a valuable habitat with a rich variety of biodiversity and is highly valued by people as an intrinsic part of our countryside. Britain was once predominantly covered by woodland but today it covers only 12% of the land. Within Glasgow the overall tree cover in the city has been estimated at 15% of the city area with woodlands over 0.2ha in size forming over 9% of the city. In Scotland, due to post-war tree planting, conifers make up 81% woodlands (State of Nature report 2013) though this figure is far lower within Glasgow though at present no definitive conifer to broadleaf tree data exists.

Woodlands are not only vital for biodiversity but play a key role in physical and mental health and well-being of residents and the production of natural resources.

In terms of ecosystem services woodlands provide carbon sequestration, reduced flood risk, reduction in soil erosion, climate change adaptation, timber production, cultural heritage and a sense of place. Trees and woodlands can also provide opportunity as a sustainable energy source through biomass systems that can help in economic development through lower energy costs as well as skills and job creation.

Under Big Step 1:

Ecosystem Restoration, Scotland's Biodiversity Route Map to 2020 sets Priority Project 2 as the restoration of native woodland. The aim is 'to improve the condition and extent of existing native woodlands and further increase new woodland planting.

Under Big Step 2:

Investment in Natural Capital, Priority Project 4 is securing economic and social benefits from, and investment in, natural capital. Part of this on-going work is the promotion of the Woodland Carbon Code to attract investment in woodland creation.

GLASGOW'S WOODLANDS

The full extent of Glasgow's woodlands are still not known; the city was surveyed in 2004 and it was found that there was 1,640ha of woodland with c.1050ha in council ownership, however the Central Scotland Green Network (CSGN) Integrated Habitat Network (IHN) from 2011 shows broadleaved woodland habitat close to 1950ha though the IHN includes area sunder 0.25ha which would not traditionally be seen as woodland.

What is apparent from the data available is that Glasgow's woodlands comprise a significant, and varied, mix of ancient and semi-natural woodlands including broadleaved and mixed woodland, Wet Woodland, Upland mixed Ashwoods, Upland Oakwoods, Upland Birchwoods along with old estate policy woodlands, non-native woodlands (predominately remnant estate broadleaved and coniferous plantation

woods), wood pasture systems and parkland trees. They also link into many more urban tree cover features such as streets and linear networks forming a wide green network across the city.

There are 343 hectares identified as being indicative of Ancient Woodland (of semi-natural origin), Long Established (of plantation origin) or Other (on Roy 1750 map) within Glasgow. Scottish Natural Heritage (SNH) undertook the Ancient Woodland Inventory (AWI) and details on the AWI can be found at <http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/woodlands/>.

A number of conifer plantations are on ancient woodland locations and as are covered by the Plantations of Ancient Woodland Sites (PAWS) designation with specific actions required to assess levels of remnant ancient native woodland and establish restoration process.

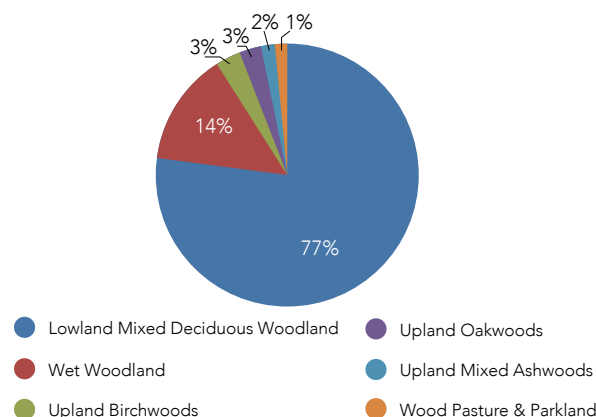
The Native Woodland Survey of Scotland (NWSS) showed that Glasgow has 870ha of native woodland (40% of city woodlands) with a further 102ha of nearly-native woodlands. Overall Native woodlands comprise 5% of the city's area and are widely distributed across Glasgow. The UKBAP Priority Habitats composition as identified by the NWSS and SSSI NVC surveys is shown in Figure 1.

It should be noted that the NWSS did record all woodlands within Glasgow and the council will work on building this dataset in order to ensure proper assessment of woodland for Priority Habitat identification.

Wood Pasture and Parkland UKBAP Priority Habitat exists in the old estate ground that now forms part of Glasgow's parks network with only one surviving example at Pollok Country Park (a total of 13ha) although it once used to cover a greater area that has since been planted up as woodland and ornamental tree features.

Of particular concern in Glasgow are the Upland Mixed Ashwoods, Upland Oakwoods and Wood Pasture and Parkland habitats given the small coverage in the city and the threats facing those communities from recent pathogens and modern land use pressures. However all the Priority Habitats are of conservation concern and Glasgow City Council recognises its duty under the Nature Conservation (Scotland) Act 2004.

Figure 1. UK BAP Priority Habitats in Glasgow by composition percentages



CURRENT FACTORS CAUSING LOSS OR DECLINE

Woodlands in general suffer from a variety of human based activities including land use pressure (in and adjacent to woodlands) as well as people pressure through recreation usage and vandalism.

These are evident in many woodlands in Glasgow; development pressure and changing on-site recreational demands both see a change in the quality and extent of woodland habitat.

Woodlands are also at threat from diseases, such as *Chalara fraxinea* and *Phytophthora* spp, which may be fatal or cause reduction in tree function and make trees vulnerable to further infections by pests and pathogens. This type of threat has seen a significant rise in recent years.

Non-native invasive species, such as *Rhododendron ponticum* are also a problem as they can out-compete native ground flora and change the composition of woodlands making them potentially less suitable for native wildlife as well as hosting diseases such as *Phytophthora ramorum* which affects certain tree species.

Roe Deer can cause damage to young trees from browsing and rubbing. New plantings are protected where possible and the use of fencing and shelters helps aid woodland establishment while allowing space for native wildlife to flourish.

Overall these pressures are causing a decline in woodlands, especially Priority Habitat woodlands, in Glasgow. Development sees the largest loss in woodlands in Glasgow with mitigation planting opportunities shrinking and with the lost ecosystem values not being returned to Glasgow for 20 to 30 years (if mitigation is successfully established). This decline and loss is leading to fragmentation of the woodland network in Glasgow which will have an impact on many other habitats and species.

WOODLAND AND TREE COVER PROTECTION MEASURES

PLANNING LAW AND STATUTORY DESIGNATIONS

The Cart and Kitch Valley woodlands form Upland Mixed Ashwoods and Upland Oakwood Priority Habitats and are protected as a Site of Special Scientific Interest (SSSI). Many other woodland sites are protected or within Local Nature Reserves (LNRs). SSSIs and LNRs give statutory protection.

Individual trees and woodlands may be protected through (single or group) Tree Protection Orders (TPOs) which the council can withhold permission to remove or work on.

Some level of protection is afforded trees within Conservation Areas; in these areas land owners need to inform the council of works on trees no less than 6 weeks prior to works commencing. This enables the council time to assess the tree to see if a TPO needs to be served.

The general planning process also incorporates the council's desires to protect and enhance biodiversity in the city.

The Local Development Plan's Environmental Policies and Supplementary Guidance gives further protection to the city woodlands along with Scottish Government policies on woodland control.

NON-STATUTORY DESIGNATIONS

Many woodlands and tree cover can be found within Sites of Importance for Nature Conservation (SINCs) and while there is a presumption against development affecting SINCs unless reasonable biodiversity enhancement and mitigation is provided there is no statutory requirements for such designated land.

OTHER PROTECTION

Outwith the planning processes, woodland and tree cover is protected under the Forestry Act 1967 (as amended) with Forestry Commission Scotland (FCS) being the approving body for any licenses for felling of live trees.

The Forestry Act does have certain exemptions based on locations, size of tree and type of activity but overall it is designed to ensure protection of woodland and tree landscape at a larger level.

RECENT ACTIONS

STRATEGIC MANAGEMENT

Since 2005 there have been dedicated Officers employed by GCC to take forward management of the council's woods.

Due to funding and capacity levels it is not possible to bring all council woodlands (c.1,100ha) into active management at the same time therefore to date the process has been to evaluate and set strategic drivers (such as woodland condition reports and the Scottish Index of Multiple Deprivation) in order to establish a priority based order of bringing woodlands back into active management.

The outcome is for Management Plans to be developed for individual woodlands as identified by the strategic drivers.

The council looks to bring all woodlands into active management over time and undertake management plan development where none currently exist.

Glasgow City Council is also looking at management from the wider Urban Forest Estate aspect in order to integrate woodland and amenity tree cover management to ensure networks and tree stock resilience is maintained and enhanced.

Land and Environmental Services has a strategic planting programme, using heavy standard stock, to help secure amenity tree features that can increase canopy proximity with woodlands increasing green network links.

Glasgow City Council also worked with Forest Research in 2014 to undertake an iTree Eco survey which used field data, air pollution and meteorological data to quantify urban forest structure, environmental effects and value to communities. The report of the survey is designed to help structure future strategic management through highlighting the value of the ecosystem but also the threats and opportunities present; the core findings for the overall tree cover in the city (council, public sector and private) are:

- Tree cover 15% of the city's area at 112 tree per ha,
- Has a replacement value of £4.6 billion,
- Provides ecosystem services of £4.5 million per annum;
 - 812,000m² rainfall intercepted each year
 - 283,000 tonnes of air pollution removed each year

- Removes an estimated 9,000 tonnes of carbon each year, worth enough to offset 177% of the total estimated annual CO₂ emissions produced by all cars owned in Glasgow
- Stores 193,000 tonnes of carbon (worth c.£40m)

The report can be found at:
<http://www.forestry.gov.uk/fr/bee-h-9y8e2j>

DIRECT WOODLAND MANAGEMENT

Woodland Management Plans are developed for each woodland and set out the strategic aims, the specific site objectives to meet the aims and then actions required to deliver change on the ground. Management Plans are renewed every five to ten year period though tend to include long term aspirations over a 20 -50 year period. The objectives and actions generated by the new Woodland Management Plans are based on the needs of the woodland for both its condition and

role within its local area as a recreational, educational resources though actions are also developed to help maximise non-council funding opportunities such as the Scottish Rural Development Programme (SRDP).

Following on from previous rounds of SRDP Woodlands In and Around Towns grant the council has delivered a range of woodland improvement works, such as 17 hectares of R.ponticum control and 15 ha detailed woodland surveying. In 2013-2014 Linn Park WIAT woodland improvements included 6 hectares of R.ponticum control, 7000 new trees and 9 hectares of woodland thinning and restructuring.

In 2015 the council worked with FCS and Central Scotland Green Network Trust (CSGNT) to bring forward new Urban Woodland Management Plans in 2016 to help secure SRDP Forestry Grant Scheme funding until 2020.

A key woodland within the new grant funding applications of 2016 will be the Cart and Kittoch SSSI where GGC, FCS and CSGNT have worked with Scottish Natural Heritage to formulate the required works to bring the SSSI back in favourable condition.

PARTNERSHIPS AND COMMUNITY

The council recognises that working with partner organisations and community groups helps secure and improve woodland condition to reduce the chances of loss or decline occurring.

FCS secured a 10 year lease with GCC in 2010 to manage the majority of woodlands within the Easterhouse and Drumchapel areas. FCS has been active in appointing Forest Rangers at both locations to engage with local communities. The lease expires in 2020 with the potential to be extended.

Glasgow City Council has also been successful in working with several organisations in the Castlemilk area, including the Cassiltoun Trust, to set up a steering group for the management of Castlemilk Park which is a heavily wooded area linking to Cathkin Braes LNR. This group has seen Cassiltoun Trust employ a Community Woodland Officer and secure a range of funding including skills improvement as well as getting much greater community involvement and ownership of the site.

The charity Urban Roots undertook a Permission To Use agreement with the council for the Malls Mire SINC woodlands in 2014 and have secured funding for woodland improvement works and access creation; they are currently seeking to further that agreement.

Council departments are also liaising to seek what opportunities there are for

further partnership working and including opportunities for greening (woodland) of the city's vacant and derelict land.



BROADLEAVED, MIXED AND YEW WOODLAND



BROADLEAVED, MIXED AND YEW WOODLAND

UKBAP Broad Habitat

This is a broad habitat covering all non-coniferous woodland and includes semi-natural and plantation woodlands and also includes habitats that can be associated with semi-woodland land uses such as orchards and agro-forestry systems (i.e. Wood-Pasture) that cannot be clearly assigned to more open ground broad habitats.

Where coniferous plantations are on Ancient Semi-Natural Woodland (ASNW) then this broad habitat covers such woodlands.

The Scottish Natural Heritage broad habitat descriptions can be found on the Biodiversity Scotland website at <http://www.biodiversityscotland.gov.uk/advice-and-resources/habitat-definitions/about/>

CURRENT STATUS

The City of Glasgow covers an area of 17,645 hectares (ha) with approximately 1,640ha of this total being wooded cover. 343ha of woodland was identified within the Ancient Woodland Inventory* of 1991. Sites surveyed are those greater than 2ha, consequently a

number of smaller, often semi-natural relics, will have been missed. In general, woodland within Glasgow is distributed among a large number of small sites and is often linear in shape.

Glasgow's woodland areas make an important contribution to the landscape and amenity of the city. A number of woodland types are present in Glasgow, ranging from conifer plantations to ancient and semi-natural woodland of high conservation value. The more natural woodlands have survived on steeper ground where development has proved too costly or difficult, such as the Cathkin Braes, Garscadden Wood and along the main watercourses.

Much of the woodland in Glasgow has had periods of intensive management and periods of neglect. A lot of the woodland was managed extensively by the owners of large estates who provided for some level of access to the woodland and managed them for a combination of amenity (private and public) and timber production. As the private estates were gradually broken up and housing development took up much of the land, the woodlands were preserved as a backdrop to housing or to provide seclusion in the more exclusive developments. Some woodland passed from private ownership into the hands of Glasgow Corporation or other public bodies such as hospital boards. Many of the large parks such as the Linn Park, Bellahouston Park and Dawsholm Park originated in this way. A number of these woodlands form part of a designed landscape and have important cultural significance.

The majority of older woodlands in Glasgow consist of mixed broadleaved species. Some, such as Garscadden Wood, have their origin in semi-natural woodland of the past and retain some native species and individual trees of considerable antiquity. The canopy cover at others is the result of more deliberate planting in the mid to late 1800s and the then fashionable species of Sycamore, Beech and others have come to dominate.

Within this Broad Habitat are specific Priority Habitats, with their own Action Plans and they are:

- Lowland Mixed Deciduous Woodland
- Upland Birchwoods
- Upland Mixed Ashwoods
- Upland Oakwoods
- Wet Woodland
- Wood-Pasture and Parkland

Other woodland types in Glasgow are the low scrub that has grown up on derelict sites throughout the city. Often colonised by pioneer birch and willows, other trees may invade, and these young woods can have a rich combination of species and benefit from a lack of disturbance.

An important habitat type often ignored is the combination of trees and shrubs planted in gardens and private grounds. While individually not thought of as forest, in combination they add up to a kind of wood pasture habitat where the built environment is substituted for the pasture element but the garden areas serve a similar ecological function to the woodland element.

Table 1: Larger sites of Broad-leaved and Mixed Woodlands in Glasgow

Site	Area (ha)
Pollok Country Park	71
Hurlethill	6
Waulkmill Glen	3
Darnley Mill Country Park	4.5
Patterton Wood	3
Cathkin Braes and Big Wood	30
Cart and Kitchie Valley SSSI	23
Garscadden Wood	11.6
Dawsholm Park	13
Linn Park	22.2
Bull Wood Plantation	6.6
Blacksey Plantation	3.5
Crookston Plantation	6.5
Daldowie Woodland	1.7
Kenmuir Wood	1.5
Gartloch Hospital Woodlands	13
Garnkirk Moss Plantations	8
River Kelvin (approx.)	14
North Calder (approx.)	12
River Clyde, Daldowie (approx.)	3
White Cart North (approx.)	3.5
Levern Water (approx.)	3.5
TOTAL	264.1

MANAGEMENT REQUIREMENTS

Management requirements for Priority Habitat woodlands relevant to the Glasgow area are given in the specific Action Plans that follow.

The majority of woodlands in Glasgow fall under this broad habitat type though they do not have any Priority Habitat elements; All woodlands in Glasgow need to be managed on a base of ensuring long-term tree cover and woodland condition along with providing a key social resource.

All woodlands in Glasgow should be managed to the UK Forestry Standard.

There is a need to properly survey all woodlands to establish base line data and the vegetative structure of the woodlands in order to identify if there are further Priority Habitat elements not yet recorded as well as helping to determine the nature and extent of management intervention.

Invasive vegetation is a problem within Glasgow and management of these will be a core consideration over the short to medium term.

A large percentage of woodlands also feature over-mature canopies with poor or non-existent understorey development and therefore restructuring of these woodlands is likely to feature from the short to long term. Restructuring may also be required following the recent series of pests and pathogens in the UK and the effect on native tree species, the monitoring of the presence, extents and movements of such pests and pathogens would be of significant benefit in establishing management prescriptions.

**Ancient Woodland Inventory Definitions:*

i. Ancient Woodland (1a and 2a)

Interpreted as semi-natural woodland from maps of 1750 (1a) or 1860 (2a) and continuously wooded to the present day. If planted with non-native species during the 20th century they are referred to as Plantations on Ancient Woodland Sites (PAWS).

ii. Long-established woodlands of plantation origin (LEPO) (1b and 2b)

Interpreted as plantation from maps of 1750 (1b1) or 1860 (2b) and continuously wooded since. Many of these sites have developed semi-natural characteristics, especially the oldest ones, which may be as rich as Ancient Woodland.

iii. Other woodlands on 'Roy' woodland sites (3)

Shown as unwooded on the 1st edition maps but as woodland on the Roy maps. Such sites have, at most, had only a short break in continuity of woodland cover and may still retain features of Ancient Woodland.





LOWLAND MIXED DECIDUOUS WOODLAND



LOWLAND MIXED DECIDUOUS WOODLAND

UKBAP Priority Habitat

This priority habitat encompasses a wide range of lowland woodland types, on well-drained soils ranging from base-rich to acidic. In this respect it differs from the other dry broadleaved woodland priority habitats in Scotland – Upland Birchwoods, Upland Oakwood and Upland mixed Ashwoods – each of which is associated with a more restricted range of soil conditions.

The National Vegetation Classification (NVC) system is a key tool to identifying this habitat type and the communities belonging to this habitat type are all examples of W8a, b and c and W10a, b, c and d. In lowland areas W8d and W16 can form part of this habitat type whilst uplands and also see We, f and g and W17 communities.

The Scottish Natural Heritage Priority Habitat descriptions can be found on the Biodiversity Scotland website at <http://www.biodiversityscotland.gov.uk/advice-and-resources/habitat-definitions/priority/> where greater NVC detailing of habitat compositions can be found.

CURRENT STATUS

Forming 77 % of Glasgow's UK BAP Priority Habitat woodlands the woodlands are spread across the city area.

MANAGEMENT REQUIREMENTS

Good management for conservation should aim towards the following:

- Maintaining a good diversity of species, sizes and age classes of trees and shrubs

If felling or thinning takes place this should ideally not reduce the variation in species, sizes and age classes of trees and shrubs. In many woods natural regeneration can be encouraged, generally by at least a temporary reduction or removal of grazing, as a means of increasing the numbers of

young trees, thereby helping to maintain the woodland in the long term. Ash, rowan, sycamore and birch regeneration often develops more quickly and abundantly than that of oak, elm and hazel. Where the non-native beech is present this species can regenerate plentifully too. The benefits of management for natural regeneration should of course be balanced against any possible detrimental effects. An increased height and density of ground vegetation can lead to reductions in populations of insects and small plants. A very dense tree/shrub canopy can outshade light-demanding species such as many lichens. It can be good to keep some glades open, to provide general habitat diversity and because glades can be important for groups such as insects, birds and, on trees at edges of glades, lichens.

- Encouraging diversity in the structure and species composition of the ground vegetation

If grazing is only light to moderate this can allow some tree and shrub regeneration to take place and also allow good flowering and seed-setting of vascular plants in the ground flora.

- Maintaining rich assemblages of bryophytes and lichens where they occur

This is most relevant in upland woods, especially in the west. In these lowland woods bryophyte and lichen floras are generally less rich but there can still be important populations of some uncommon species at some sites, where it can be important to maintain their favourable conditions which vary between species: some need more shade; others more light.

- Maintaining good quantities of standing and fallen dead wood

Dead wood is best left in the woodland because it is an important habitat for birds, insects and, on fallen rotting logs, bryophytes,

especially liverworts. Fallen dead wood also helps to provide variety in habitat structure on the ground, and the additional shade and shelter close to fallen timber helps to maintain the humid conditions needed by some woodland species.

- Controlling the extent and spread of non-native trees and shrubs

Non-native trees and shrubs can occur in this habitat as a result of deliberate under- or inter-planting, or by seeding in from nearby sources. The commonest of such species here are conifers such as spruces *Picea* spp., firs *Abies* spp., pines *Pinus* spp., larches *Larix* spp. and western hemlock *Tsuga heterophylla*; beech *Fagus sylvatica*, sycamore and rhododendron *Rhododendron ponticum*. All of these except larch have the potential to grow thickly and cast such heavy shade and leaf litter as to impoverish the native woodland ecosystem. Sycamore tends to be less overshadowing than beech,

rhododendron and evergreen conifers, but can out-compete native tree species in some areas of the country. Control of these species is desirable in order to prevent ecological impoverishment of the habitat. Rhododendron ponticum can be especially damaging because it can invade an area in a relatively short time, forming such dense thickets that almost all plant life is overshadowed and smothered by leaf litter. It is less worrying in this lowland woodland habitat than in more humid western upland woods where it spreads more rapidly and threatens internationally important assemblages of oceanic bryophytes, lichens and ferns. However, where it is present in these lowland woodlands removal of rhododendron is desirable. The most important things to note are:

- there are several techniques available, and each site should be evaluated to determine which would be most appropriate.
- cut and burn is historically most popular in Scotland but is generally not the most effective,
- stem injection is extremely effective, although it takes longer for the results to show,
- mechanical removal (including Lever and Mulch TM) can also be very effective, but requires considerable skill, and
- follow-up treatment and long-term monitoring are essential to ensuring success.





UPLAND BIRCHWOODS



UPLAND BIRCHWOODS

UKBAP Priority Habitat

*This is woodland in which birch – whether silver birch *Betula pendula*, downy birch *Betula pubescens* or both – is dominant in the canopy. The field layer is mostly grassy or heathy, but when very heavily grazed may be dominated by large bryophytes. Most examples of this priority habitat are on moderate to steep slopes below 400m, with well-drained brown earth or podzol soils. This priority habitat can occur in mosaics with the Upland oakwood, Upland mixed ashwoods and Wet woodland priority habitats, as well as with open habitats including bracken, heath, cliffs, screes and acid grassland.*

The National Vegetation Classification (NVC) system is a key tool to identifying this habitat type and the communities belonging to this habitat type are all examples of W4a, W10e, W11 and W17 in which oak forms <30% of the canopy cover and upland fringe examples of W16 in which oak forms <30% of the canopy cover.

CURRENT STATUS

This forms only 3% of Glasgow's woodlands. The locations of areas of Upland Birchwoods require to be mapped across the city.

MANAGEMENT REQUIREMENTS

Good management for conservation should aim towards the following:

- Encourage regeneration to ensure a continued canopy and diversity of species, sizes and age classes of trees and shrubs.

If felling or thinning takes place this should ideally not reduce the variation in species, sizes and age classes of trees and shrubs. In many woods natural regeneration can be encouraged, generally by at least a temporary reduction or removal of grazing, as a means of increasing the numbers of young trees, thereby helping to maintain the woodland in the long term. Birch and rowan regeneration often develops

more quickly and abundantly than that of oak, elm and hazel. The benefits of management for natural regeneration should of course be balanced against any possible detrimental effects. Enclosing woodlands to encourage regeneration can lead to dense thicket regeneration of birch, which can lead to loss of ground flora and epiphytes, at least temporarily. A very dense tree/shrub canopy can outshade light-demanding species such as many lichens. It can be good to keep some glades open, to provide general habitat diversity and because glades can be important for groups such as insects, birds and, on trees at edges of glades, lichens. However it may be the only option available to allow regeneration to take place effectively and retain woodland at a site.

- Encouraging diversity in the structure and species composition of the ground vegetation

If grazing is only light to moderate this can allow some tree and shrub regeneration to take place and also allow good flowering and seed-setting of ground flora plants including dwarf shrubs. Heavy grazing can lead to extensive carpets of mosses becoming dominant or co-dominant on the ground, as vascular cover becomes shorter and sparser. This has led some people to think that moderate to heavy grazing is needed in order to maintain bryophyte abundance and diversity, but the main bryological interest in these woods is not on the ground but on rocks and trees.

- Maintaining rich assemblages of bryophytes and lichens on rocks and trees, especially in the west

To a large extent this means maintaining shaded conditions so that shade- and humidity-demanding bryophytes and lichens, including many uncommon species, do not suffer from too much exposure to sunlight

and wind. However, this also means guarding against overshading because many of these species are intolerant of heavy shade. Where felling or thinning is planned in western woods it is best to assess the richness of the trees and shrubs concerned, and that of nearby rocks, and to carry out the planned management only where these epiphytic and saxicolous floras are not especially rich or do not include species of special interest.

- Maintaining good quantities of standing and fallen dead wood

Dead wood is best left in the woodland because it is an important habitat for birds and insects and, on fallen rotting logs, bryophytes, especially liverworts. Fallen dead wood also helps to provide variety in habitat structure on the ground, and the additional shade and shelter close to fallen timber helps to maintain the humid conditions needed by some woodland species.

- Controlling the extent and spread of non-native trees and shrubs, especially *Rhododendron ponticum*

Non-native trees and shrubs can occur in this habitat as a result of deliberate under- or inter-planting, or by seeding in from nearby sources. The commonest of such species here are conifers such as spruces, firs, pines, larches and western hemlock, together with rhododendron. All of these except larch have the potential to grow thickly and cast such heavy shade and leaf litter as to impoverish the native woodland ecosystem. Control of these species is desirable in order to prevent ecological impoverishment of the habitat. *Rhododendron ponticum* is the most serious of these alien woody species because it can invade an area in a relatively short time, forming such dense thickets that almost all plant life is overshadowed and smothered by leaf litter. Worst of all, rhododendron is especially common and invasive in the types of humid western woodland, including many

belonging to this priority habitat, which are of international importance for the oceanic bryophyte, lichen and fern floras. Removal of rhododendron is therefore desirable from such woods and their surroundings. Sycamore is generally uncommon in Upland birchwoods, and where it occurs it is generally less competitive with native tree species and can actually be of conservation value in providing a neutral to basic bark habitat for certain lichens of interest which would otherwise be rare or absent on the more acidic bark of birch.





UPLAND MIXED ASHWOODS



UPLAND MIXED ASHWOODS

UKBAP Priority Habitat

*This is woodland on base-rich soils, in upland parts of the UK. The tree canopy typically includes ash *Fraxinus excelsior*, wych elm *Ulmus glabra* or sycamore *Acer pseudoplatanus*. Downy birch *Betula pubescens*, rowan *Sorbus aucuparia*, hazel, *Corylus avellana* goat willow *Salix caprea*, grey willow *Salix cinerea*, eared willow *Salix aurita*, bird cherry *Prunus padus* and alder *Alnus glutinosa* can occur too.*

Most Scottish examples of this priority habitat are on moderate to steep slopes with moist soils below 300m. Associated habitats include other woodland types in the Upland oakwood, Upland birchwoods and Wet woodland priority habitats, grassland, mires, bracken, cliffs, screes and limestone pavement.

The National Vegetation Classification (NVC) system is a key tool to identifying this habitat type and the communities belonging to this habitat type are all examples of W7c (drier examples, generally on slopes and including ash, elm, hazel etc), W8e, f and g (all examples), W8d (examples which are in upland fringe areas) and W9 (all examples).

CURRENT STATUS

This forms only 2% of Glasgow's woodlands. The locations of areas of Upland Ashwoods require to be mapped across the city.

MANAGEMENT REQUIREMENTS

Good management for conservation should aim towards the following:

- Maintaining a good diversity of species, sizes and age classes of trees and shrubs

If felling or thinning takes place this should ideally not reduce the variation in species, sizes and age classes of trees and shrubs. In many woods natural regeneration can be encouraged, generally by at least a temporary reduction or

removal of grazing, as a means of increasing the numbers of young trees, thereby helping to maintain the woodland in the long term. Ash, rowan, sycamore and birch regeneration often develops more quickly and abundantly than that of oak, elm and hazel. Where beech *Fagus sylvatica* is present this species can regenerate plentifully. Beech is a non-native species in Scotland and can be problematic in ash woods, as its dense canopy can eradicate ground flora and prevent the regeneration of native tree species. It can be difficult to control in the situations where this woodland habitat is found. The benefits of management for natural regeneration should of course be balanced against any possible detrimental effects. An increased height and density of ground vegetation can lead to reductions in populations of insects and small plants. A very dense tree/shrub canopy can outshade light-demanding species such as many lichens. It can be good to keep some glades open, to provide general habitat diversity and

because glades can be important for groups such as insects, birds and, on trees at edges of glades, lichens.

- Encouraging diversity in the structure and species composition of the ground vegetation

If grazing is only light to moderate this can allow some tree and shrub regeneration to take place and also allow good flowering and seed-setting of the broad-leaved herbs characteristic of this type of woodland. With heavier grazing there is less regeneration and the ground vegetation can become less herb-rich and more grassy.

- Maintaining rich assemblages of bryophytes and lichens on rocks and trees, especially in the west

To a large extent this means maintaining shaded conditions so that shade- and humidity-demanding bryophytes and lichens, including many uncommon species, do not

suffer from too much exposure to sunlight and wind. However, this also means guarding against overshading because many of these species, especially lichens, are intolerant of heavy shade. Where felling or thinning is planned in western woods it is best to assess the richness of the trees and shrubs concerned, and that of nearby rocks, and to carry out the planned management only where these epiphytic and saxicolous floras are not especially rich or do not include species of special interest.

- Maintaining good quantities of standing and fallen dead wood

Dead wood is best left in the woodland because it is an important habitat for birds, insects and, on fallen rotting logs, bryophytes, especially liverworts. Fallen dead wood also helps to provide variety in habitat structure on the ground, and the additional shade and shelter close to fallen timber helps to maintain the humid conditions needed by some woodland species.

- Controlling the extent and spread of non-native trees and shrubs, especially *Rhododendron ponticum*

Non-native trees and shrubs can occur in this habitat as a result of deliberate under- or inter-planting, or by seeding in from nearby sources. The commonest of such species here are conifers such as spruces, firs, pines, larches and western hemlock, together with beech, sycamore and rhododendron. All of these except larch have the potential to grow thickly and cast such heavy shade and leaf litter as to impoverish the native woodland ecosystem. Sycamore tends to be less overshadowing than beech, rhododendron and evergreen conifers. Control of these species is desirable in order to prevent ecological impoverishment of the habitat. However, it may also be desirable to retain mature specimens of non-native trees that support important bryophyte, lichen and fungal communities. Mature sycamores are a good ecological analogue for ash, which

is threatened by ash die-back disease. *Rhododendron ponticum* is the most serious of these alien woody species because it can invade an area in a relatively short time forming such dense thickets that almost all plant life is overshadowed and smothered by leaf litter. *Rhododendron* tends to be less common in this priority habitat than in oak and birch woods on more acidic soils. However, it can still occur here and in the west can threaten internationally important assemblages of oceanic bryophytes, lichens and ferns, just as in the more acidic oak and birch woods. Removal of rhododendron is therefore desirable from such woods and their surroundings. As previously highlighted beech can also be particularly problematic in this woodland habitat.





UPLAND OAKWOODS



UPLAND OAKWOODS

UKBAP Priority Habitat

This is woodland on well-drained to rather poorly drained, acidic to neutral soils in the upland parts of Britain, where either pedunculate or sessile oak forms at least 30% of the canopy cover. Other tree and shrub species occur commonly, especially downy birch, silver birch, rowan, hazel and holly. Like upland birchwoods, the field layer is mostly grassy or heathy, but when very heavily grazed can be dominated by large bryophytes.

Most Scottish examples of this priority habitat are on moderate to steep slopes below 300m, with well drained brown earth or podzol soils. This priority habitat can occur in mosaics with the Upland birchwoods, Upland mixed ashwoods and Wet woodland priority habitats, as well as with open habitats including bracken, heath, cliffs, screes and acid grassland.

The National Vegetation Classification (NVC) system is a key tool to identifying this habitat type and the communities belonging to this habitat type are all examples of W4a, W10e, W11 and W17

in which oak forms >30% of the canopy cover, upland fringe examples of W16 in which oak forms >30% of the canopy cover and examples of non-NVC 'WLz' (with very species-poor *Luzula sylvatica* ground vegetation) in upland or upland fringe situations, in which oak forms >30% of the canopy cover.

CURRENT STATUS

This forms only 3% of Glasgow's woodlands. The locations of areas of Upland Oakwoods require to be mapped across the city.

MANAGEMENT REQUIREMENTS

Good management for conservation should aim towards the following:

- Encourage regeneration to ensure a continued canopy and diversity of species, sizes and age classes of trees and shrubs

If felling or thinning takes place this should ideally not reduce the variation in species, sizes and age classes of trees and shrubs. In many woods natural regeneration can be encouraged, generally by at least a temporary reduction or removal of grazing, as a means of increasing the numbers of young trees, thereby helping to maintain the woodland in the long term. Ash, rowan, sycamore and birch regeneration often develops more quickly and abundantly than that of oak, elm and hazel. Where beech is present this species can also regenerate plentifully. The benefits of management for

natural regeneration should of course be balanced against any possible detrimental effects. An increased height and density of ground vegetation can lead to reductions in populations of insects and small plants. A very dense tree/shrub canopy can outshade light-demanding species such as many lichens. It can be good to keep some glades open, to provide general habitat diversity and because glades can be important for groups such as insects, birds and, on trees at edges of glades, lichens. Enclosing woodlands to encourage regeneration can lead to dense thicket regeneration however it may be the only option available to allow regeneration to take place effectively and retain woodland at a site.

- Encouraging diversity in the structure and species composition of the ground vegetation

If grazing is only light to moderate this can allow some tree and shrub regeneration to take place and also allow good flowering and seed-setting of ground flora plants including dwarf shrubs. Heavy grazing can lead to extensive carpets of mosses becoming dominant or co-dominant on the ground, as vascular cover becomes shorter and sparser. This has led some people to think that moderate to heavy grazing is needed in order to maintain bryophyte abundance and diversity, but the main bryological interest in these woods is not on the ground but on rocks and trees.

- Maintaining rich assemblages of bryophytes and lichens on rocks and trees, especially in the west

To a large extent this means maintaining shaded conditions so that shade- and humidity-demanding bryophytes and lichens, including many uncommon species, do not suffer from too much exposure to sunlight

and wind. However, this also means guarding against overshading because many of these species are intolerant of heavy shade. Where felling or thinning is planned in western woods it is best to assess the richness of the trees and shrubs concerned, and that of nearby rocks, and to carry out the planned management only where these epiphytic and saxicolous floras are not especially rich or do not include species of special interest.

- **Maintaining good quantities of standing and fallen dead wood**

Dead wood is best left in the woodland because it is an important habitat for birds, insects and, on fallen rotting logs, bryophytes, especially liverworts. Fallen dead wood also helps to provide variety in habitat structure on the ground, and the additional shade and shelter close to fallen timber helps to maintain the humid conditions needed by some woodland species.

- **Controlling the extent and spread of non-native trees and shrubs, especially *Rhododendron ponticum***

Non-native trees and shrubs can occur in this habitat as a result of deliberate under- or inter-planting, or by seeding in from nearby sources. The commonest of such species here are conifers such as spruces, firs, pines, larches and western hemlock *Tsuga heterophylla*, together with beech *Fagus sylvatica*, sycamore *Acer pseudoplatanus* and rhododendron. All of these except larch have the potential to grow thickly and cast such heavy shade and leaf litter as to impoverish the native woodland ecosystem. Sycamore tends to be less overshading than beech, rhododendron and evergreen conifers. Control of these species is desirable in order to prevent ecological impoverishment of the habitat. *Rhododendron ponticum* is the most serious of these alien woody species because it can invade an area in a relatively short time forming such dense thickets that almost

all plant life is overshadowed and smothered by leaf litter. Worst of all, rhododendron is especially common and invasive in the types of humid western woodland, including many belonging to this priority habitat, which are of international importance for the oceanic bryophyte, lichen and fern floras. Removal of rhododendron is therefore desirable from such woods and their surroundings. The most important things to note are:

- there are several techniques available, and each site should be evaluated to determine which would be most appropriate.
- cut and burn is historically most popular in Scotland but is generally not the most effective,
- stem injection is extremely effective, although it takes longer for the results to show,

- mechanical removal (inc Lever and Mulch TM) can also be very effective, but requires considerable skill, and
- follow-up treatment and long-term monitoring are essential to ensuring success.





WET WOODLANDS



WET WOODLAND

UKBAP Priority Habitat

Wet woodland (often termed Carr) occurs on poorly drained or seasonally wet soils usually with willows, birch or alder as the main tree species. It frequently occurs as part of a habitat mosaic, with other drier, woodland types and on mixed fens where it can form a gradual boundary between dry woodlands and wetlands

They occur on a range of soil types and correspondingly support a diverse associate ground flora including Sphagnum and other mosses, sedges or tussocky grasses and various wetland herbs. Carr woodlands represent a late successional stage of a wetland ecosystem, very much dependent on local hydrology and land use pressures, but typically derived from open fens or marshes, as they begin to dry out.

Willow carr is most typically associated with less acidic fen habitats, whereas Birch is associated with more acidic mires or raised bog margins. Alder woodlands occur as a late successional stage of drying out wetlands, but also along river

margins and flood plains, and flushed soils in woodlands.

Carr woodlands dominated by alder were, in the past, commonly coppiced and this practice has ensured that alder has remained as the dominant species and has prevented succession of the woodland to drier woodland types. Other carrs, typically willow carr, have generally avoided forestry management and have developed as part of the natural succession.

Carr woodlands occur throughout Britain although concentrations occur about lowland fen areas, and in upland areas of western Britain. During the late 1980s the Nature Conservancy Council

estimated that there were at least 25,000 to 30,000 ha of ancient or semi-natural wet woodland within the UK, but there could be as least as much again if woodlands of more recent origin are included.

CURRENT STATUS

In Glasgow there is limited data on distribution and much is represented by local stands forming habitat mosaics, or along narrow burn margins, rather than large examples. Possil Marsh supports local large stands, although many other wetlands tend to be open or support scattered individuals.

Wet woodlands support a range of plant species, notably bryophytes, although many are also associated with open wetlands or drier woodland habitats. The habitat can be important, in association with open habitats, for other wildlife such as invertebrates and birds.

Table 1: Main Wet Woodlands
(approximate areas)

Site	Hectare	Comment
Garscadden Burn	3.0	Alder
Possil Marsh	4.0	Willow
Cardowan Moss	0.1	New planting
Frankfield Loch	0.2	Willow
Craigend Moss	3.0	Planted Birch
Commonhead Moss	5.0	Invasive Birch
Garnkirk Moss (S)	3.0	Invasive Birch
Garnkirk Moss Plantations	6.0	Planted Birch and Pine
Bishop Loch	1.0	Willow
White Cart (Linn Park)	1.0	Alder/Willow
TOTAL	26.3	

MANAGEMENT REQUIREMENTS

Management should aim towards maintaining and, wherever suitable, restoring the natural ecological diversity and improve their aesthetic value. Where woodlands have importance in the landscape and for nature conservation management should also seek to maintain the genetic integrity of populations of native species, so far as is practicable. Wet woodlands have traditionally been highly managed woodlands owing their origin to single planting events and/or cutting and regeneration management; in order to continue historical and cultural management then where appropriate opportunities to produce utilisable wood should be explored and this would help continue the historic ecosystem cycle. As with all woodlands in Glasgow management should always seek to enlarge all woods where possible and especially smaller coverage priority habitats such as Wet Woodlands.



WOOD-PASTURE & PARKLAND



WOOD-PASTURE & PARKLAND

UKBAP Priority Habitat

In this priority habitat mature, open grown trees such as oak, ash, alder or birch are scattered among more open areas of grassland, bracken, heath or wetland. Younger trees may also be present and can be locally quite dense, but the total canopy cover through the area as a whole is more open than in woodland.

The ground vegetation is very varied in species composition but is generally managed in an unintensive way, with no more than minimal use of fertilisers or pesticides. As a result it tends to be of a semi-natural nature, and is often of much ecological interest. It is commonly grazed by deer or domestic stock such as sheep or cattle. In some places it is not currently grazed but has been in the past.

In contrast to most other UK BAP priority habitats, Wood-pasture and parkland is not defined by any particular type(s) of vegetation, NVC types, Annex I habitats or Phase 1 habitat types. Instead, it is defined by the structure of the habitat:

- Open grown trees of varying ages and sizes including mature, over-mature or veteran specimens, distributed irregularly so as to form mosaics with open habitats such as unintensively managed grassland which is or has been grazed.

Because of this it can overlap with other priority habitats such as Lowland mixed deciduous woodland, Lowland meadows and Lowland dry acid grassland.

The definition of this priority habitat is such that Wood-pasture and parkland can overlap with other priority habitats.

In all cases the inclusion of any of these priority habitats within larger areas of Wood-

pasture and parkland priority habitat depends on their being in places where the habitat structure is one of open grown, planted trees spaced at a moderate to high density.

There can be further classification of Wood-Pasture and Parkland habitats to see if any ancient remnants are present on site by following Holl, K. and Smith, M. (2002) Ancient Wood pasture in Scotland: Classification and management principles. Scottish Natural Heritage Commissioned Report F01AA108.

CURRENT STATUS

Glasgow has only one Wood-Pasture & Parkland location which is in Pollok Country Park and extends to 13ha.

Records in the early 1700s show that the estate was developing orchards, gardens, parkland and meadows. Sir John Maxwell, who inherited the estate in 1785, is known to have improved the parklands and included imported plant materials from various countries with 1796 map starting to show what could be early Wood Pasture.

The John Ainslie 1796 map clearly shows tree cover within fields (defined by woodland boundaries).

The current field layout dates to around 1880s/1890s and only slightly differs from the 1860s map which is the earliest detailed mapping of the estate.

The 1890s map indicates the fields have turned into a Deer Park which would continue grazing though likely at a different intensity to cattle.

Since Glasgow City Council (and its previous constitutions) has continued the grazing of grasslands within the fields it is therefore likely that there has been continuous grazing and tree cover mosaic across the fields since the late 1700s.

A recent survey of individual and small groups of trees within the Park was undertaken and this has identified 336nr living trees of varying condition. *Quercus* and *Crataegus* species formed the highest element of the trees with 16% and 14% respectively with Common ash (10%) also forming a key element; Table 1 provides the complete species composition.

The age categories of the trees given in the survey is Young (8%), Mid Age (25%), Mature (63%) and Over-mature (4%); it should be noted that age categories are a subjective measure and true planting date is not available but it would show that there is a good range of age groups present in the fields.

Historic maps would indicate a good chance of some trees planted pre-1800.

The total canopy cover of the trees within the assessment area is 1.52ha which forms 11.6% tree cover.

Table 1. Tree species composition

Species	Number	Percentage
Quercus	54	16.1%
Crataegus	50	14.9%
Acer	48	14.3%
Fraxinus	35	10.4%
Fagus	32	9.5%
Aesculus	25	7.4%
Tilia	23	6.8%
Ilex	19	5.7%
Sorbus	16	4.8%
Prunus	11	3.3%
Sambucus	6	1.8%
Betula	3	0.9%
Carpinus	3	0.9%
Pinus	3	0.9%
Cotoneaster	2	0.6%
Unknown	2	0.6%
Castanea	1	0.3%
Laburnum	1	0.3%
Populus	1	0.3%
Ulmus	1	0.3%
TOTAL	336	100%

VETERAN TREES

Veteran trees provide high landscape, amenity, cultural and ecological value with the latter being of particular importance in Wood Pasture systems.

There is no set definition of a veteran tree and Forest Research state “the species, relative ages, management practice, aesthetic, cultural and biological importance should all be taken into account when surveying or assessing potential veteran trees”.

The Woodland Trust has a UK wide project to map all ancient, veteran and notable trees and this assessment has been undertaken within Pollok Country Park. The survey identifies 1nr ancient and 16nr veteran trees within the grazing fields being assessed.

The ancient and veteran trees identified make up 5% of trees within the assessment area; by assessing the canopy extent of the ancient/veteran trees it can be identified that they cover 2.2% of the assessment area.

ADJACENT TREE COVER

The current field layout dates to around 1880s/1890s and only slightly differs from the 1860s map which is the earliest detailed mapping of the estate.

To the West is estate woodland that abounds the open fields and so adjacent canopy cover is present; these woodlands are of later date than the wood pasture system with 1910s Ordnance Survey maps showing woodland areas not in the 1890s maps.

Tree cover gets improved to the South and West by the 1910s and is not dissimilar to the current tree cover levels.

OVERLAPPING UK BAP PRIORITY HABITATS

The Native Woodland Survey of Scotland (NWSS) has included the woodlands at Pollok Country Park and the survey shows native woodland as the central North-South tree feature within areas and the woodland to the East of the lower fields.

The NWSS marks these woodlands as Lowland Mixed Deciduous Woodland which is a UKBAP Priority Habitat.

The tree cover structure found and measured against the UKBAP Priority Habitat description would indicate the central fields in Pollok Country Park are Wood Pasture and Parkland habitat.

Further to that it would appear that with ancient and veteran trees present the Wood Pasture could include older tree cover features; based on Holl & Smith (2002) it would appear that this may then be a form of Ancient Wood Pasture. The veteran trees cover around 2% of the area which is very low but they are still a highly important ecological feature that needs to be recognised.

If veteran trees are present but cover less than 25% of the area then Holl & Smith (2002) state that the Ancient Wood Pasture and is in a designed landscape then it forms a specific sub-set of wood pasture.

Therefore the conclusion of the assessment is that:

1. All fields are UK BAP Priority Habitat (Wood Pasture and Parkland)
2. 56% of the area is high likely to be Ancient Wood Pasture (Parklands and orchards)

MANAGEMENT REQUIREMENTS

Generally this type of habitat requires veteran tree management in conjunction with an appropriate grazing regime. The other main consideration is that management should be based on minimal intervention.

Specifically at Pollok the fields require a conservation management plan as a priority along with some veteran tree management actions in the short term.

Suitable veteran tree management plans need to be developed for each ancient and veteran tree to inform an overall strategy for ensuring long term tree cover put in place that contains replacement planting operations.

Grazing management will also be key to securing and improving this habitat; in order to establish an appropriate regime the composition of the grasslands needs to be established. A detailed NVC survey should be undertaken of the entire habitat area from which detailed planning and actions can be developed and provide a base from which to assess and review intervention methods.

Further consideration of these matters will be undertaken as part of the updating of the Park Management Plan for Pollok Country Park, in conjunction with stakeholders, to align with the refurbishment and redisplay of the Burrell Collection.

ECOSYSTEM STATEMENT: WETLANDS



ASSOCIATED HABITATS:

Wet Woodland, Canal, Fen, Marsh, Raised Bog, Reedbeds, Rivers and Streams, Standing Open Water, Swamp

ASSOCIATED SPECIES:

Otter, Water Vole, Jack Snipe, Reed Bunting, Common Frog, Common Toad, Palmate Newt, Atlantic Salmon, Dragonflies and Damselflies, Bog-mosses, Bog-rosemary, Tufted Loosestrife

More information about Glasgow's biodiversity and the full LBAP can be found at:

www.glasgow.gov.uk/biodiversity

INTRODUCTION

Wetland is a key habitat with a very rich and complex associated biodiversity. Freshwater and wetland habitat make up only 3% of the UK's land surface but support around 10% of its species (State of Nature report 2013). It is not only vital for wildlife to thrive and flourish but also plays an important role in helping to ameliorate against climate change through flood management. In terms of ecosystem services, wetland provides clean drinking water and water sources for industry, recreation and tourism.

The Water Framework Directive was transposed into Scottish law in 2003 by the Water Environment and Water Services (Scotland) Act (WEWS) 2003. The Act created a new River Basin Management Planning process to achieve environmental improvements to protect and enhance the water environment sustainably and to control damaging activities.

Under Big Step 1:

Ecosystem Restoration, Scotland's Biodiversity Route Map to 2020 sets Priority Project 3 as the Restoration of freshwaters. The aim is 'to secure good ecological status for more rivers and lakes in Scotland and thereby secure biodiversity gains and a range of ecosystem services; through addressing diffuse pollution, invasive non-native species, physical modifications as well

as riparian and wider-catchment land management issues.'

GLASGOW'S WETLANDS

Several watercourses pass through Glasgow on their journey between the central uplands of Scotland and the Firth of Clyde. The River Clyde, River Kelvin, White Cart Water and the Levern Water are some of the city's larger rivers which have varying degrees of biodiversity richness. There are also a number of smaller burns crisscrossing the city to enter the lower Clyde. The Forth and Clyde Canal is the city's only canal and as with the rivers, it forms a wildlife corridor through built up areas, joining green spaces and wildlife areas to form a habitat network which allows the movement of animals and plants.

Hogganfield Loch, Frankfield Loch and Bishop Loch are the three largest open water bodies in Glasgow but there are a large number of other water bodies, including many park ponds which have value for wildlife.

There are six main sites of remaining raised bog, all of which have suffered from some degree of disturbance but which support areas of good quality bog vegetation and are designated as sites of importance for nature conservation (SINCs).

Along with the rivers, canal, water bodies and raised bog, there are also areas of swamp, marsh, fens and reed beds making up Glasgow's wetlands.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Wetlands are at threat from a variety of different common factors such as draining and infill due to agricultural improvements or land use pressures from development. Raised bogs have suffered from peat extraction and forestry operations in the past. In Glasgow water quality is an issue and nutrient input can cause eutrophication and problems with blue-green algal growth in ponds and larger water bodies. Neglect of wetland habitats and lack of management leads to natural succession with scrub invasion and woodland growth. Other pressures on wetlands include recreational usage which can disturb wildlife, bank erosion or stabilisation projects, herbicides and the introduction of both native and alien fish species for coarse angling.

RECENT ACTION

Many of Glasgow's key wetland sites are protected either as Sites of Special Scientific Interest (SSSIs), Sites of Importance for Nature Conservation (SINCs) or within Local Nature Reserves (LNRs). SSSIs and LNRs give statutory protection while there is a presumption against development affecting SINCs unless reasonable biodiversity enhancement and mitigation is provided. The City Development Plan Supplementary Guidance details the steps potential developers must take in any planning application which may affect biodiversity.

The Glasgow Living Waters was a partnership project between Glasgow City Council and Froglife which ran from 2009 until 2013. It involved pond creation and enhancement, amphibian and aquatic invertebrate surveys, volunteer training and raising awareness of wetland biodiversity and was an extremely successful partnership project.

Waterfowl monitoring (over 30 species) has been carried out at 15 water bodies as part of the national Wetland Birds Survey (British Trust for Ornithology) over a number of years to contribute to national biodiversity indicator monitoring.

The Pond naturalisation programme has been running in Glasgow since 1995. A large number of park ponds have been naturalised by creating edge habitat and islands (where feasible) and planting native aquatic and emergent vegetation. The success of the programme has been measured in the increase in breeding waterfowl at the various sites. Apart from the intrinsic value for biodiversity, the attractive nature of naturalised ponds has helped draw community interest and raise awareness of biodiversity. In addition to the benefits to fauna and to the public using the parks, the naturalisation has created small areas of marsh, swamp, fen and reedbed habitats.

Many of Glasgow's smaller burns have been culverted and built over. There are proposed projects to deculvert part of the Tollcross Burn at Sandyhills Park and at the Levern Water and Brockburn. Deculverting (daylighting) burns contributes to flood management but carefully designed, they can also enhance local biodiversity.

At Sandyhills Park, the Council are working with SEPA and other Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) members to progress a project which will daylight a section of the Tollcross Burn and also undertake a wider morphological assessment of the Tollcross Burn catchment. The project aims to reduce flood risk and improve river water quality as well as enhance biodiversity and wetland habitats.

Scottish Government Green Stimulus Peatland Restoration grant, in partnership with GCC and SNH funded bog restoration works at Commonhead Moss LNR, with the

installation of 20 plastic piling dams, removal and treatment of 8ha of scrub and the felling of mature birch woodland in 2013/2014.

The Scottish Environment Protection Agency (SEPA) has produced 'Pollution Prevention Guidelines' which are given to anyone applying to carry out works. These guidelines encourage people to take charge of protecting our environment, and minimise the risk of pollution occurring. The Controlled Activities Regulations (2011) deal with any activity likely to cause pollution to the water environment.

Under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 there is a general requirement for new developments to incorporate a Sustainable Urban Drainage System (SUDS). These include porous paving and water retention ponds which aim to reduce the flash flooding and pollution caused when heavy rain pours off hard paving and down drains. There can be direct

gains for biodiversity where SUDS ponds are created if these are sensitively designed with appropriate native edge and aquatic planting and wildflower sowing.

SEPA guidance has a presumption against culverting streams and burns. This should make it much harder for developers to get permission to culvert a stream simply to make available more land. In turn, this should reduce habitat loss, and help prevent flooding.





RAISED BOG



RAISED BOG

CURRENT STATUS

Lowland raised bogs are peatland ecosystems that develop in areas of poor drainage, such as topographic depressions and along river flood-plains. Peatlands form when waterlogged ground conditions inhibit the normal microbial breakdown of organic material resulting in the formation of peat. Initially the wet conditions result from mineral enriched ground water (often termed minerotrophic) and the peatlands are then called fens or mires (see Fen HAP).

In areas such as central and western Scotland, high rainfall allows the waterlogged peat to accumulate above the groundwater table. As the surface of the peat grows above the ground water, rainfall, which is very low in minerals or nutrients, becomes the only source of water (often termed ombrotrophic). This process can continue for many thousands of years producing a characteristic dome shape and a great depth of peat (some exceed 10 metres). Such peatland ecosystems are called bogs or mosses, and typically they can be divided into raised and blanket bogs (the latter more typical of upland and western areas).

Active bogs are dynamic systems where new peat is continually forming from the organic remains of the highly adapted flora that can tolerate the harsh conditions of waterlogging and nutrient deficiency. Bog-mosses (*Sphagnum* spp.) are crucial in the formation of the acidic conditions characteristic of ombrotrophic bogs. The typical flora of such sites consists of a range of bog mosses, forming colourful thick carpets or characteristic raised hummocks, generally with a number of other mosses, liverworts and lichens. Vascular plants are limited in number but typically include cotton-grasses (*Eriophorum* spp.) and ericoid shrubs (heathers), with other colourful and specialist

associate species such as Bog-asphodel, Cranberry and Round-leaved Sundew. In addition to the floral interest, there is a large number of specialist animals, notably invertebrates, associated with bogs.

Raised bogs are classified into primary and secondary types, reflecting degrees of disturbance. Primary raised bogs retain their characteristic shape and surface vegetation, although the latter can be degraded by drainage, grazing and burning. Secondary bogs have been subject to much degradation, caused by peat extraction, intensive draining and enrichment for afforestation or intensive agricultural use but still retain a high water table and surviving elements of the bog flora, and may be capable of recovery.

Raised bogs were once a common feature of the flood-plains of the Clyde and its major tributaries, extending from the Linwood

area, west of Paisley, to the uplands east of Glasgow; raised or intermediate bogs are also an important feature of depressions across the upland, central belt of Scotland. Today relic raised bogs can still be found in the northeast of the city, but all of the sites have suffered from many centuries of disturbance, such as drainage, cutting, burning and intensive agricultural use. Boglands formerly occurred to the south of the Clyde but have long since vanished and their legacy rests in place names such as Mossspark, Bogside, Moss Road and Honeybog.

The remaining boglands or fragments of deep peat are listed in Table 1. There are six main sites, all of which have suffered from varying degrees of disturbance, but most support areas of good quality bog vegetation, showing signs of recovery and retain considerable nature conservation interest. Several of these boglands extend beyond the City boundary into neighbouring authorities.

The stratified layers of deep peat forming a raised bog represent a valuable historical archive, stretching back some 6000 years. The remains of plants and animals, atmospheric dust and occasional human artefact, are preserved in the peat and can be used to assess changing patterns of vegetation, climate change and human activities.

Table 1: Main peatlands supporting bog vegetation

Site name	Primary Area	Secondary Area	Total Area (Ha)
Millerston (Wetlands)	2.8	4.4	7.2
Cardowan Moss	0.2	3.0	3.2
Saughs Moss	2.6	0.0	2.6
Garnkirk Moss	0.8	8.3	9.1
Craigends Moss	1.8	8.0	9.8
Commonhead Moss	1.0	24.0	25.0
TOTAL	9.2	47.7	56.9

CURRENT FACTORS CAUSING LOSS OR DECLINE

All of the raised bogs within Glasgow have suffered from degradation over the past centuries. It is of critical importance that raised bogs remain waterlogged and that nutrient input levels remain minimal. A number of factors are recognised as being a threat to raised bogs, these include peat extraction – the extraction of peat and/or underlying mineral deposits for horticultural and fuel uses. Also forestry which cause the loss of surface vegetation due to deep drainage, fertilising and heavy shading from planted trees (usually exotic conifers).

Built Development such as opencast mining or built developments can result in the total destruction of bogs or serious damage to their hydrology. Agricultural intensification

leads to drainage, burning, heavy grazing, trampling and surface contamination from stock droppings or feed and these can cause severe degradation of the bog vegetation.

All sites have suffered from past disturbance such as cutting and draining and any recovery process may be hampered by the lack of sympathetic management. Many bogs are also currently burnt as a result of vandalism or accidents.

Regional Drainage Pressures - perimeter drainage resulting in a lowered water table can adversely affect the hydrology of the raised bog. While pollution causes contamination of ground water, deposition of atmospheric pollutants and fertiliser drift which may all impact on the surface vegetation.



MARSH



MARSH

CURRENT STATUS

Marsh is a general term, which usually refers to vegetation occurring on a mineral soil (as opposed to organic peat) that has a water table at, or very close to, the surface of the ground for most of the year. Distinction between marshes and fens can be difficult, as they share similar vegetation, and a number of modified fens are included within the general marsh term (other fens are covered by a separate HAP). They are often species-poor and commonly in agricultural use and are frequently dominated by grasses and rushes.

However a number of smaller, often urban fringe, composite wetlands, such as small pool margins and marshy depressions at mixed sites, are also included under this heading. Many of these smaller marshes are ungrazed and are likely to be indistinguishable floristically from some of the fen, swamp and reed habitats (larger examples are covered by their respective HAP). Additionally, some types of inundation grasslands, often grazed and usually found on periodically waterlogged soils along the margins of slow moving, watercourses or slowly draining depressions, can be considered as marshy grasslands.

Those areas of marshland that have suffered from agricultural improvement, primarily used

for grazing by cattle, can be classified under the broad heading of rushy pasture. They are a very familiar feature of agricultural landscapes throughout Scotland, dominated in the local area mostly by Soft-rush (*Juncus effusus*) or occasionally Sharp-flowered Rush (*J. acutiflorus*). Similar marshy pastures dominated by Purple Moor-grass (*Molinia caerulea*) are absent from Glasgow, although the species occurs on modified peat bogs (see Raised Bog HAP). Where heavily grazed, rush pastures can be botanically poor but may often contain large numbers and varieties of invertebrates, which in turn provide food for a number of wading birds.

Table 1: Main Glasgow sites supporting mostly rush dominated marshes

Site	Area (ha)
Darnley/Brock Burn	1.0
Kittoch Water	0.2
Cathkin Braes	0.6
Garscadden Burn	1.5
Cleddans Burn	2.0
Possil Marsh	1.0
Lochfauld Marsh	1.5
Kenmure Marsh	2.0
Robroyston Park	1.0
Summerston	1.0
Lethamhill G.C.	0.5
Cardowan Moss	0.5
Lochwood Wetlands	1.5
Bothlin Burn	1.0
Gartloch Pool	5.0
Provanhall	0.2
Malls Mire	0.5
TOTAL	21

CURRENT FACTORS CAUSING LOSS OR DECLINE

Marshlands in common with other similar wetlands have suffered to varying degrees from agricultural improvement and development pressures. Land-use pressures may threaten small marshes in urban areas and several on farmland may also suffer from infilling operations.

Agricultural support mechanisms over the years have encouraged farmers to keep large numbers of livestock on their farms leading to problems of overgrazing and a concomitant decrease in the quality of these habitats. A number of sites, especially in the West of Scotland, have suffered from afforestation. Paradoxically, with changes in agricultural use, a threat lies in some pastures being ungrazed and unmanaged, with a gradual succession to scrub or other wetland types.



REEDBEDS



REEDBEDS

CURRENT STATUS

Reedbeds are a specialised type of swamp habitat dominated by common reed (Phragmites australis), where the water table is at or above ground level for most of the year. They are considered to be pure reedbeds where this plant constitutes more than 90% of the vegetation cover. Where the vegetation cover is less than 90% but greater than 75% the reedbed is often referred to as impure. Below this degree of cover, the vegetation grades to swamp or fen habitat depending on the soils and the level of the water table.

There is an estimated 5-6,000 ha of reedbed in the UK. The greatest concentration occurs in East Anglia, amounting to some 2,500 ha, however the largest single reedbed is that on the Tay Estuary which covers 410 ha. In ecological terms, larger habitats are of more value as wildlife refuges and many of the 900 or so sites in the UK are fragmented into small blocks of less than one hectare. Twenty hectares is considered nationally important as it is the minimum size of reedbed that can support breeding populations of some of the rarer reedbed birds.

Whilst the botanical interest of pure reedbed may be fairly low, they can be very important for birds, although some impure stands support nationally rare or threatened species of plants

and a number of important invertebrates.

The largest reedbed within Glasgow is at Bishop Loch/Bothlin Burn where there is approximately 19 hectares of swamp vegetation of which well over half is dominated by Common Reed. There are also smaller, more localised patches at Possil Marsh and Kenmure Marsh. Reedbeds are home to many species of invertebrates, and birds such as Reed Bunting and Water Rail which are in decline nationally. In addition, these areas are a valuable habitat for many mammals, including the Water Vole and Roe Deer.

CURRENT FACTORS CAUSING LOSS OR DECLINE

The major factor that has reduced the area of reedbed in the UK in the past has been agricultural improvement. Reedbeds were drained to provide new farmland, with the resultant loss of the habitat and its associated species. Today most reedbeds are being lost through land use pressures, such as landfill, mineral working and urban developments, but a further danger is from neglect. If reedbeds are to remain as they are they require some form of active management otherwise they will dry out with eventual succession to woodland. The RSPB has estimated a loss of between five and ten percent of reedbed between 1979 and 1993 in England alone. A further threat lies in the fragmentation of the habitat, which can have a detrimental affect on a number of important, dependent species.





SWAMPS



SWAMPS

CURRENT STATUS

A swamp is an area of vegetation where the water level is at least 20 cm above the surface for most of the year; it can occur on a wide range of substrates. Typically they are characterised by the domination of a species poor, tall emergent plants, namely several tall sedges, Reedmace, Bulrush, Reed Sweet-grass and Reed Canary-grass. Frequently occurring with fen, this habitat can contain many of the same species and indeed may grade into fen as the water table lowers; typically swamp habitats are often found in the transitional zone between fen and open water

Different swamp vegetation types occur at a number of sites forming mosaics as the water table varies in height above an undulating surface or the water depth increases towards the open water. Such mosaics are frequently seen around Glasgow, for example at Bishop Loch, Possil Marsh, Lochfauld Marsh and Kenmure Marsh. A number of swamp vegetation types are recognised in Britain with about 13 occurring in the Glasgow area, these include:

ENRICHED WATER:

- Reed Sweet-grass: pure stands of nutrient rich deep water, very common to the canal edge
- Reedmace: local stands at wetland sites and a good colonist at smaller, often urban, sites
- Branched Bur-reed: deep water of ditches, water course margins and farm ponds
- Spike-rush: deep water to water body margins, ditches and ponds
- Reed Canary-grass: species poor stands at summer dry swamps and along riverbanks
- Common Reed: forming very tall, mostly species poor stands in deep water (see separate HAP)

MESOTROPHIC WATER:

- Lesser Pond-sedge: local stands, some partly shaded, at a few local sites
- Bulrush: tall stands in very deep water; only at a few sites
- Bottle Sedge: common dominant at a number of sites, frequently grading to fen and marsh areas
- Water Sedge: a number of species poor, local stands occur
- Water Horsetail: open water margins, farm ponds and ditch margins; usually deep water

Table 1: Main swamp areas within the City

Site	Area (Ha)
Garscadden Burn	0.5
Possil Marsh	6.0
Kenmure Marsh	1.0
Lochfauld Marsh	3.0
Millerston Wetlands	0.2
Hogganfield Park LNR	0.2
Baggie Minnie Pond	0.1
Frankfield Loch	1.0
Todds Well	0.1
Gartloch Pool	0.5
Garnkirk Moss (S)	0.1
Bishop Loch	14
Lochwood Wetlands	0.1
Bothlin Burn	1.0
Cardowan Moss	0.1
Pollok Country Park	0.2
Forth & Clyde Canal	?
TOTAL	28.1

CURRENT FACTORS CAUSING LOSS OR DECLINE

As with all wetland habitats the major threats to the habitat have been from agricultural improvements and development pressures. In the case of swamps, people have often viewed them as waste ground and, therefore, they have often been used for infilling activities and subsequently built upon. Drainage, water abstraction and the canalisation of adjacent watercourses have all had their effects, reducing and fragmenting these habitats and so making them more vulnerable to disturbance and further loss. Some swamps need to be managed otherwise they will fill up with leaf litter and organic matter and dry out, eventually developing into scrub and woodland.



FENS



FENS

CURRENT STATUS

Fens are peatlands, which receive water direct from rainfall as well as drainage from the catchment area; the latter source results in a varied input of nutrients and minerals into the fen water table. The fine classification of fen types is extremely complicated due to a number of factors such as vegetation composition, local geology, nutrient status of the water supply and on the pattern of water movement within the fen. There are two broad types recognised.

Poor-fens are usually deficient in minerals (such as calcium) and are usually found in the wetter, upland north and west of the Britain. Their vegetation is typically composed of short sedges and Sphagnum bog-mosses. Rich-fens, on the other hand, are well supplied with minerals and support a wide range of vegetation types and can be extremely species rich. A further important and attractive fen type is the tall herb fen, which is sensitive to grazing pressure; typical common species are Meadowsweet (*Filipendula ulmaria*), Angelica (*Angelica sylvestris*) and Valerian (*Valeriana officinalis*).

Recognition of fens can be difficult with various gradations to deeper water swamps or, on agricultural land, rush dominated pastures or marshes. However in Glasgow there are a number of wetlands supporting fen habitat, many are poor-fens, but a few are species rich, such as at Possil Marsh and Kenmure Marsh.

The range of fens within the City support great diversity of plants, including a number of locally rare and threatened species. Fens provide a good habitat for many invertebrates, including aquatic beetles and dragonflies, support mammals and provide breeding habitats for a range of birds.

Table 1: Key Fen Habitats and approximate areas

Site	Area (ha)
Garscadden Burn	0.5
Possil Marsh	10.0
Kenmure Marsh	8.0
Lochfauld Marsh	3.0
Frankfield Loch	0.5
Garnkirk Moss (S)	1.0
Bishop Loch	1.0
TOTAL	23

CURRENT FACTORS CAUSING LOSS OR DECLINE

Fens are dynamic systems and past management activities have helped to prevent natural succession to carr woodland. However, many of these practices have either ceased, with subsequent scrub succession, or damage has occurred through drainage and intensification of agriculture or direct loss from infilling. In the City water quality is an issue with nutrient enrichment or toxic chemicals, which may lead to the loss of invertebrates and fish and amphibian prey for some key species, such as herons and kingfishers.





RIVERS AND STREAMS



RIVERS AND STREAMS

Current Status

Rivers and streams are flowing watercourses. Their function is to move water from uplands to the sea. In their natural state, watercourses are home to hundreds of different species of plants and animals. Clean water and an unspoilt bank supply the most diverse habitat, particularly if the yearly cycle of flood and drought is left unmanaged. In a modern city this natural condition rarely exists.

Several watercourses pass through Glasgow City on their journey between the central uplands of Scotland, and the Firth of Clyde, and what happens to them while under our jurisdiction greatly affects their biodiversity. This Habitat Action Plan is concerned with protecting these waterways, and providing the best possible habitat for the greatest variety of species.

Prior to 1800, rivers and streams meandered naturally through the area now covered by Glasgow, and were in a clean and healthy condition. But as the city developed, and space was needed for building, the rivers were gradually contained, and also became the accepted

route for disposal of effluents. By the early 1900s, all rivers in the area were little more than open sewers.

Happily, legislation in the late 20th century caused many sources of pollution to be removed, and as a result, water quality improved considerably. However, management of the river flows continued; to bring about the city map we see today. Many of Glasgow's smaller burns are culverted throughout their length, and it is probably safe to say that all watercourses within the Glasgow City boundary have now been modified in some way to suit the requirements of our urban life.

WHITE CART WATER

The White Cart Water is in fair condition where it enters Glasgow City. After this, its condition deteriorates as it receives sewage and industrial effluents from the city, and also water which flows through land contaminated by chromium. Chromium was dumped in this area from paint works in the early 20 century. However, at Pollok Country Park there is a thriving coarse and trout fishery, and there have been sightings of otters, all of which suggests that the river here is in satisfactory condition.

In recent years this river has flooded residential areas causing thousands of pounds worth of damage. At Cathcart and Langside it goes through a number of sharp bends, and under two low bridges, and during times of heavy rain, the water runs too quickly off paving, causing pollution and flash flooding in the confined space.

The Levern Water is a tributary of the White Cart Water. Until the 1970s this was a very polluted burn, but the closure of many small sewage treatment works means the river now supports a good trout fishery throughout.

RIVER KELVIN

This too is an important recreational river for Glasgow, having the Kelvin Walkway in its lower reaches, and being a feature of Kelvingrove Park. The main water quality problems are sewage pollution and general street run-off, but the river still manages to be in good condition at Balmuirdy Bridge, and fair condition at Kelvingrove. In 1995, salmon were reported in the Kelvin for the first time in over 100 years.

RIVER CLYDE

The slow moving Clyde still harbours contaminants from years past, and is also still the main receptor of Glasgow's present day sewage effluent. It is in fair condition as it comes into Glasgow at Cambuslang, but poor condition by the time it reaches Dalmarnock Bridge. However, even at Dalmarnock Bridge the condition has improved significantly compared with that seen 50 years ago, and salmon returned to the Clyde in 1983. Other main sources of pollution are the North Calder Water, and a number of small burns which enter the Lower Clyde - Light, Tollcross, Camlachie, Molendinar, West, Garscadden and Malls Mire Burns. These are all subject to sporadic pollution from sewage and surface water drains and industrial sites. In many cases this is due to wrong connections, which are extremely difficult to trace, particularly as much of the length of these burns are hidden in culverts. The Malls Mire Burn is badly polluted with chromium.

Despite these impacts, most of Glasgow's larger rivers still run in a reasonably natural channel, and retain some wildlife interest. Indeed, in some parts of the city, a small river channel may be the last remaining semi-natural feature, and as such it may become a haven and refuge for many species

CURRENT FACTORS CAUSING LOSS OR DECLINE

Glasgow's industrial past has left a legacy of contaminated land. Rainwater sometimes leaches toxic chemicals such as chromium from the soil into watercourses. Sewage and current industrial discharges may cause pollution incidents. These are mostly controlled, but occasionally accidental or unconsented discharges occur. Pollution from

diffuse sources such as hard standings in cities and road drainage also occurs. Misconnected drains are a serious threat to water quality, often remaining undiagnosed for years. As well as affecting water quality, they can also introduce harmful litter to a watercourse. Climate change may be causing an increased frequency and intensity of rainfall events. Sudden heavy rain may bring about erosion with a resulting loss of habitat.

Culverting is a very serious threat to the biodiversity of a river. All habitat is lost, although water dwelling species can often survive to pass through short culverts. Canalizing, where straightening and containment of a river channel may be carried out to control where the water goes is a threat. As well as causing loss of habitat, this will affect the natural flow regime of the river, and erosion and deposition sites further downstream may change.

Land values in Glasgow remain high, and bring about the desire to minimise space taken by river corridors by building developments. Development on floodplains can increase the risk of flooding as the rate of storm water run-off is increased, and less land is available to store the floodwater. This may lead to policies for further hard engineering of river channels for flood defence.

The fencing off of streams, canals and water bodies is generally done to protect city dwellers from danger but can have mixed consequences for wildlife. In some cases it can be very positive in preventing people trampling riverbanks. However, often people dump rubbish over fenced off areas, and they can become very unsightly. Fences can also prevent access to rivers, streams and ponds by animals such as Roe Deer.

The introduction of fish species by angling clubs and members of the public may purposefully or accidentally introduce species to our river. These may upset the natural balance, or out-compete native species, and bring about their demise. Alien plant species such as Giant Hogweed, Japanese Knotweed and Himalayan Balsam are colonising many of our riverbanks. Though these plants are attractive in their own right, they can reduce diversity along our riverbanks, and upset the natural balance of species. Fly tipping and litter is a serious problem for wildlife. Small animals may become entangled; it is unsightly, and when removing it the habitat may become trampled.

Bank strengthening by artificial means can cause a loss or decline of biodiversity. Often, eroding banks are protected using concrete or gabion baskets. It would be more beneficial to biodiversity to use natural methods such as tree planting.





STANDING OPEN WATER



STANDING OPEN WATER

Current Status

This plan covers all the areas of standing open water in the Glasgow City Council area. It encompasses the UK National priority habitats 'mesotrophic lakes' and 'eutrophic standing water'. The distinction between these two can be blurred by human induced nutrient enrichment, so that they are both treated within this single plan.

Standing open water includes natural systems of lochs and pools, as well as man-made reservoirs, ponds and quarry pools. Also included are small water bodies (less than 2 ha) such as ponds, often artificially created, in parks, farms and privately owned land. It covers the open water zone and any free-floating, submerged or floating-leaved vegetation and any emergent fringing vegetation. The plan excludes the City's rivers and streams which are covered by a separate plan.

EUTROPHIC OPEN WATER

Eutrophic water bodies support abundant life because of their high levels of plant nutrients (particularly phosphorus and nitrates). They are characterised

by having dense, long-term populations of algae in mid-summer and mud-beds rich in organic matter. Plant communities vary but typically include Fennel-leaved Pondweed (*Potamogeton pectinatus*), Broad-leaved Pondweed (*Potamogeton natans*), Spiked Water-milfoil (*Myriophyllum spicatum*), Yellow water-lily (*Nuphar lutea*) and duckweeds (*Lemna* spp); there may also be marginal, emergent swamp communities. The fauna is a diverse mix of invertebrates, including snails, dragonflies and water beetles, but if nutrient levels continue to increase, the diversity may become restricted to a few groups (usually worms). Coarse fish such as Roach, Tench and Pike are typical of eutrophic waters. Nationally important bird populations can also be supported.

The high levels of nutrients in eutrophic water bodies may derive from natural, or from artificial sources. Where nutrient levels become very high the plant community may become dominated by the few species able to tolerate such conditions eg types of blue-green algae and filamentous algae such as blanket weed. In some cases, the algae can release substances which are toxic to animals and maybe people.

MESOTROPHIC OPEN WATER

Mesotrophic open water bodies contain lower levels of nutrients than eutrophic bodies, but higher levels than acidic (or base-poor) oligotrophic waters (the latter are covered within the raised bog action plan). They tend to be restricted to the north and west of Britain. Mesotrophic lochs are regarded as being of high importance for nature conservation nationally and in the City, as they support a very rich diversity of macrophytes,

including a number of nationally rare or scarce species. Similarly macroinvertebrates are well represented, notable groups being dragonflies, water beetles, stoneflies and mayflies.

A number of open water bodies occur within the City. Only three form large areas exceeding 9 ha (Bishop Loch, Hogganfield Loch and Frankfield Loch) but a further seven exceed 1 ha. Many of the smaller sites are managed in formal public parks and may have a reduced, relative ecological interest compared with the larger semi-natural sites, however they can support a range of aquatic species and have an actual or potentially high local nature conservation value.

MAIN LOCATIONS OF OPEN WATER IN GLASGOW

1. Possil Loch	(1.5ha)
2. Hogganfield Loch	(22 ha)
3. Frankfield Loch	(9ha)
4. Bishop Loch	(23ha)
5. Gartloch Pool	(2ha)
6. Millerston Wetland	(0.2ha)
7. Provanhall	(1.4ha)
8. Darnley Mill LNR	(0.5ha)
9. Pollok Country Park	(0.5ha)
10. Glen Park, Castlemilk	(0.2ha)
11. Springburn Park	(1.5ha)
12. Queen's Park	(0.8ha)
13. Maxwell Park	(0.3ha)
14. Alexandra Park	(1ha)
15. Rosshall Park	(0.2ha)
16. Knightswood Park	(0.7ha)
17. Bingham's Pond	(2ha)
18. Kelvingrove Park	(0.1ha)
19. Victoria Park	(1ha)
20. Elder Park	(0.1ha)
21. Richmond Park	(1.1ha)

CURRENT FACTORS CAUSING LOSS OR DECLINE

The main threat to standing waters in Glasgow is a loss of biodiversity caused by increasing levels of nutrients. Evidence of changes in the biodiversity of Glasgow's open water is limited but some species recorded over the past 150 years are now presumed to be extinct. Eutrophication is caused by excessive nutrient input from sewage effluent, agricultural run-off (diffuse or point source), accidental spills (eg slurry), fish farms in lakes or feeders, and at smaller sites large wildfowl populations and people feeding the ducks.

Some water bodies have been subject to fluctuations in water levels eg Possil and Frankfield Lochs are shown as dry (or marshy) on earlier maps. Conversely a number of water bodies, shown on earlier maps (several early 19th century) are now gone (eg Robroyston, Lochgrog and Malls 'Maulds' Myre.)

Development pressure can result in the total destruction of smaller ponds and affect the hydrology of larger water bodies as can the drainage and infilling of small farm ponds and wetlands.

Other causes of loss or decline include water toxicity from pesticides, organic matter or heavy metals discharged into feeder water courses and land use activities such as drainage, forestry and ploughing which can result in increased water borne sedimentation.

Reinforcement of banks using gabions or other engineering solutions can reduce bank side vegetation.

Recreational pressures can cause disturbance to wildlife, bank erosion and increased water turbidity while neglect at ponds can affect biodiversity. Other problems are the use of herbicides to control vegetation at recreational water bodies and the introduction or heavy stocking of alien or native species for recreational angling which can disturb the natural ecosystem.

ECOSYSTEM STATEMENT: URBAN



ASSOCIATED HABITATS:

Allotments, Built up Areas and Gardens, Graveyards and Cemeteries, Open Mosaic Habitats on Previously Developed Land, Parks and Green spaces, School Grounds, Transport Corridors

ASSOCIATED SPECIES:

Bats, Fossorial Water Vole, Hedgehog, House Sparrow, Peregrine Falcon, Swift, Common Frog, Common Toad, Palmate Newt, Purple Ramping-fumitory, Sheep's-bit.

More information about Glasgow's biodiversity and the full LBAP can be found at:

www.glasgow.gov.uk/biodiversity

INTRODUCTION

About 9.5% of the UK is urbanised overall. In Scotland this figure is approximately 3% but urban areas contain about 80% of the human population (State of Nature report 2013). People and wildlife have co-existed closely for thousands of years. As people created and moved into urban settlements, many wildlife species took advantage of the new opportunities created by buildings and the spaces left between them. Many examples of this can still be found today in Glasgow, a city in which the history of human settlement stretches back over 2000 years.

Nowadays the city presents wildlife with a complex mosaic of opportunities to colonise what in many ways can be a sheltered and welcoming environment. The close potential for contact between wildlife and people in the city allows an appreciation and enjoyment of our local biodiversity. Under Big Step 3: Quality Greenspace for health and education benefits, Scotland's Biodiversity Route Map to 2020 sets Priority Project 5 (more people experiencing and enjoying nature), Project 6 (taking learning outdoors) and Project 7 (developing Scotland's natural health service) all of which can be achieved through the urban ecosystem.

GLASGOW'S URBAN ENVIRONMENT

Glasgow is a city of over 600,000 people but there are over 90 parks and open spaces which provide a green network of habitats through the built up areas. The River Clyde is a major wildlife corridor through the city while the River Kelvin and other rivers and streams, the Forth and Clyde Canal and railway lines, both used and disused, provide other important wildlife corridors. There are also 32 allotment sites which provide some habitats for wildlife.

With relatively small changes in our behaviour, we would all be able to improve the life chances of numerous species of wildlife be it in our gardens, parks or landscaping schemes,

for example in new industrial parks. A well planned and managed environment also has the potential to bolster good health, reduce flood risk, improve air quality and ameliorate wind speeds as well as providing food and shelter for indigenous plants and animals. Built up areas and gardens form approximately 75% of the total land area of Glasgow and are the key areas in which people interact with their local wildlife.

Around 3.6% of land in Glasgow is currently unused but has been previously built on (Scottish Vacant and Derelict Land Survey 2014). These 'brownfield' sites provide habitat for a variety of species. Some of these species include rare and threatened invertebrates, particularly on open mosaic habitats where land has been previously developed. In Glasgow, brownfield sites can be important habitat for nationally significant fossorial water vole populations. Where land has been left vacant and derelict for longer, succession

to scrub and woodland allows a complex and rich biodiversity to occur.

A key priority in the National Planning Framework 3 is the environmental improvements in the central belt with Central Scotland Green Network helping to make the area more attractive to residents and investors through delivering transformational projects. The Glasgow and Clyde Valley Green Network Partnership (the regional component of CSGN) is helping to deliver the 7 Lochs Wetland Park in the north-east of the city which will provide benefits to both biodiversity and communities.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Lack of awareness and understanding of the requirements of wildlife in the urban environment is a threat to its habitats and species as is inconsistent or inappropriate management of open spaces. Likewise a lack of knowledge of the importance of ecological connectivity and of the value of open spaces to biodiversity can cause habitat fragmentation or destruction. Modern building techniques, including the renovation of old buildings, can reduce habitat space for wildlife such as bats and birds.

Brownfield sites often are not protected and are targeted for development. The Scottish Planning Policy (2014) policy principles include 'considering the re-use or re-development of brownfield land before new development takes place on greenfield sites.'

Increasing pressure of development causes loss of habitat and potentially the loss of integrated habitat networks through the city.

Pollution, illegal dumping and vandalism are all threats to urban biodiversity, causing damage and a negative perception of some open spaces. The spread of non-native invasive species can be detrimental to the diversity of native wildlife.

RECENT ACTION

There are now 12 Local Nature Reserves in Glasgow (declared by May 2016). The city currently has an LNR area of 0.86 hectares per 1000 population and this equates to almost 3% of the total land area of the city. The LNRs are designated for their wildlife value and for public access and enjoyment. There are plans to create more LNRs in the future.

LNR celebration events are held annually to raise awareness of biodiversity and encourage community involvement.

The Council's Land & Environmental Services employs Natural Environment Officers who promote public enjoyment of the city's natural resources and advise on their management and protection.

The Council's Countryside Ranger Service runs an annual Wild About Glasgow Countryside Events programme with over 100 free events to engage the public in environmental and biodiversity activities. The Countryside Ranger Service also works with volunteer groups and schools to raise awareness of nature and wildlife city-wide.

The Conservation Volunteers (TCV) in partnership with GCC has run a Glasgow Habitat Restoration Project for a number of years. This has involved a large number of

volunteers working in parks, wildlife sites and Local Nature Reserves to enhance habitats for nature.

The RSPB Giving Nature a Home in Glasgow project began in 2014. The project aims to engage Glasgow's citizens in transforming city spaces, private, community owned and public, into biodiverse havens for nature and people. The Project has run two successful wildlife garden festivals and bioblitzes. The RSPB is working in partnership with GCC and others to achieve the project aims and objectives.

A TCV Natural Communities trainee was placed with GCC in 2013 and undertook biodiversity and community involvement projects including 'Wild for Art' with young people and the 'John Muir Discovery Award' in partnership with the Children's Inclusion Partnership.

The Council's Education Services promote and encourage schools to engage with biodiversity and link to the Curriculum for Excellence, and the city's strategy for taking learning outdoors 'Outside Now!' through the Eco Schools programme.

The Glasgow Open Space Strategy has been drafted and when finalised, should help to set out how the city's open spaces are managed and enhanced in future.

Integrated Habitat Network Mapping has been produced by CSGNT and focuses on linking and protecting green spaces between urban areas, including Glasgow.

The Seven Lochs Wetland Park continues to be developed.

Glasgow City Council and SNH have provided funding for a Community Project Officer to raise awareness and increase understanding of Glasgow's east end fossorial Water Vole population.



OPEN MOSIAC HABITAT ON PREVIOUSLY DEVELOPED LAND



INTRODUCTION

The rich industrial heritage of Glasgow has resulted in many hectares of land being listed as vacant or derelict. These brownfield sites can be incredibly important for biodiversity, often supporting nationally important populations of rare and endangered invertebrates, alongside other wildlife such as birds, plants and lichens.

With the loss of natural habitats in the wider countryside through agricultural intensification and development, wild areas within the urban environment have become crucial to the survival of many increasingly threatened species in the UK. As a result, Open Mosaic Habitat on Previously Developed Land (OMHPDL) was recently included as a UK Biodiversity Action Plan priority habitat.

Vacant and derelict land provides an often unrecognised contribution to wildlife habitat. Frequently sites have a variety of small-scale habitats within them, such as: pools, areas of rocky ground, exposed soil, and scrub. This complex make-up can, in turn, provide home to a wide variety of species.

Many of these have only a brief existence, but where heavy disturbance ceases and re-development is delayed, semi-natural habitats such as grasslands, wetlands, ruderal habitats, scrub and secondary woodland start to develop and can evolve in to highly complicated habitat mosaics.

As vacant and derelict land sites tend to be in urban environments, the wildlife using them has an added value in being able to be enjoyed by large number of people who pass by these sites. Despite this, there is sometimes a tendency to view them as unsightly areas, leading to a pressure for them to be 'tidied up'. Vacant and derelict land is also under significant pressure from redevelopment. Whilst by

its nature it can be perceived as a transitory habitat, due to the reduction of heavy industry and current economic climate the overall amount of this habitat looks as if it will be reduced in Glasgow, along with a number of important species that utilise them.

These sites can be an invaluable resource for local communities by providing easily accessible areas of informal green space where a rich variety of wildlife can be appreciated and the often robust nature of the sites can support heavier recreational usage than many wildlife sites.

HABITAT PROFILE

'Open Mosaic Habitat on Previously Developed Land' (OMHPDL) was designated as a UKBAP priority habitat by the UK Government in 2007. For sites to be classed as OMHPDL, a number of criteria must be met. One of the key features is initial disturbance, followed by natural colonisation

by plants and animals without human intervention or management.

Disturbance from previous land use and remains of building material often adds to the variety of habitat types at different stages of succession found at brownfield sites. Another important characteristic of brownfield sites is a lack of topsoil, which sometimes results from sites being cleared. Other bare habitat includes artificial surfaces such as cracked concrete or rubble, which are poor at retaining water and are low in nutrients. These conditions encourage high floral diversity as fast-growing species are unable to out-compete other plants, which in turn provide many opportunities for invertebrates to exploit. Other wildlife groups like birds and mammals are often attracted by the abundance of invertebrates to feed on. Bare patches are important for warmth-loving (thermophilic) invertebrates as they provide opportunities for basking as well as

for ground nesting species such as solitary bees and wasps. Additional features provided include varied drainage, ranging from freely draining gravel and rubble to impermeable substrate such as concrete, where seasonal pools can form. This variety is important for insects that have a complex life history; e.g. some species have aquatic larvae and terrestrial adults. A lack of management at these sites allows many species to complete their life cycle within the same site, especially those that over-winter in plant stems or within grass tussocks.

What is characteristic of all vacant and derelict land sites is their transient nature and the fact that they are host to 'new' or successional habitats. In the UK, this trait is rare, if not unique to vacant and derelict land and can attract uncommon plants and animals, such as orchids, bees and solitary wasps. From a starting point of bare earth or rubble, if the land continues to be

undeveloped, later stages of succession can emerge, including scrub and bushes and moving through to woodland. These stages are also important in hosting species such as grasshopper warblers. As well as vegetation or 'soft' habitat, vacant and derelict land can also contain old buildings, which may provide roosting habitats for bats and birds.

OMHPDL is by its nature a temporary habitat. Without management intervention OMHPDL is likely to have an average lifespan of between 15 and 20 years and may take up to 15 years to achieve its biodiversity potential. By prioritising the redevelopment of brownfield sites it would be possible to produce a redevelopment schedule whereby sites without OMHPDL or those with OMHPDL coming to the end of its natural lifespan were developed first. Where sites with OMHPDL need to be redeveloped, Integrated Habitat Network models may assist in identifying which sites are the most important as "stepping stones".

In addition to 'natural' colonisation, vacant and derelict land can also be seen as an opportunity to actively create a rich habitat for wildlife within a built-up area. There are a number of examples in Glasgow where former industrial sites (or parts of them) are now being managed for wildlife, such as Robroyston Park LNR (southern half), Bishop Loch LNR (part of), Commonhead Moss (part of), Darnley Mill LNR (part of) and a number of disused railways now designated as local SINC.

LEGAL STATUS

Vacant and derelict land has no legal protection as a habitat and in fact, reclamation of these sites is encouraged within the Scottish Planning Policy (SPP), National Planning Framework (NPF)¹⁸ and through the Vacant and Derelict Land Fund. Almost all new development is controlled through the planning system and overseen by Glasgow's City Development Plan. This aims to steer development to the most appropriate sites and in doing so avoid damaging important wildlife sites. However, because of the lack of information on brownfield sites and the general perception of them, described above, the habitats and species of vacant and derelict land often fail to be protected.

With its designation as a UKBAP priority habitat in 2007, Open Mosaic Habitats on Previously Developed Land (commonly referred to as brownfield sites) need to be identified and considered for their biodiversity. Recent work has identified 120 sites in Glasgow that potentially qualify as OMHPDL.

Many species that are found on the sites may be protected. Badgers, protected by the Protection of Badgers Act (1992) as amended, have been known to form setts in areas of derelict land. Other protected species that have been found in this habitat are water vole (particularly fossorial water vole), nesting birds such as sand martins, bats, common toad, common frog, palmate newt and smooth newt.

CURRENT STATUS

Glasgow is currently the biggest contributor of the number of sites of vacant and derelict land in Scotland, with sites spread across the council area. The 2013 Vacant and Derelict Land Survey recorded 656 ha of derelict land and 580 ha of urban vacant land within Glasgow. As sites are developed the amount of vacant and derelict land will be reduced, however new sites will appear according to variations in the local economy. In times of economic prosperity or during major infrastructure improvement projects, when development of brownfields is most prevalent, sites with OMHPDL provide important refugia for wildlife. At other times, when redevelopment is at a slower pace there is greater scope for wildlife to spread out from these refugia to other brownfield sites.

The importance of vacant and derelict land as a wildlife habitat is being increasingly recognised, particularly by the inclusion of OMHPDL as a UKBAP Priority Habitat. A key indicator of this is the drive to replicate some of the small-scale habitats that are found in vacant and derelict land sites within developments. Examples of this are Sustainable Urban Drainage ponds, green roofs and using native plants in landscaping schemes.

There are several projects that will offer the opportunity to reclaim vacant and derelict land as a functional area. Examples are the Glasgow and Clyde Valley Green Network Partnership and Design Scotland's (A+DS) Legacy 2014 programme Stalled Spaces Scotland, aimed at supporting local authorities and communities to bring derelict and vacant land back in to temporary use to benefit communities.

The amount of vacant and derelict land in Glasgow may decrease in the future as business and residential development increases pace. However, the long term extent of the habitat depends on a number of factors such as the economic climate, the development of mechanisms to remove contamination and climate change, which will affect the species which colonise vacant and derelict land sites.

Brownfields are often threatened with development as they are viewed as being low value land that is preferable to develop over more 'green' sites including agricultural fields. The National Planning Framework 3 (NPF3) states that planning has an important role to play in finding new and beneficial uses for previously used land including, in the right circumstances, 'green' end uses (Scottish Government, 2014). Brownfield sites often have a much higher biodiversity value than neighbouring sites including agricultural land

or parks. Restoration of ex-industrial sites into green space can be just as damaging to their biodiversity value as more intensive development. The majority of brownfield land can be developed with relatively low impact upon biodiversity, however it is important that sites are assessed for their ecological value so that objective decisions can be made and those of high biodiversity value can be retained.

CURRENT FACTORS AFFECTING THIS HABITAT

There is economic and policy pressure to redevelop sites. Public perception can be negative and there is a lack of information and awareness of the species and habitats that can be found in vacant and derelict land.

There can be issues with non-native species and the processes of natural succession.

Recreational pressure can be damaging - although light disturbance benefits early successional habitats and can increase habitat diversity it can be a problem for birds while excessive dog-fouling can promote species-poor grassland by enriching the soil.

Some sites suffer from regular arson, fly tipping, and anti-social behaviour, which can result in sites losing popularity with the communities surrounding them.

Restoration works to buildings, including health and safety issues linked to the above can affect these sites, along with contaminated land and pollution.

Greenspace management, including landscaping and a drive for woodland planting can destroy the existing value of the habitat.

CURRENT ACTION

The Local Development Plan's Environmental Policies and associated Supplementary Guidance provide for the consideration of development proposals' impacts on protected, or otherwise important, species or habitats identified on, or adjacent to, the site before a decision is made on an application.

The Biodiversity Officers are consulted on planning applications and in relation to development briefs for council properties potentially being sold. Through this process preliminary ecological assessments are requested for sites with any potential wildlife interest. The assessments flag up any rare or protected habitats and/or species and further survey requirements and recommendations.

A number of former industrial sites are designated as SINC's and some form part of LNRs.

The Supplementary Guidance to the LDP states that 'wherever possible, development shall enhance biodiversity and/or habitat connectivity. New developments shall aim to incorporate existing habitats, enhance and expand them and/or help create new habitats as well as enhancing the ecosystem services that the development site currently supports, or could support.'

ECOSYSTEM STATEMENT: FARMLAND



ASSOCIATED HABITATS:

Acid Grassland, Neutral Grassland, Woodlands, Hedgerows, Standing Open Water, Boundary Features (walls, ditches)

ASSOCIATED SPECIES:

Bats, Brown Hare, Barn Owl, Grey Partridge, Reed Bunting, Short-eared Owl, Skylark, Tree Sparrow, Yellowhammer, Common Frog, Common Toad, Burnet-saxifrage, Purple Rampion, fumitory

More information about Glasgow's biodiversity and the full LBAP can be found at:
www.glasgow.gov.uk/biodiversity

INTRODUCTION

Farmland makes up around 75% of the UK's landscape. It includes arable fields, improved and semi-improved grassland and associated features such as fallow land, field margins and hedgerows. These habitats, in turn, are home to species such as skylark and European hare. All of this is affected by the way that farmland is managed for food and if farming systems, practices and policies change, they can have a huge impact on farmland wildlife.

UK indicators show that farmland birds and butterflies have declined drastically since the 1970s and 14% of all farmland flowering plants are on the national Red List (State of Nature report 2013). Intensive management of agricultural land is also seen as a major driver (20% loss in species populations between 1970-2012 (2016 Burns et al)) in species declines in the UK

If managed well, farmland provides a diversity of habitats and species and its size and scope can allow for the movement of animals and plants through the landscape. Farmland provides vital ecosystem services such as arable crops for food, livestock production, protection of soils from erosion, climate

change adaptation, sense of place, employment and health benefits.

Under Big Step 5: Sustainable management of land and freshwater, Scotland's Biodiversity Route Map to 2020 sets Priority Project 11 as sustainable land management. The aim is to 'support sustainable land management under the Common Agricultural Policy (CAP) and establish a network of demonstration sites in which ecosystem health is improved alongside agricultural production.' Part of the on-going work is 'targeted support for sustainable land management practices under SRDP Agri-Environment Climate and Forestry Grant Schemes'. This is relevant to Glasgow's farmlands.

GLASGOW'S FARMLANDS

The majority of Glasgow's farmland is on the periphery of the city with much of this being concentrated in the south-west and north. This land forms part of a more extensive agricultural network across lowland Scotland. The city's farmland is dominated by arable farming to the north, especially in the fertile Kelvin floodplain and by hay meadows and cattle pasture in the shallow soils of the Cathkin hills.

Farmland habitats in Glasgow include extensive areas of farmed grassland (meadow and pasture), these are predominantly neutral in character but include smaller areas of acid-heath grassland on the shallower southern soils and the coal measures grasslands to the north east of the city. Many of the GCC managed farm grasslands also contain well managed field boundary habitats such as walled features, hedgerows and ponds, which

provide valuable additional natural habitat for birds, small mammals, amphibians and insects. Although grassland forms the bulk of the managed farmland habitat there are also more intensively managed areas of farmland habitat to the north in the Kelvin floodplain where arable farming and limited field edge habitat predominates.

The smaller areas of grazed grassland (pasture) scattered throughout the city include the urban country estate with its wood pasture at Pollok that continues to be grazed by Glasgow's prize winning herd of Highland cattle. In addition to Pollok the Council's cattle also graze at Dawsholm and Carbooth retaining smaller areas of pasture at these sites.

Glasgow's farmland covers over 80 hectares of the city. Glasgow City Council owns one farm at Blackfaulds Farm, Garthamlock which is leased to tenant farmers as horse and cattle

pasture and there is also extensive farmland at Carmunnock which provides linking habitat between the Cart and Kittoch SSSI and the LNR at Cathkin Braes. There are also several farms, to the north and north-east of the city, in private ownership.

Since 2002 the farmland at Windlaw, Carmunnock has been managed and enhanced under a system of government funded farmland payment schemes that have conserved and enhanced the farmland habitat here for biodiversity. Most recently this has involved payments under the Scottish Rural Priorities Scheme (SRDP) to meadow manage over 50 hectares of farmland at Windlaw, 16 hectares at Pedmyre and 10 hectares at Mid Netherton. A further 1.2 hectares at Carnbooth has been managed as biodiverse pasture using the Council's herd of Highland cattle. Additional management to maintain hedgerows has also been undertaken throughout the farmland at Windlaw through this scheme.

The Farmland bird project was started in 2004 and finished in 2013 with the aim of increasing the habitat suitability of farmland in Glasgow for breeding birds. The project was focused on two large farmland areas in the city namely the Council farmland at Windlaw-Mid Netherton and the privately managed farmland at Millichen- the site of Glasgow's only breeding population of tree sparrow . Work included: planting new hedgerows and maintaining existing ones; planting of bird cover fields; erecting nestboxes; creation of species rich grassland and the creation of ponds. All phases were funded by the Landfill Community Fund with the project being led by RSPB initially and latterly Starling Learning. Monitoring of the farmland birds during the project showed that house sparrows at Millichen had increased by over 37% as a result of the project with a tenfold increase in the numbers of overwintering linnet in Glasgow's farmland.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Farmland habitats for biodiversity are under threat from development pressure, intensification of farming methods, changes in farming practices such as the move from spring to autumn sowing of arable crops, increased pesticide usage and over-grazing or poaching by cattle.

RECENT ACTION

The Scottish Rural Priorities (SRDP) grant for farmland biodiversity work at Carmunnock continued until summer 2015 when the current scheme finished. There is the opportunity to apply for a new scheme to continue the biodiversity management of the farmland meadows at Carmunnock from 2017. Assuming that Scotland is ineligible for European assistance at this point then hopefully a similar or alternative Scotland

scheme will be applied for to continue this farmland management for biodiversity.

Pasture at Pollok (mostly wood pasture) and at Carnbooth and Dawsholm continues to be managed using the Council's herd of Highland cattle with supplementary support from the SRDP scheme.

There are now almost 40 ponds within the Cathkin- Carmunnock farmland complex and these continue to be monitored for birds and amphibians by GCC Countryside Rangers.

Hedgerow management/establishment on farmland ceased in 2015 but further work on these important farm boundary features will be possible through the SRDP scheme or failing that hopefully through a new Scottish/ UK scheme for hedgerow management.

Unharvested crops have been trialled by GCC LES at Cathkin Braes (Carmunnock) and at Hogganfield Park LNR but currently only

RSPB have continued to manage habitat as bird food at smaller more urban sites in the city through their house sparrow plot project that forms part of their Giving Nature a Home UK wide Project – see Urban Action Plan.





BOUNDARY FEATURES



ECOSYSTEM STATEMENTS: FARMLAND

BOUNDARY FEATURES

Current Status

The scope of this plan covers hedgerows, walls (dykes) and ditches. In the modern intensive agricultural landscape these features, with their associate marginal herbaceous vegetation, can serve as important seminatural resources, with considerable nature conservation interest. This interest can also extend into urban areas when such features have been retained, or newly created, during developments. Roadside verges, parks and other open spaces are obvious locations but in urban Glasgow garden boundaries represent a large resource.

Hedgerows are typically linear, living features comprising shrubby, woody growth maintained by periodic cutting, with a functional role in retaining stock and providing shelter. Hawthorn (*Crataegus monogyna*) is by far the commonest species on farmland supplemented locally by blackthorn (*Prunus spinosa*), roses (*Rosa* spp.) and various tree species. In the urban areas, where stock proofing is not required, Beech (*Fagus sylvatica*) and Common Privet (*Ligustrum ovalifolium*) have been commonly used, with additional exotic species (including conifers) in more recent times.

The highest conservation interest is normally focussed on ancient hedgerows, which tend to be species rich and may be

relic strips of former woodland. In the local area most farmland hedgerows are more likely to have been planted during the last 200 years or so. However they can still be important for biodiversity when they comprise a number of shrubs with climbers, sometimes emergent trees, and a rich herbaceous hedgebank flora; in turn they support a rich array of mammals, birds and invertebrates. Even monotonous hedgerows can provide winter berry crops for birds as well as shelter for nesting and summer feeding. Additionally they have an important corridor function providing a habitat network, potentially linking fragmented habitats.

Hedgerows are most obvious at the remaining agricultural land in the City e.g. about Carmunnock, Summerston, Saughs, Leverndale and Darnley.. Many are still under active management but the condition of several sections can vary from heavily maintained to overgrown or gappy.

Walls traditionally have been used as boundaries where soils are too poor for hedge planting or where there is a plentiful supply of stones. Old walls would utilise local stones (from fields or quarried) and the diverse geology can influence the plants and lichens that subsequently colonise (as can any mortar used). They are most common in upland areas so there are very few examples recorded at Glasgow farmlands. The most notable are in the Cathkin area with only scattered examples elsewhere. Other old walls are associated with old estates and houses, but information on distribution and biodiversity interest is limited.

Walls provide a habitat for various plants, notably mosses and lichens, which can add additional colour to the weathered stonework. Botanical interest can also be high on adjacent earthbanks, which may have escaped intensive agricultural management. A wide range of animals exploit the shelter and niches provided by walls and they are of additional value as basking places for invertebrates and reptiles.

In low-lying areas ditches may serve as boundaries (usually with fences). The open water is an important habitat for many aquatic plants and animals. Emergent and inundated side vegetation also provide linear areas of marshland and, depending on grazing pressure, marginal herb-rich grassland above the banks. In the Glasgow area such habitats are very important for Water Voles as well as other mammals, birds, amphibians and invertebrates.

Properly functioning ditches need to be regularly maintained by periodic clearing of silt and vegetation. This work can be damaging to wildlife but with good guidance practices management can be beneficial by retaining a mosaic of open water and vegetation types. However some heavily maintained ditches can be damaging when draining wetlands and raised bogs habitats.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Loss of walls and hedgerows has been caused by direct destruction and removal while unsympathetic management for biodiversity of hedgerows, over-grazing and neglect have resulted in tall and gappy hedgerows with impoverished hedge banks. Vandalism and removal of stones from stonewalls has caused loss of boundary features while the cost of repair and source of suitable stone for old stone wall renovation is a problem. The direct application or drift of fertilisers, pesticides and herbicides onto boundary vegetation and the culverting or piping of ditches also cause loss or decline.



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LBAP PARTNERS



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Butterfly Conservation

Clyde Amphibian and Reptile Group

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