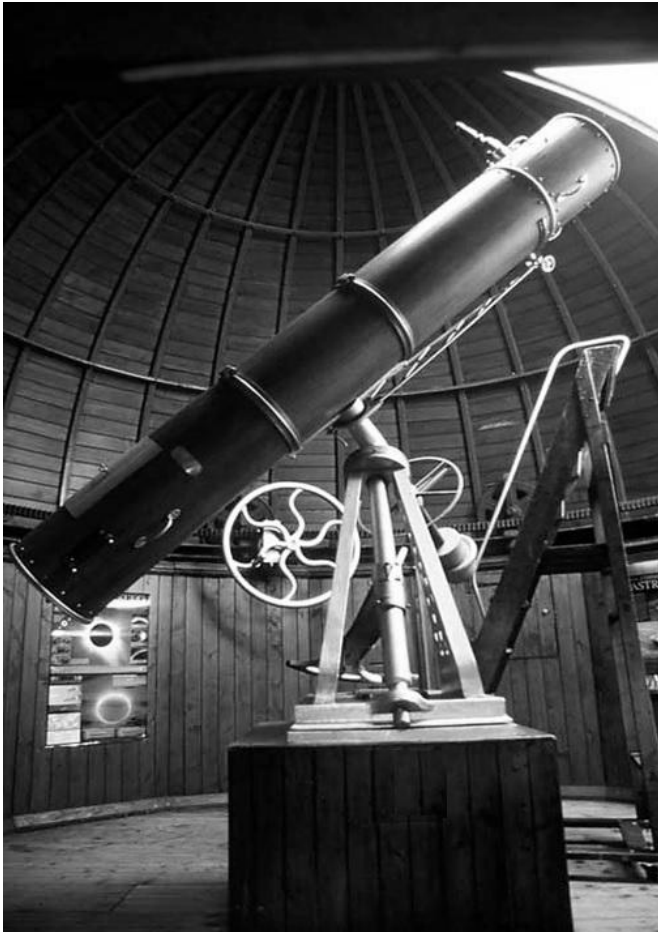


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*the Forth
Naturalist
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The High School of Stirling Telescope

VOLUME 40

*the Forth
Naturalist
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Ruff: A regular passage migrant in autumn; also seen in winter and spring.

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the Forth Naturalist and Historian

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THE FORTH NATURALIST AND HISTORIAN

The Forth Naturalist and Historian (FNH) is an informal enterprise of Stirling University. It was set up in 1975 by several University and Central Regional Council staff to provide a focus for interests, activities and publications of environmental, heritage and historical studies for the Forth area, comprising now local authority areas Stirling, Falkirk and Clackmannanshire.

Since then the organisation of an annual environment/heritage conference has been an important feature.

The annual Forth Naturalist and Historian has published numerous papers, many being authoritative and significant in their field, and includes annual reports of the weather, and of birds in the locality, plus book reviews and notes. These volumes provide a valuable successor to that basic resource The Transactions of the Stirling Field and Archaeological Society, 1878-1939. Four year contents/indexes are available, and selected papers are published in pamphlet form, while others are available as reprints.

In addition a 230 page book Central Scotland – Land, Wildlife, People, a natural history and heritage survey, was produced in 1994 and is available in the form of a CD-Rom, Heart of Scotland's Environment (HSE).

Other FNH and associated publications still in print include – Mines and Minerals of the Ochils, Airthrey and Bridge of Allan, Woollen Mills of the Hillfoots, The Ochil Hills – landscape, wildlife, heritage – an introduction with walks, Alloa Tower and the Erskines of Mar, and the Lure of Loch Lomond a journey round the shores and islands. Several of these are in association with Clackmannanshire Field Studies Society.

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Report on the *Forth Naturalist & Historian* Conference

Saturday November 12th, 2016

Our Urban Heritage: Gardens and Wildlife Past & Present

Richard Tipping

This year our attention was drawn to gardens and urban spaces. Much of the Forth Valley is today an urban environment and most of us live in towns. Before this though, apart from country-dwellers, most people saw farmland as utilitarian: it served a function - to feed us. But green spaces were set aside. With the emergence of wealthy landowners, large landscapes were designed and many of these were created in central Scotland. Designed landscapes seemed almost to try to improve on nature. From the 1750's, with the industrial revolution, new land uses appeared in the countryside. Some of these were industrial landscapes, now mostly derelict, and we are looking for new uses for these abandoned spaces. They have become the focus of much new innovative nature conservation. Even in the middle of towns, nature conservation and nature are thriving.

The focus of the morning session was the history and conservation of our designed landscapes. **Catherine Middleton** has been at Historic Environment Scotland since 2003 and has been responsible for casework relating to gardens and designed landscapes on the Historic Environment Scotland (HES) Inventory of Gardens and Designed Landscapes for over 10 years (www.historicenvironment.scot). She introduced us to the Inventory, which covers 373 sites, all of national importance. The criteria for determining national importance are their value as a work of art and/or their historical, architectural, horticultural, arboricultural, silvicultural, scenic, nature conservation and archaeological value. Gardens and designed landscapes offer significant opportunities for education, employment and recreation and serve as important links in the 'green network' throughout central Scotland. Designed landscapes are grounds consciously laid out for artistic effect. They are the estate policies we most often think of. Estates like Touch or Hopetoun House were designed for pleasure as well as the production of resources. Enclosed by boundary walls, they include mansion houses, avenues forming vistas, formal and informal gardens, terraces or grottoes, water features and archaeological remains. The Inventory also includes other types of site, such as botanical gardens and horticultural collections, urban parks and even cemeteries.

The Inventory informs the management of change. To ensure that the most important gardens and designed landscapes survive, change needs to be managed to protect and, where appropriate, enhance the significant elements. One of the most recent additions to the Inventory was the Japanese-style garden at Cowden in Clackmannanshire in 2013. It was designed for Ella Christie, a dynamic and visionary female landowner and explorer in the first decades of the 20th century, by Taki Handa, a Japanese female garden designer. The garden was seriously vandalized in the 1960s, but much of its essential structure endured and it is currently being restored. Cowden now survives as an exceptional example of the Japanese-style garden tradition in the UK and is once more Shah-Rak-Uen, 'the place of pleasure and delight'.

Marilyn Brown was an investigator at the Royal Commission on the Ancient and Historical Monuments of Scotland from 1978 until her retirement in 2012. She had particular responsibility for designed landscapes and garden archaeology, an interest which culminated in the publication of *Scotland's Lost Gardens* in 2012. Marilyn discussed the King's Knot, Scotland's finest surviving early modern garden, created for James VI and I as part of more extensive gardens beneath Stirling Castle. This is a distinctive formal design, with a two-stepped hexagon elevated some 3m above its surroundings and a lower, simpler square to the west. It has survived largely through the grounds being converted to pasture, though the construction of a turnpike road in 1813 cut across the west end. It was thought that the King's Knot had no close parallels in Scotland, but detective work has revealed two others. At the Lincluden Collegiate Church in Dumfriesshire, an early earthwork motte was re-moulded to create raised, star-shaped terraces. These were first described by Thomas Pennant in 1769 and, like the King's Knot, were possibly prepared for James VI and I. This design re-emerged in 1922 and has been reconstructed. Closer to Stirling, it is now realised that a terraced garden surrounds Linlithgow Palace, again for James VI and I, built perhaps in the 1630s. This is clear from the sketch made by John Slezer (1659-1717). In 1680 there were two terraces, which later became five, leading down to the Watergate. The closest parallel may have been Somerset House in London, constructed for Anne of Denmark but destroyed a century later. These designs would have been much more intricate than the grass we now see, with low hedges, paths coloured with coal-dust, brick or gravel and features such as a sundial, or maybe a fountain. There would also have been parterres, ornamental arrangements of flower beds.

The history of Callendar Park in Falkirk was reconstructed by **Geoff Bailey**, Keeper of Archaeology & Local History at Falkirk Museum since 1984 and author of publications ranging from the Antonine Wall to Falkirk's maritime contribution to WWII. Geoff made the point that public access to the grounds of Callendar has been the norm rather than the exception, and that

the boundaries had been relatively 'porous'. The site has great antiquity and continuity as a centre of power from the late Iron Age hill-fort, found only 15 years ago, to the Wall, incorporated into the later park, a large 9th century AD timber hall and to the medieval thanage. A "strong" 15th century castle was accompanied by a deer park, but there were common rights to fuel. Timber was used in Linlithgow Palace and south of the castle the estate became more of an industrial site when coal began to be worked.

In 1681 a formal, walled garden with an avenue and other roads was laid out for the Earl of Callendar, and when William Forbes bought the estate in 1783, 15 foot (4.6m) high stone walls seem to have excluded other people. Despite this, there was farmland in view at the front of the house. Common rights were, however, revoked and innovative piped drinking water which went to Falkirk was re-directed to the estate stable-block. Forbes introduced a 'naturalistic' parkland and prevented the Edinburgh & Glasgow Union Canal from spoiling the view, followed in turn when the railway was kept at bay in the 1840s. Now only the mausoleum is owned by the Forbes family, lying within the Forestry Commission-owned woodland. Since 1963 the park has been owned by Falkirk Council. Much of the former grandeur has survived amid plans for re-development and open spaces lie cheek-by-jowl with public tennis courts and facilities.

Lorna Innes graduated in archaeology at the University of Glasgow in 1993 and, despite spells away from Orkney to Essex and five years as the first St Kilda Archaeologist for the National Trust for Scotland, has always been drawn back to central Scotland. She introduced the Glorious Gardens project, which she manages through Northlight Heritage. This project, its 'pilot' stage coming to fruition, is funded by Historic Environment Scotland and the Heritage Lottery Fund. It has focused on the Falkirk region, south and east of the town of Falkirk and the Clyde Valley between Hamilton and Lesmahagow. It introduces volunteers to the varied techniques of documentary and archaeological surveys in exploring designed landscapes, some of which are neglected and forgotten. Volunteers record the properties, studying photographic records, recording trees and gardens, undertaking documentary research. This includes visits to the Royal Commission on the Ancient and Historical Monuments of Scotland and the National Library in Edinburgh, where they explore family histories and old maps.

Powfoulis, for example, was a large estate on the Forth estuary between Airth and Grangemouth. The estate has shrunk and is now the site of the Powfoulis Manor Hotel, approached from the west. Originally, in the 1680s, the driveway was from the east, from the river Forth, and the original gateposts still survive. Cartographic sources like Pont's map of the 1590s and the mid-18th century Roy Survey aid archaeological investigation of, for instance, the newly discovered heated walled garden. Similarly,

Muiravonside can be traced on Pont, its subsequent formal gardens later replaced by parkland. Carronvale House is a category A listed country house in Larbert, a large two-storey house with neo-Georgian details. Its outer walls date from the 18th century, with two new wings added in the 1820s and then extensively remodelled in 1897. Such designed landscapes were frequently re-designed and earlier features now lie derelict to be re-discovered in the Glorious Gardens project.

Urban landscapes were the focus in the afternoon, and their futures as reserves for wildlife. The British Trust for Ornithology initiated its Garden Birdwatch Survey in 1994, a simple enough concept in which volunteers in houses throughout the UK record each week the maximum number of each species of bird to visit their gardens. Some 15,000 volunteers return 6.7 million weekly reports. It is the largest year-round garden bird survey in the world and unique in its scale. **John Wilson**, Garden Birdwatch 'ambassador' for Lothian, revealed some of its 17 years of findings. House sparrows, despite their name, have declined steadily in towns as well as in rural areas, perhaps as nesting sites have been lost. Starling populations have also fallen, maybe for the same reason. Numbers of greenfinches have also declined, possibly as trichomonosis jumped species from collared doves. 'Winners' include wood pigeon, which increasingly displaces collared doves in our gardens. Goldfinches are also thriving in our gardens having moved from farmland, where they are in decline, for reasons not yet clear but which probably include increasing mortality in the wild in 'hard' winters. Nuthatch populations can be seen to be moving north into central Scotland, probably as a result of climate change. Redwing, a winter migrant from Scandinavia, was widely reported in gardens for the three years 2010-2012. In England blackcaps are now finding it easier to migrate from the continent, avoiding those difficult and energy-consuming, longer journeys and some are over-wintering precisely because of the provision of supplementary foods and the reliability of bird food supplies in British gardens.

Human or anthropogenic habitats are now critical for species like sparrow, blackbird, greenfinch, starling and robin. Some rural species readily move into gardens in bad weather because we put out food and long-tailed tits can be seen in built-up parts of Glasgow. Scottish gardens are best for brambling and siskin, the latter reliant on Sitka spruce seed. In general, garden birds are thriving – species numbers in gardens are increasing - but we should be aware that this may indicate that things are not so good further afield.

'On the Verge', founded in 2010, is a young affiliation of volunteer conservationists who are demonstrably changing our urban spaces in Stirling. **Leigh Biagi**, its founder, gave us some insights into their work. Alerted by Professor Dave Goulson at Stirling University and the Bumblebee Conservation Trust, and concerned at the near-extinction of bumblebees and

the failure of pollination, Leigh and 10 like-minded volunteers began to sow seeds of wild flowers on road-side verges. They engaged with community groups, schools, allotment-holders and Stirling Council. Permissions were gained, ground was prepared and then planted, maintained and scythed. Stirling Council allowed them to work on 25 large sites and became willing partners. The Council policy is now to sow wildflowers as it is good public relations and there are significant savings in maintenance as grass-cutting is needed much less. Seed selection is critical. 'On the Verge' does not sow just the pretty annuals, though these catch the eye. It's not cost-effective and perennials are needed to attract bees. The mean number of bees visiting perennial species in years 2-3 is seven times that visiting annuals. It's worth listing the flowers in the mix which feeds the pollinators in Stirling's urban spaces: Yarrow, Kidney Vetch, Clustered Bellflower, Common Knapweed, Meadow Cranesbill, Field Scabious, White Deadnettle, Meadow Vetchling, Toadflax, Ox Eye Daisy, Birdsfoot Trefoil, Selfheal, Yellow Rattle, Red and white Campion, Red and White Clover, Ragged Robin, Bush Vetch and Hedge Woundwort.

Falkirk has inherited an industrial past. The final two talks of the day looked at two different ventures to bring wildlife and a sense of the countryside to the town. **Clare Toner** began working for the Scottish Wildlife Trust in April 2016 as the Seasonal Ranger at Jupiter Urban Wildlife Centre, and is now the Falkirk Reserves Ranger, also looking after five other reserves in the Falkirk area. She studied zoology at Glasgow University and fell in love with the Scottish countryside. The Jupiter Centre is an un-prepossessing 4.2 hectare strip of land in Grangemouth, formerly an ICI dyeworks, adjacent to a railway sidings and a DIY warehouse. Work began in 1992 when contaminated soil was stripped and replaced, ponds dug and pathways laid. The Centre intended to create habitat diversity, demonstrate the value of wildlife gardening, create a resource for local people and provide formal and informal environmental education opportunities.

Today there are in this small space wildlife gardens meadows that were planted up and are scythed rather than cut, eleven ponds, a wetland and woodland. The trees in the woodland area are all self-seeded, not planted, and include birch, alder and hawthorn. The gardens have different styles with an inventive use of recycled materials. There have been 360 plant species recorded, including four species of orchid (broad leaved helleborine, northern marsh, common spotted, common twayblade), early bloomers like primrose, cowslip and snowdrop, encouraging early pollinators, later flowers like bluebell and lady's smock, and aquatics: yellow flag iris, water crowfoot and reed mace. There are 13 butterfly species, eight species of dragon-flies and damsel-flies and 50 species of birds, including coot, mallard, moorhen (for the first time in 2016), tree-creeper and a heron, and bullfinch and thrush, both on

the Falkirk Biodiversity Action Plan. Foxes, rabbits, hedgehogs, rats, mice, shrews, voles, soprano and pipistrelle bats have all been seen or captured by remote cameras. The Centre also welcomed over 10,000 people in 2015, and outreach is directed to schools and community centres to continue to inspire people to learn more about and care for nature.

The Falkirk Helix, just across the road from the Jupiter Centre, is a different 'beast' in scale and funding but has a similar origin in the demise of the industrial landscape, including land contamination, closure in the 1960s of the Forth-Clyde canal and its subsequent neglect and the removal of many iron foundries in the 1970s. **Keith Jones**, a volunteer at the Helix, was our guide to its recent blossoming as the district began to revive in the 1980s as the population grew. In the 1990s the canal was restored and road-links upgraded and in the 21st century work was undertaken at the Falkirk Wheel and Falkirk Community Stadium and with community groups such as the Communities Along the Carron Association (CATCA). More emphasis was placed on green-space initiatives for community health benefits and 'green' tourism. The Helix is named from the structure of DNA. It is the 'green heart' at the centre of Falkirk, a visible connection between diverse communities, combining and inspiring culture, heritage, recreation, sports, arts and education.

The concept was first elucidated in 2003, a community centre built in 2007, and funding from the Big Lottery in 2011 allowed construction and moulding of the site, the shaping of the Lagoon, its beach and its wetland boardwalk. The iconic Kelpies were created in 2013, the park was opened in 2014 and the visitor centre was opened in 2015 by Princess Anne, indicative of its increasing national and global significance. It welcomed 1,000,000 visitors by April 2015 and 2,040,000 visitors by September 2016.

THE STATUS OF BIRD POPULATIONS IN THE UPPER FORTH OVER FOUR DECADES: 1970'S TO 2015.

David Bryant

Introduction

Our knowledge of the abundance and distribution of birds in Central Scotland has a chequered history. At various times over nearly three centuries, local records have been more or less well-informed although rarely comprehensive. Much of it was recorded in personal notebooks and remains unpublished. Systematic observation, reporting and coverage of the area were not in place until the late 1960s. The turning point occurred in 1968 with the establishment, by the Scottish Ornithologists Club (SOC), of a Scotland-wide recording-network for birds. This involved a Local Bird Recorder assuming responsibility for a prescribed area in Central Scotland (hereafter called by the current name used for bird recording; 'Upper Forth') and reporting to the SOC each year on the observations made mainly by amateur birdwatchers. While all the records were retained by the SOC, only the most important on a national scale were published in the annual Scottish Bird Reports, themselves covering three decades (1969-2001). Reporting of local sightings, in combination with more detailed recording and particularly in giving more weight to commoner species, began with the publication of the first 'Stirling and Clackmannan Bird Report' (covering 1974 & 1975) in the *Forth Naturalist and Historian*. This reporting and publishing tradition continues to today, but instead of the original 10, there were 77 contributors in 2014, including many participating in organised surveys as well as more-casual birdwatching.

Recording of wildfowl numbers was a pioneer Pan-European project in the world of modern bird recording. This programme began across the UK in 1947 and included counts from the Upper Forth. It progressively recruited more observers and sites, and therefore more detail, up to the present time. Essentially all major lochs and lakes, major rivers and wetlands are now counted under the Wetland Bird Survey (WeBS) scheme. Estuaries were added to the coverage from winter 1969-70, initially under the banner of the Birds of Estuaries Enquiry.

Then, with the first of four 'Bird Atlas' surveys of Britain and Ireland beginning in 1968, the era of standardised recording of breeding and wintering birds across the UK, Scotland and its central valley was truly underway. It has to be acknowledged that the pioneer individuals and organisations involved in these ambitious surveys were always aware they were risking failure, in the sense of inadequate coverage and sustainability,

but their optimism and hard work has been amply justified. These National surveys, in conjunction with the Upper Forth Bird Reports (covering Stirlingshire, Clackmannanshire, Falkirk and briefly South-west Perthshire), BTO-organised monitoring of woodland and farmland birds, now called the Breeding Bird Survey, (BBS). There was also a range of species-surveys or wider studies, especially of rarer species, conducted by the RSPB and others. These provide most of the information on which a review of status can now be attempted.

This account is the latest contribution to a series of four locally-focused reviews (Rintoul & Baxter, 1935; Bryant, 1974; Bryant *et al.* 1993 and Bielby *et al.* 2013, Clackmannan only), plus two checklists which comment on the general status as well as the species appearing anew or disappearing locally (Henty and Brackenridge 1992, Bielby and Pendlebury 2015). Two Scotland-wide books published in the review period provide a wider context for understanding changes in Upper Forth: Thom (1986) and Birds of Scotland (BoS) (2007).

To bring the story right up to date (early 2015), the most important changes in the species present and their abundance and distribution over the forty years of bird reports in the Forth Naturalist and Historian are described here. It does not, however, try to cover many familiar species that are currently widespread or believed to be little-changed in numbers. It draws on all the generic sources mentioned above and some sections begin with a context-setting summary of the main changes over the previous 40 years; *i.e.* from Rintoul & Baxter (R & B) (1935, to the start of the 'modern era' in the early 1970s (Bryant 1974).

Making comparisons of status through time can be made difficult by changes in the recording boundaries used, especially when comparing historic and recent events. This applies particularly to the rarer species which may be confined to a small area or single site near a recording boundary. Briefly, across the four decades of the review period traditional bird-recording areas such as Counties were replaced by Local Government Districts within the Central Region, which was itself then abandoned while district boundaries were adjusted.

Overlaying these politically-driven changes were the SOC's own bird-recording boundaries, which mostly followed political boundaries, but were modified to accommodate observer access. For example, South-west Perthshire, Endrick Mouth, eastern Loch Lomond, the southern part of the Carron Valley, Crook of Devon and Glendevon, were at first included in the Central Scotland (Upper Forth) recording area but are no longer. Any impact of these boundary changes will be mentioned if there is an obvious effect on local status.

Breeding species: gains 1930s to 1970s: Eight species bred for the first time in the four decades between the R&B era and the modern era (Table 1). These were Canada Goose, Montagu's Harrier, Herring Gull, Common Gull, Green Woodpecker, Collared Dove, Pied Flycatcher and Hawfinch. Probable or possible but unproven gains involved a further five species: Red-throated Diver, Goshawk, Wood Sandpiper, Redwing and Crossbill. A further species was deliberately introduced (Greylag Goose) and another (Osprey) recolonised after its extirpation in about 1840.

The Canada and Greylag Goose already had feral populations to the South and smaller populations breeding to the North. Canada Geese apparently colonised the Upper Forth unaided, especially where lowland lochs and artificial waters abutted farmland, mirroring the 'parkland' habitat they flourish in elsewhere. In contrast, Greylags were introduced by shooting interests in the Trossachs area and first settled and then apparently spread to other sites in the uplands as well as the Eastern lowlands. Early autumn flocks of 500 or more birds, presently appearing before migrants arrive from Iceland, are probably comprised of mainly locally breeding birds and their young.

Three species settled for only a short period and seem unlikely to return in the near future. The breeding of the Montagu's Harrier, Redwing and Hawfinch never involved more than one to a few reported pairs, and seem most easily explained as 'outliers' from stronger populations elsewhere which found local conditions were suitable for just a short while. In contrast, the Red-throated Diver apparently moved in and, in spite of a tiny population, has managed to maintain a foothold to the present day. Four of the remaining colonists, Common Gull, Green Woodpecker, Collared Dove and Pied Flycatcher are now firmly established and reflect much more widespread and well-documented expansion trends into the area (BoS 2007). Amongst these, only the Green Woodpecker has shown hints of local range contraction, although it remains well-established in many areas nearby.

Breeding species: gains 1970s to 2015: There has been a remarkable number of breeding newcomers over the 40 'review years'; 14 in all. Many were quite unexpected in 1970. One of these, however, is now firmly established across the area, whilst the others are seemingly trying to gain a firm foothold and a few others have 'come' but are now 'gone'. The most striking colonist in this period is the Common Crossbill. In the early 1970s, breeding remained unproven (although probably occurred at times) and even breeding season records were rare. By the end of the review period, however, many sites with suitable conifer habitat supported Crossbills, albeit in varying numbers.

Table 1. Gains and losses of breeding bird species in the Upper Forth over 80 years (1930s to 2015).

Proven first-time breeders	Probable or possible 1 st time breeders	Introduced or Recolonised	Ceased to breed
1930s-1974			
Canada Goose	Red-throated Diver	Greylag Goose (I)	Willow Tit
Montagu's Harrier (T)	Goshawk	Osprey (R)	Pintail
Common Gull	Wood Sandpiper (O)		
Green Woodpecker	Redwing		
Collared Dove	Crossbill		
Pied Flycatcher			
Hawfinch (T)			
Herring Gull (T)			
N=8	N=5	N=2	N=2
1975-1992			
Black-throated Diver	Honey Buzzard*		Corncrake
Red-throated Diver			Yellow Wagtail
Ruddy Duck (T)			Arctic Tern (O)
Common Scoter (O, T)			Nightjar
Little Ringed Plover			Herring Gull
Arctic Tern (O, T)			LBBG
Crossbill			Common Scoter
N=7	N=1	N=0	N=7
1993-2015			
Nuthatch		Nightjar (R)*	Ruddy Duck
Reed Warbler		Herring Gull (R)	Corn Bunting
Bearded Tit		LBBG (R)	
Eider		Red Kite (I)	
Goshawk			
N=5	N=0	N=4	N=2

*Treated here as a proven breeder but proof is lacking or unpublished; T=a temporary colonisation; O=outside present Upper Forth boundary; R=recolonised; I=introduced; LBBG=Lesser Black-backed Gull.

A link to the spread and maturation of conifer forests seems a likely explanation for the increase, but it also occurs in long-established conifer woods. While it is most likely that the species involved is indeed the Common Crossbill, mainly dependent on Norway Spruce but also seen in Scots Pine, the co-occurrence of some Parrot Crossbill or Scottish Crossbill cannot be wholly eliminated without detailed study (BoS 2007). All the other newcomers remain scarce and some are vulnerable to local extinction. The trend for the still-scarce Nuthatch, however, appears positive and has carried

it across the Upper Forth, so a reversal seems unlikely. Black-throated and Red-throated Divers exemplify the vulnerability of rarer species requiring scarce habitats. Increased disturbance of breeding birds, human persecution, eutrophication of upland lochs, predation of young by fish, gulls, Mink or Otter are just a few of the threats to their persistence. Perhaps the White-tailed Eagle will also be a threat to these rare waterbirds in the future?

Two raptors use remote forests for breeding although only the Goshawk is now apparently regular. However, if the Goshawk uses more accessible lowland sites it is likely to be persecuted as a threat to game birds. The rare Honey Buzzard could be shot unwittingly as part of the still-widespread practice of illegal killing of raptors to protect game. It is not a scavenger, however, so at least it is not so vulnerable to poisoning of carrion which still takes such a toll of Common Buzzards and the successfully re-introduced Red Kite.

The Ruddy Duck was for many observers an arresting if unnatural 'introduced' arrival in the area. It duly bred in small numbers (from 1991) but was then identified by various agencies as an 'invasive species', causing damage to remote populations of the declining White-headed Duck in Europe. Accordingly, a UK-wide control programme has run since 1999 (Henderson 2009) and this has apparently eliminated the local population (most recent Upper Forth record, 2013). The Arctic Tern is only mentioned in passing in this account because it bred (twice) by the Endrick Mouth, part of a river system which was within the former Central Region and the 'Central Scotland' area of interest (Corbett *et al.* 1993). Similarly, the breeding Common Scoters of Loch Lomond edged into the same Central Scotland area, although these too are now gone. Eider duck [Plate 1/a] was formerly a non-breeding rarity on the Forth Estuary west of the famous Bridges, but gradual increases in wintering numbers have likely led indirectly to their first proven breeding in Upper Forth in 2000. To date (2015) only a single brood of small ducklings has been proven, so it is uncertain if young have matured in the area or if more than one pair has ever been involved.

The remaining first-time breeders are all typical of lower ground and are found entirely in wetland habitats. Little Ringed Plover is known to have made three nesting attempts, of which only the most recent was successful (in 2011). The brownfield and natural river-shingle sites they choose for nesting are always liable to change or flood and in two cases site-management duly made the habitat unsuitable. For a secure colonisation, it will probably be necessary to manage water levels on freshwater wetlands with exposed shingle or sand and shallow pools. Reed Warbler and Bearded Tit have both bred in local reed-beds during the past few years (respectively, from 2011 and 2013). Breeding is likely or has been proven in each year since, so they appear

to be firm settlers. The persistence of Bearded Tit, however, will depend on an expanded population and an absence of extreme winter weather, which could easily extinguish this colonist. In contrast, the migrant Reed Warbler, perhaps encouraged northward by climate warming, seems likely to have a more certain future, especially as its scarce reed-bed habitat is being extended locally at the new RSPB reserve at Black Devon Wetland.

Breeding species: losses 1935 to 1970s and 1970s to 2014: The losses from the two '40-year' time periods are treated together in this section because relatively few species are involved (Table 1). Two breeding species were lost in the first period, although one (Pintail) was probably never more than a sporadic breeder. The other (Willow Tit), however, was established in scattered damp woods. Their fate locally is shared across much of the UK, with many populations disappearing even where there was no obvious habitat loss or change. So, while the causes remains uncertain, further sightings of Willow Tit, let alone their breeding, are unlikely.

Four species have been lost since 1970, in spite of some of the causes of their declines being known. There is good reason to suppose that the loss of three farmland species; Corncrake, Corn Bunting and Yellow Wagtail, is related in different ways to the intensification of agriculture. The Corncrake was still present across the Carse of Stirling and along the Forth and Allan valleys in the early 1970s, being found (albeit mostly heard) in a few wet meadows (with Flag Iris), seed-hayfields (mainly Timothy) and the margins of barley crops. These habitats were not being farmed intensively before this time, but by about 1975 most had gone as drainage and fertilization of wet meadows and multiple applications of herbicides and other pesticides rendered them progressively less suitable. Such a sudden loss of Corncrakes was hard to understand at the time but more recent work has shown how the short lifespan of Corncrakes makes them vulnerable to even a temporary loss of traditionally managed habitats (Green 2004).

The rapid decline of the Corn Bunting across the UK was a greater surprise to many observers because of all farmland birds it was the one that appeared to be the least demanding of biodiverse habitats. Often, the only obvious vegetation in their former habitats was along roads or farm-tracks and the only tall perches for song-posts were telegraph posts and wires. It turned out that the shift in grain cultivation from spring planting to mainly autumn planting, and associated multiple chemical treatments, deprived the buntings of their winter seed supply, comprised mainly of fallen grain and weed-seeds. The last known site where they sang their jangling song was around Skinflats, which was, and remains, one of the most intensively farmed landscapes in the area.

The last Corn Buntings were recorded in Clackmannanshire in 1988 (Bielby *et al.* 2013) and to the south of the Forth in 2000 (BoS 2007). Yellow Wagtails ceased to breed in the Grangemouth area in 1986. Migrant Yellow Wagtails still occur on passage but only restoration of extensive wet grassland meadows or provision of high-level saltmarshes by managed re-alignment might tempt some to stay and breed. The breeding and subsequent loss of Common Scoter and Ruddy Duck is discussed above. The Nightjar has re-established itself recently in many of its haunts in South-west Scotland, so it is perhaps no surprise that they also returned recently to forest clear-fells in the Trossachs. Involving a few pairs at most, it is always at risk of being under-recorded because of its nocturnal habits and this is a species which deserves a full night-time survey to confirm its current status.

Two species were described by Bryant *et al.* (1993) as 'lost' breeders (plus the Lesser Black-backed Gull) but they have since returned (Table 1). The Herring Gull formerly had a large breeding colony in the middle of East Flanders Moss, shared with Lesser Black-backed and Black-headed Gulls. When the large gull colony disappeared (late 1980s) it was concluded they had ceased to breed in the Upper Forth area. This may or may not have been the case but they have since been found to breed at many urban sites, almost exclusively on the roof-tops of commercial and industrial buildings in the East. This has occurred to such an extent that many warehouse rooftops in Grangemouth, Falkirk and Alloa now support thriving colonies of Herring and Lesser Black-backed Gulls

A balance sheet for breeding birds: Beginning with 109 breeding species reported by R&B, there has been a marked and progressive increase (Table 2). It is worth reflecting briefly, however, on what the mid-1930s list might have looked like if John Harvie-Brown had survived to write the 'Vertebrate Fauna of Forth'. His intimate first-hand knowledge of the local area could have provided a fuller list of proven breeding and visiting species. Even so, perhaps only the Red-throated Diver was indeed 'overlooked'; although they may have been persecuted and so indeed absent as a regular breeder. By 1974, the list of breeders had swollen to 117, jumping to 131 species in 2015, although this number is depressed due to the four breeding species lost during the 40 year review period. The overall total of species known to have bred since records began is 141 although, clearly, 10 of these no longer do so (Table 2).

What is apparent is that at the level of species-richness, there have been considerable net gains, seemingly running counter to the popular impression of our wild life being in decline. Sadly, the reality of wildlife declines in their early stages mainly involves reduced populations and ranges rather than loss of species, so the full scale of change is masked by focussing on the number of species alone. In brief, we now have smaller and more isolated populations of

many widespread species even though we have more species in total than in earlier times.

Table 2. Bird species 'richness' in Upper Forth between 1935 and 2015. The listings cover numbers of 'all species' ('Upper Forth list') and 'breeding species' alone ('Upper Forth breeders').

Cut-off date	Number of species recorded and breeding
1935	Upper Forth' list = Rintoul & Baxter (1935) = 204
1935	Upper Forth Breeders 1930s = 109
1974	Upper Forth' list = Bryant (1974) = 224
1974	Upper Forth Breeders 1960/70s = 117
1992	Upper Forth' list = Henty & Brackenridge (1992) = 258
1992	Upper Forth Breeders 1980s = 124
2015	Upper Forth' list = Bielby & Pendlebury (2015) = 281
2015	Upper Forth Breeders = 131
2015	Overall Upper Forth breeders 1930s to 2015: 141

Two notable species: The modern era of systematic description and analysis of our area's birds has allowed us to put species into a wider National or International context. Two species amongst the Upper Forth's birds stand out in terms of their contribution to conservation. Both have made their centre-stage appearance during the past 40 years of this review, emphasising again that we live in a time of flux and that not all changes are negative. This is the case because the two species occupy a unique position amongst Scotland's wildlife, whereas other, better known and often more celebrated species, are found more widely and abundantly across the nation. The first example is the flock of Bean Geese (*taiga* race) wintering on the Slamannan Plateau (McIver and Simpson 2013) [Plate 1/b].

This flock is presently the largest in the UK and is defined as being of National Importance. There is circumstantial evidence that these birds were originally displaced from South West Scotland, re-established themselves around the Carron Valley Reservoir (CVR), only to move on from there when the water level was raised in 1987. The flock presently finds refuge in the rugged, wet plateau-moors and sheep farms to the east of Fannyside Loch, their most regular roosting site. From a handful of birds at CVR in the 1950s and 60s, perhaps around 50 in the 1970s, there are now 100-300 on the Slamannan Plateau. There is no obvious threat, but any population of this size, restricted to a small area, is at risk from habitat and management changes. Recent studies have revealed that these birds derive from a small area in central Sweden and so could be vulnerable to change at both ends of their migratory path.

The Shelduck is a familiar bird around Scotland's coasts and on some freshwater lochs. There is nowhere else, however, that this beautiful estuarine

duck gathers in such large numbers as around Grangemouth in late summer. The large size of their population qualifies this single flock as being of International Importance (defined as comprising more than one per cent of the North West European flyway population). The birds form a large, tightly-grouped cluster to shed their flight feathers, while enjoying the 'security' of the group and an inaccessible site; namely remote mudflats bounded by a busy shipping channel, industry and 'keep-out' notices. From a handful of birds discovered moulting in 1974 (Bryant and Waugh 1976, Bryant 1978) the population has risen to over 4,000, reaching 7,000 in one year (*pers obs.*). While it is unclear where these birds are from, it is likely to include some from the local area, others from Scotland's west coast and perhaps some from Ireland as well. The vulnerability of this flock to an accidental oil-spill from the busy shipping lane makes it one of Scotland's most vulnerable wildlife 'jewels'.

Raptors: There are 14 species of raptors recorded as breeding in the Upper Forth area [Buzzard Plate 1/c and Short eared owl Plate 1/d]. Some are widespread and conspicuous whereas others have been seen by only a handful of people and their status is precarious. Also, one species is extinct after a short-term presence. Amongst the most obvious now is the Common Buzzard, although in the 1970s it was a rare bird in many lowland parts, often poisoned or shot into local extinction. At the other end of the abundance-scale is a potential (re-)colonist, the White-tailed Eagle. A programme of reintroduction to Fife between 2007 and 2012 resulted in the release of 86 young (BoS 2007). The first recent breeding success in East Scotland occurred in 2013. No breeding has yet occurred in Upper Forth but this species is an example of a likely colonist over the coming decade or so, following their local extinction in the 18th century. An overall perspective of the 'state of raptors' in the Upper Forth area is gained by aggregating the fortunes of the fourteen species (Table 3).

Potential colonists include species that may yet breed as well as those that have established a very precarious foothold. Species can be considered as established residents only when they spread beyond single sites or have populations exceeding about five pairs. There is reason to hope this may be achieved over the next 40 years. The most welcome category is the number of species that has increased, numbering five, all now capable of sustaining their numbers. It is notable that at least three different forces underpin these increases: natural recolonization, (re)introduction and reduction of threats. Firstly, there is the spectacular re-colonisation by the Osprey, from a single pair in the 1970s to over 20 pairs to date. It is now a species enjoyed by many, from birdwatchers to walkers, over local lochs in both the Highlands and lowlands. There is also a dedicated Osprey nest-viewing facility near Aberfoyle in the National Park.

Table 3. Status changes 1970-2014 amongst raptors breeding in Upper Forth.

Potential (re)colonist	Increase	Stable	Decline	Extinct
White-tailed Eagle	Osprey	Golden Eagle	Hen Harrier	Montagu's Harrier
Marsh Harrier	Red Kite	Merlin	Kestrel	(Extinct by 1956)
Honey Buzzard	Buzzard			
Goshawk	Sparrowhawk			
	Peregrine			
N=4	N=5	N=2	N=2	N=1

Orr-Ewing (2014) provides population details on 10 Upper Forth raptors

Secondly, the Red Kite has been successfully re-introduced by RSPB-SNH cooperation near Doune and now graces both Upper Forth's uplands and western lowlands with its buoyant flight. It is sufficiently abundant that it is able to support a tourist enterprise at Argaty (from 2003). Thirdly, the reduction in some specific adverse factors has allowed three species to increase. Most likely the widespread poisoning of carcasses on the uplands, nominally aimed at corvids and foxes in sheep country, was reduced and allowed Buzzards to spread out from their western haunts in the uplands. Once they had penetrated the lowlands they found that persecution was lower, poisons rarer and they were, to the surprise of some, anyway 'at home' in less-rugged settings.

A worm-eating Buzzard may not conform to the 'large raptor' stereotype but they have necessarily broadened their diet as they have moved into new low-lying territory, or found new ways of getting it, such as road-kill along the M9 Motorway. Two species, Peregrine and Sparrowhawk have benefitted significantly from the withdrawal of organochlorine-based agricultural pesticides. While neither species was driven out of Upper Forth, even at the height of the pesticide-era, both suffered reduced breeding success and territory-occupation, and were comparatively scarce in the wider countryside during the non-breeding period. Recovery was probably underway by the early 1980s, however, and now they are found nesting successfully in both their traditional upland and forest haunts as well as in the lowlands, including some Peregrines using some industrial structures for nesting.

Two raptors, currently the largest and smallest breeders locally, the Golden Eagle and Merlin, have remained roughly stable in terms of occupied sites, even though breeding success has been depressed by persecution and pesticides. Unfortunately, both species include grouse moors within their ranges and this exposes them to the illegal killing that persists on many of the moors in the area. The Merlin is absent from many places where the habitat

appears suitable: persecution maybe continues in these sites. These practices have had a more dramatic effect on one of the two species that has declined in the area. Once easily seen on the upland fringes or over estuary marshes in winter, the Hen Harrier is now sufficiently scarce that individual sightings are reported.

There is common agreement that the Hen Harrier is the most persecuted of our local raptors and until this is reduced they are likely to remain scarce, not least because grouse moors attract birds from elsewhere, only for them to be killed in turn: a raptorial Black Hole! Fox predation may also reduce nesting success and furthermore it is likely that the reduction in the planting of forestry on grassy moorland has also made fewer opportunities for harriers to use such low-risk, food-rich sites for breeding.

The Kestrel was for many decades the most familiar of local raptors, rarely persecuted and largely unaffected by pesticides. Unfortunately, this has changed since the 1980s, with the species remaining widespread but much-reduced in numbers. One possible explanation is that the ubiquitous intensification of farming practices in both the upland fringes and the lowlands; including the elimination of much 'rough ground', hedgerows, wide field margins and corners; has reduced populations of small mammals and invertebrates on which they mainly rely. The near local-extinction of the Barn Owl during the late 1980s (see Atlas 2) is perhaps linked, in part, to a similar cause. The Barn Owl, periodically depleted by hard winters, presently exists at lower densities than before.

Wetlands: The Upper Forth wetlands range from remote montane lochans, through large highland lochs, Scotland's only lake at Menteith, the UK's largest raised bog at Flanders Moss, some reservoirs, riverine reedbeds from Stirling downriver, to the broad reaches of the muddy Forth Estuary between Cambus and Blackness. It is amongst the birds of the estuary, however, that striking changes are best known. The most important of these is the development of an Internationally important flock of moulting Shelduck in the Grangemouth area (see above). However, all the news about Shelduck is not good, since wintering numbers have fallen away from the 2,000+ of the 1970s and 1980s to under 500 at present. One possible explanation is that the 'clean up' of waste water entering the Forth has reduced inputs to the nutrient cycle, impacting particularly the tiny mudflat-invertebrates that Shelduck rely on.

Within the context of generally stable and often Nationally and Internationally important populations of wintering waterfowl, a few other species have shown marked upward and downward trends over the review period (Bryant 1987, 1997). Dunlin and Knot are scarcer now than at the start of detailed monitoring in the early 1970s, in both cases mirroring declines

across the UK as a whole. Possibly both of these trends are related to a marked warming along their migratory routes, encouraging them to overwinter closer to their Arctic breeding grounds. In contrast, an obvious increase amongst the waders is shown by the Black-tailed Godwit. In the 1970s a sighting of even a single Black-tailed Godwit was treated as a 'good' find by local birdwatchers. In 1974-75, for example, the largest group reported across the two years comprised only six birds. By the 2,000s flocks of 500+ were regular, occasionally 1,000+, with Kinneil being a focal site but also with records from Blackness to Cambus. As with another species favouring mild and muddy estuaries or marshes, recent climate warming appears to have encouraged these visitors from Iceland to spend more time in Upper Forth, rather than passing through quickly to more southerly haunts. It is a good example of the 'Swings and Roundabouts' of the apparent effects of climate change; we seemingly lose out with our Dunlin and Knot but gain Black-tailed Godwits [Plate 1/e] in compensation'. Any 'uncompensated' losses due to climate change will be hard to accept!

Amongst the wintering ducks, the Pintail is a local highlight of Regional importance. While they occasionally turn up in ones or twos elsewhere, there is a regular flock in the Grangemouth area. This is a duck which prefers mild wintering areas: its non-breeding range stretches south to Sub-Saharan Africa. Hence regular wintering flocks are scarce in Scotland. The rise in numbers from tens to the present levels of 100+ is welcome and perhaps reflects improved conditions for feeding, fewer harsh winters, or maybe reduced pressure from wildfowling. Records of Garganey as short-term visitors in spring have become more frequent in recent years, perhaps also linked to climate warming during their arrival period [Plate 1/f].

Uplands: The uplands embrace most of the northern and western sectors of the Upper Forth area as well as the more isolated Ochil Hills and the escarpment linking Touch Moors to the Campsie Fells. While predatory birds are a prominent feature of the uplands (see above); this section explores some changes amongst other typical upland species, notably breeding waders and songbirds. Golden Plover and Curlew are particularly notable on mid-level uplands; nesting above most of the managed grassland but below the exposed ridges of the summits. Golden Plover bred widely across these habitats in the 1970s (Atlas 1) but have since disappeared from many areas (Calladine *et al.* 1990). There is no known cause for this decline but two trends may be relevant. Unfertilized, diverse pastures near to breeding areas have been replaced by nitrogen-enhanced, re-seeded pasture which supports few invertebrates. As a result, a favoured feeding opportunity for breeding plovers has been degraded or lost. Equally, higher levels of sheep-stocking over much of the period (albeit recently reduced) has led to rough grass replacing much Heather moorland, the latter a preferred habitat for nesting

plovers. The cause of declines in Curlew are less clear, but again the reduced quality of food-rich grassland in the vicinity of tussocky upland grasslands may be a factor. Detailed studies have indicated that predation of nests may also be involved, perhaps due to fewer farmers and gamekeepers being involved in Fox or Crow control, so fewer Curlew nests and chicks survive their vulnerable youth.

The uplands and upland fringes are well known as a haunt of the chats. Wheatears, Whinchats and Stonechats are most obvious at lower levels, although Wheatears may reappear close to rocky peaks. The Stonechat has twice experienced declines to near-extinction in the review period; the first more precipitous than the second. The Stonechat was widespread in the uplands up to the winters of 1978/79 and 1981/82 when unusually harsh spells eliminated most birds. Their recovery took over 20 years, when once again they were present in both uplands and lowlands. They were then faced with two further harsh winters, in 2009/10 and 2010/11, again knocking numbers back to near zero. At the present time Stonechats are again slowly recovering their ground, although they will likely take a further decade or so of mild winters to re-establish themselves fully. The Whinchat has maintained its numbers in several upland glens in the face of declines across most parts of the UK. Local studies have shown how habitat management can influence Whinchat populations and concluded that changes in grazing and forestry have probably contributed to some local declines (Calladine & Bray 2012).

Farmland: The lowlands flanking the River Forth comprise the largest acreages and most productive farmland in the area, mainly devoted to arable crops. The country further west and north is increasingly dominated by livestock and root crops but the principal crop is grass, grazed directly or cut for silage. The early years of this review, essentially the early-mid 1970s, marked the widespread adoption of intensive farming methods across the area. Since this approach to farming has continued to the present day, with only infrequent and local 'de-intensification' on organic farms, its long-term impact on bird populations has become clearer.

A dramatic loss has involved the Corn Bunting (see above). Unfortunately, the fate of the Corn Bunting could very well be mirrored soon by a second species; the Grey Partridge. Previously a familiar inhabitant of grain-growing areas or rough grassland with rushes bordering the uplands, the species is now only hanging on in a few sites in the East: these include some 'brownfield' sites. It is an ironic comment on the state of our now-impoverished farmland habitats, that they are now less suitable for some wild birds than abandoned so-called 'wasteland'. Two other species have been lost from the area: Yellow Wagtail and Corncrake (see above). It is sobering that all of the three species to become extinct in the Upper Forth area since 1970 are associated with lowland farmland. Most likely, it is this habitat that has deteriorated most in term of its naturalness, which is linked, at least in part, to

wider economic factors and to the pressures and incentives imposed via the Common Agricultural Policy (dating from 1973).

Three species of wader: Redshank [Plate 1/g], Lapwing, Snipe, are traditionally associated with lowland wet meadows for breeding; requiring some standing water in early summer and tussocky cover for nests. At present these habitats are hard to find on most 'well-drained' farmed land, but there are patches throughout, such as alongside rivers and the estuary and where grazed meadows abut the rough ground of the uplands. Surveys of the estuary hinterland in the early 2000s detected about 100 Lapwing territories although only a portion of these were occupied in any one year and many failed (Bryant *unpubl.*). Fortunately, all these species continue to breed widely on hill ground. A fourth species, Curlew, also nests in lowland fields (as well as uplands) in small numbers but seems likely to disappear soon as grassland management continues to intensify and as hayfields on low-lying fields are drained and converted to silage fields. Equally, there is little doubt that all these species would benefit from wet-meadow re-establishment by conservation-managers in the lowlands. At least four species typically linked to farmland, probably more, have declined during the review period: Barn Owl, Skylark and Tree and House Sparrows. Nevertheless this does not seem to have been a drastic decline; all four have shown maintenance or even some recovery in population over the past few years. Furthermore, the Skylark remains well established in the uplands so its local presence is not seriously threatened. Tree Sparrows showed a marked decline during the 1980s and 90s (Atlas 2) but seem to have re-established themselves along the Forth corridor more recently (Atlas 3). Perhaps this is related to provision of nestboxes and their increasing use of winter-feeding opportunities, especially at bird tables, improving their overwinter survival. Tree Sparrows were almost unknown at bird-tables in the 70s and 80s even though they were widespread at the time. Experience with this species, here and elsewhere, suggests that action to enhance winter food supplies, on farms and in gardens, could be important in consolidating and extending the species' range locally.

It is pleasing that several other farmland species have fared relatively well locally, even though they have declined elsewhere. Outstanding amongst these is the Yellowhammer, which remains widespread. Equally, numbers of Linnets and wintering Reed Buntings and field-breeding Oystercatchers are apparently stable, and evidence of a widespread decline amongst the three swallow species and Common Swift is lacking. It has to be said, however, that demonstrating population changes in House Martins is complicated by their tendency to re-locate their colonies periodically, so evidence of widespread changes requires very extensive and long-term surveys, providing more detail than Atlas fieldwork or casual reports. Sand Martins experienced a marked drop in numbers in the 1980s, due to droughts in their Sub-Saharan wintering

areas (Bryant & Jones 1995) but have since recovered to include a colony with about 1000 pairs.

Woodland: One of the area's greatest wildlife assets is the songbird community of our western (called 'Atlantic') oakwoods. These typically include a quartet of local or generally-declining species which find refuge in these upland woods: Redstart, Wood Warbler, Tree Pipit and Pied Flycatcher are the key species (Bryant 1993). It is clear from surveys that populations of these are the equal of those elsewhere and, in the case of Tree Pipits, are increasing as many of those elsewhere decline (Atlas 3). Numbers of Pied Flycatchers have also increased, largely due to provision of nestboxes throughout the area of the National Park where its core populations are found. Wood Warblers, however, have declined over the Upper Forth as a whole and have been nearly lost from most eastern haunts, although they remain widespread in the Atlantic oakwoods. The Redstart has almost certainly declined, within and outside the oakwoods, although populations seem to have stabilised over recent decades. They can still be found throughout the area, but only remain in isolated patches in most of the lowlands.

Two species found in mature coniferous forests have had very contrasting fortunes. The Capercaillie has become extinct locally whereas the Common Crossbill has occupied a majority of suitable habitats (see above). Clearly, their different ecologies have led to contrasting outcomes. Perhaps the ground nesting Capercaillie has been tipped into extinction by collisions with deer-fences or the recently-arrived Pine Marten, whereas the branch-tip breeding habits of the Crossbill keeps their eggs and young out of the way of these proficient nest-thieves. The timing of the Capercaillie's local demise, in the 1980s (last record 2011), fits closely with the Marten's spread, but clearly elsewhere it manages to persist in the presence of the martens so it is likely other factors are involved (BoS 2007).

Changes in species recorded - the Upper Forth bird list:

Knowledge of the changing status of breeding and wintering birds is important for guiding and supporting the conservation and greater scientific understanding of our bird life. It is the occurrence of occasional visitors, however, that often brings the greatest surprise and delight on a walk or monitoring count. In one obvious sense, every area's cumulative bird list will increase through time, because newcomers will continue to appear.

Table 4. First records for Upper Forth: 1993-2014.

Species	Type	Year of first record and comment
Great White Egret	Sp	2014 (First reported shot in 1887, Loch Katrine)
Little Egret	Sp	2002 (SOC website notes one undocumented bird in 1969)
Glossy Ibis	Sp	2009 (One, a presumed escape, seen in 1990s)
Ferruginous Duck	Va	2005
Lesser Scaup	Id	2004 (Earlier records may have been rejected as 'hybrids')
Barrow's Goldeneye	Va	2006
Ross's Goose	Id	2009 (Wild status remains unresolved)
Egyptian Goose	Sp	2003 (R&B report only 'escaped' birds)
Common Crane	Sp	2003
Spotted Sandpiper	Id	2007
Ring-billed Gull	Id	2007
Bonaparte's Gull	Va	2012 (Reported but not offered for formal review)
Mediterranean Gull	Sp	2000
Water Pipit	Id	1977 (Omitted from Bryant <i>et al.</i> 1993)
Red-rumped Swallow	Va	2012
Rose-coloured Starling	Va	2002
Firecrest	Va	2008 (Also one undocumented report from 1970s)

Details of earlier 'first records' since R&B are given in Bryant (1974), Henty and Brackenridge (1992), Bryant *et al.* (1993), Bielby and Pendlebury (2015). Sp- spreading (north), Id - identification refined, Va - vagrant.

The rate of addition to the species list, however, is of interest, and the species that appear for the first time are often indicators of a changing wider world or a particular mix of events. Seventeen species have been added to published lists for the first time over the 21 years since 'Central Scotland' (1993) was published (Table 4). Six of these may have been recorded earlier, but the historic record is unclear (see notes on Table 4). These additions, remarkably, total the same as the 17 newcomers discovered in the 22 years from 1970-1992 (Bryant *et al.* 1993). The recent newcomers fall into three types (Table 4.). Some have arrived as a wave of occurrences has swept across Britain; generally progressing from South to North (Sp). The best example of this is the Little Egret. This small heron was until recently a rare visitor to Scotland and so was not a predictable newcomer to the Upper Forth. By the 1980s, however, it was clearly spreading northwards through England, breeding as it went. It duly arrived in the Upper Forth in 2002 and has occurred regularly ever since. There is no publicised breeding yet in Scotland but widespread sightings suggest it might happen soon. Little Egrets have been recorded in every month of the year in the Upper Forth, although early summer records are few because wintering birds move south to breed. The recent breeding of Cranes in North East Scotland, following earlier attempts being made progressively northwards from their East Anglian re-colonisation

sites, made a local sighting more likely. Coupled with its long-term status as an occasional off-course passage migrant, an occurrence was probably due. A progression to breeding is possible, but unlikely any time soon. Great White Egret, Glossy Ibis and Mediterranean Gull are comparable examples of ongoing patterns of increasing northward occurrences duly leading to records in the Upper Forth. A few species have probably been recorded because identification criteria have been developed and publicised and some sub-species have been split into two single species (**Id**). Lesser Scaup, Spotted Sandpiper, Ring-billed Gull and Water Pipit are examples, where earlier occurrences, especially of females, or birds in winter or immature plumages, could have been overlooked. Two records of Ross's Goose also fall into this category although its status as a wild vagrant remains unproven. Some species have shown no pattern of sightings in Scotland or the UK which hinted that a local record was imminent: these are the true vagrants (**Va**). Barrows Goldeneye is outstanding in this category over 40 years and remains unique in the area. Conversely, Ferruginous Duck, Red-rumped Swallow, Rose-coloured Starling and Firecrest were unsurprising newcomers, albeit late-in-the-day, given their more frequent appearances nationwide, albeit in small numbers.

There is one exceptional and negative status-change in the Upper Forth record. The Lesser Spotted Woodpecker reported in the Trossachs in 1968-1970, was for a long time Scotland's only record. It has been reviewed recently, however; and the record has been relegated to the 'unproven' category. Were such a long-staying visitor to re-occur in the Upper Forth it seems likely that many observers and photographers would provide conclusive, positive or negative, evidence of such an unlikely occurrence.

Future trends: Three formerly well-established breeding species are at some risk of being lost to the area. Two are tied to montane habitats and a third to farmed land. The Ptarmigan is a relict of earlier 'arctic' conditions; when ice covered the landscape (BoS 2007). It now lives on the tops of the highest mountains where its habitat is threatened by progressive climate change. Even in the face of climate warming, however, it is not certain that the Ptarmigan would be pushed out: it could for example consolidate in smaller numbers on north-facing slopes. In such conditions, however, any small or edge-of-range groups could be lost and Upper Forth certainly has some of these on its lesser Munros. The Ring Ouzel retains a presence throughout the uplands but many local clusters present in the 1970s are now gone. Loss of Heather moorland and overgrazing of the uplands has been cited as a cause of the retreat but for a migrant species the cause could equally lie overseas. The decline of the Grey Partridge, however, gives every sign of being terminal. Farming and shooting interests have unfortunately not stepped in to support the species with well-tried habitat-enhancement techniques; instead

attempting to replace their loss to sport shooting with the introduced, but not self-sustaining, Red-legged Partridge.

It is presently uncertain if Dunlin and Greenshank retain a firm foothold as a breeding bird in the Upper Forth area, although they both do so within the most-extensive of its earlier boundaries. Nevertheless, they could easily be lost as a breeding bird in this wider area. The future status of other 'at risk' species and groupings appears to be more secure although this can never be certain with small populations. Black Grouse, Goshawk, Honey Buzzard have interest groups either monitoring their success or rehabilitating their habitat (Black Grouse). The two breeding diver species, however, are so thinly scattered that disturbance and other factors during breeding remain a threat.

The future of the Hen Harrier is at the focus of much conservation concern; principally due to the illegal killing around grouse moors. It has recently become clear, through imposition of legal penalties and firm evidence of unlawful killing, that all the estates with extensive Heather moors in the south-west of Upper Forth, stretching from Touch to the Campsies have been involved in illegal persecution of birds of prey. Most likely these practices have also inhibited colonisation by Red Kites while essentially eliminating breeding Hen Harriers from this area. It is clear that effective enforcement of the law, including licencing, or other controls, of driven grouse shooting in Scotland, is required to allow the Hen Harrier to recover as a widespread breeding bird.

The two outstanding groupings of wetland birds that flourish in the area; wildfowl and waders are certainly now more secure from the twin blights of land-claim and pollution that played their part in the past (McLusky *et al.* 1992). There is, however, the invisible threat of climate change which is apparently already encouraging 'short-stopping' (curtailed migration) by ducks and waders before they reach their southern wintering ranges. This has perhaps affected UFs migrant waterbirds less so than elsewhere because many of Scotland's wintering birds arrive from Iceland and the remote Arctic further to the north and west. In contrast, species moving into Scotland across the north-west European mainland, are now staying closer to their Baltic and Russian breeding grounds. It seems reasonable to speculate that this has affected populations of wintering Dunlin and Knot locally. The growing interest in and recognition of the importance of these spectacular waterbird populations should encourage greater local conservation efforts which could moderate any further losses related to climatic amelioration.

Conclusion

The birds of the Upper Forth area occupy a distinctive space amongst Scotland's rich wildlife populations. The area can boast most of the characteristic and spectacular bird species of the Highlands, such as Golden Eagles and Black Grouse and yet at the same time has an impressive list of lowland species, often close to their northern limits within Britain. This places the Upper Forth in a good position to accommodate some species under pressure from climate warming effects further to the south. Willow Warblers and Tree Pipits seem to be two such beneficiaries to date, while we are also experiencing colonisation by the Reed Warbler and the more-slowly spreading Bearded Tit. When this is coupled with the wildlife riches of the Forth Estuary and the whole area's role as a waterbird refuge, including moulting Shelduck, large flocks of wintering Pink-footed Geese and a flock of rare Bean Geese, it supports a distinctive and very important variety of birds.

The last forty years has seen a positive net change in the number of breeding species and the list of visiting species has risen steadily throughout. Populations of some species are, nevertheless, under threat and it seems certain that further breeding species will be lost over the coming 40 years. Nevertheless, the majority seem likely to persist at some level as breeding residents or visitors and a few will increase, or colonise, and then spread in ways we cannot yet predict.

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THE JOURNEY TO JUPITER: 1992 to NOW

Clare Toner

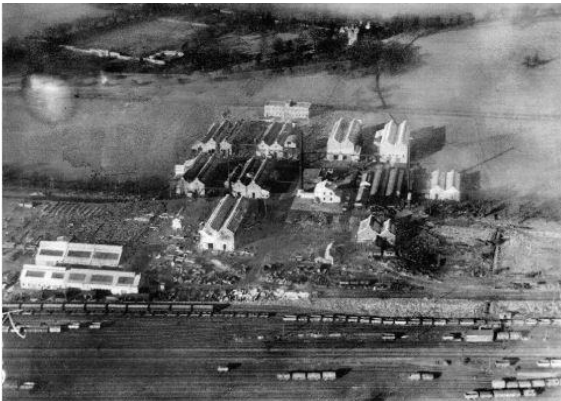
Introduction

The name, Jupiter Urban Wildlife Centre, illustrates its setting. The reserve, in Falkirk, is surrounded and seemingly hemmed in by industrial sites, housing and the railway between Falkirk and Grangemouth, with the M9 motorway only tens of metres away. Despite this urbanisation, Jupiter is a flourishing green oasis with many plant and animal species, and is a great place to escape hectic modern life. But how did this piece of industrial land grow into the nature reserve we have today?

A little recent history

Jupiter has not always looked like it does today (See Plate 2/a). The earliest image we have found of the area is an aerial photograph. This shows the area in 1925, with the busy railway lines to the Grangemouth Docks at the bottom of the image, to the north west of the Jupiter Reserve (Blackie 2009). The railway still defines the edge of the reserve. Whilst we can find no record of the site containing any of the dye work buildings, Jupiter has also spent time as a railway marshalling yard and we sometimes find evidence of this by finding pieces of clinker (spent coal) on the ground.

Figure 1. Aerial photograph of the Scottish Dyes Ltd. chemical plant in 1925.



After seeing the work of the Scottish Wildlife Trust at the Glasgow Garden Festival in 1988, the then property owners, ICI, approached the Trust to ask for their expertise in creating Scotland's largest wildlife garden, on 10 hectares of industrial wasteland. It was an ambitious project, to create valuable habitats from old

industrial land, and aimed to provide opportunities for local community engagement and education. The original plans were in three parts, working east to west: to construct formal demonstration gardens, to create a series of wildlife friendly habitats, and two large ponds. In all, over 1,000 trees and shrubs were

planted, some gifted or rescued from waste ground, and others moved within the reserve. The local community has been involved with Jupiter since its inception with many residents, local businesses, school pupils and members of the Trust's Falkirk Members Group providing advice and much needed physical effort to create the reserve.

Figure 2. Magnus Magnusson's oak planting at the opening: April 1992. (Credit: Scottish Wildlife Trust).



In 1992, the broadcaster and writer, Magnus Magnusson, and at the time, Chair of Scottish Natural Heritage, officially opened the Jupiter Urban Wildlife Centre. He planted an oak sapling in the formal gardens to celebrate the event. The tree is there still and has grown, as the reserve has also grown.

Figure 3. Sarah Cooper, Seasonal Ranger, aged 27, in front of Magnus' Oak, aged 25 (Credit: Clare Toner, 2016).



Since its opening in 1992, Jupiter has undergone a number of changes. The former Jupiter DIY warehouse, which housed the visitor centre and provided the reserve with its name, was sold off by the then landlord to a timber merchants, along with a semi-natural area to the north east. The reserve closed for a time in 2005, but re-opened less than a year later, as a smaller

reserve, of 4.2 hectares, but with a new visitor centre which we still have today.

Jupiter has also seen many staff changes since Bill Brackenridge, the first ranger, took up post in 1991. Bill described for the *FNH Journal* those early years at Jupiter (Brackenridge 1996). In recent times, the reserve has benefitted from the addition of a seasonal ranger throughout the busy spring and summer months. As part of the 'Save our Magnificent Meadows' Project, for instance our several seasonal rangers have been active, organising activities, events and meadow-related education sessions. Sarah Cooper, our current summer ranger says, ". 'Meadows are a valuable but sadly decreasing habitat in the UK. Our magical meadows at Jupiter are home to many species of bumblebees and butterflies and we have been encouraging people of all ages to appreciate the hidden value of this rare habitat."

The Jupiter Reserve today - reaching out to the community

One of the most rewarding aspects of working at Jupiter are the many and different people we meet on a daily basis. Some may only visit once, for an event, perhaps, or whilst on holiday, whilst others come almost daily to walk their dogs or walk themselves. It's heartening to see their reaction to being in this wee oasis of green, 'a haven amongst trains and industry'.

It is a joy to be immersed in this greenery - especially with the industrial activity going on constantly right outside the reserve. There is nothing better than sitting next to a pond, eating your lunch, listening to goldfinch wittering away above you, and catching a glimpse of shy moorhen chicks skulking through the reeds and enjoying the regular excitement as new flowers bloom throughout the season.

However, the day is not just sitting about this. The staff and volunteers at Jupiter work hard to keep the place welcoming for humans, animals and plants alike. We currently have 12 regular volunteers, ranging in age from 9 to 67 years old. They help us with all manner of activities such as reserve maintenance, habitat construction, wildlife garden maintenance and public events. In June alone, they volunteered 115 hours of their time. There are many duties that we must do in order to make visitor experiences memorable, enjoyable and inspiring, such as the seeming endless bramble trimming, especially in the summer time: they grow whenever you are not looking, and have been recorded to grow up to 8cm a day! There is also preparation for educational visits and events, which means preparing equipment and planning engaging and varied sessions. We also receive help from corporate groups the People's Postcode Lottery and Scottish Water, with staff looking for a day away from the office to do some volunteering and to contribute to our practical conservation work.

This wonderful bunch are guaranteed to bring sunshine to a showery day with tales of their own adventures with wildlife, enthusiasm for the most unappealing task (such as turning the smelly compost heap) and real care and commitment to making the reserve a welcoming place for wildlife and visitors (See Plate 2/b) Fiona, who has been at Jupiter since 2014, shares her experiences of volunteering, "I

have so many happy memories of volunteering at Jupiter, it's difficult to choose just one, and so I'll list some of my favourites: 1. Catching a glimpse of the kingfisher, 2. Weeding between pavers (well each to their own!), 3. Making bird boxes and 4. Eating cake, biscuits and drinking tea." Volunteering isn't all about trimming those pesky brambles and scything the meadows until you feel like your arms may fall off. It is a social time, and for some people it may be one of the few structured activities they have in their week.

Last year we welcomed over 7600 people, taking part in education activities, public events, or as curious visitors. Eighteen primary schools from the 'central belt' come for nature investigations such as bug hunting and pond dipping, and four local secondary schools come to learn biological survey techniques. A highlight from the Easter holidays this year was our Gruffalo's Easter party which involved myself dressing up as the mouse and our intern, Iris as the Gruffalo.

Figure 4. The Gruffalo's Easter Party, April 2017
(Credit: Sarah Cooper, Scottish Wildlife Trust).



We were a sight to behold, though I'm not sure whether some of the children knew whether to laugh or cry. Some groups also come for sessions to build self-confidence and to learn transferable skills such as habitat maintenance and litter picking. Within these groups there are pupils of all abilities and additional support needs. We also go out to schools or community centres to inspire people to learn about nature.

The benefits of outdoor learning are widely reported: building confidence, learning new skills, improving attitudes towards the environment, and creating a sense of belonging. Learning outdoors also increases interpersonal and social skills, such as communication and team

work. For educators, pupils and parents alike, outdoor learning is a welcome inclusion in the Curriculum for Excellence. The staff at Jupiter endeavour to support our local schools in providing a place and expertise to facilitate this. "The core values of Curriculum for Excellence resonate with long-standing key concepts

of outdoor learning. Challenge, enjoyment, relevance, depth, development of the whole person and an adventurous approach to learning are at the core of outdoor pedagogy. The outdoor environment encourages staff and students to see each other in a different light, building positive relationships and improving self-awareness and understanding of others" (Learning and Teaching Scotland, 2010). Or as one Beancross Primary 5 teacher described, "A great day bug hunting and pond dipping to help bring our learning to a real life context."

Unfortunately, many children seem unaware of the nature all around them. Maybe they do not spend much time outside or they do not know how and where to look. So it is a joy to see how excited they become when discovering something as common as an earthworm, an animal that I was picking up and trying to pet as soon as I could walk. The audience of older children can sometimes be more difficult to connect with, as perhaps they are at a time in their lives when only the things they choose for themselves are of interest to them. No matter what their level of enthusiasm is, ours is always high, and hopefully some of this inspires them. Even if all they remember is finding a devil's coach horse beetle from the pitfall traps (Figure 7), then at least they have seen something that they hadn't before.

Figure 5. Devil's coach horse beetle (*Ocyopus olens*) at the Jupiter Reserve (credit: Alan Stubbs).



The events we organise are mainly aimed at families with children of school age and we aim to provide a programme of varied and engaging seasonally appropriate topics. We also run adult events for more specialist knowledge such as wildflower walks and wildlife photography. Adults also benefit from visiting the reserve. "There are associated health

benefits to learning outdoors. Research indicates that the use of greenspace or 'green exercise' improves health. In particular, learning outdoors generally results in increased levels of physical activity. In addition, interacting with greenspace (walking, gardening, etc.) improves emotional wellbeing and mental health" (Muñoz 2009). We have many regular users (dog walkers, Nordic walking groups and locals coming for fresh air) who tell us how much they love coming here. A short walk from their houses, passing timber merchants, they can relax and enjoy the peace and greenery away from traffic and stresses of modern life. Many parents bring their children here, commenting on the safe environment, the friendliness of

the staff and the variety of activities on offer. They can borrow equipment for pond dipping, bug hunting, go on the tree trail, and do a scavenger hunt. We don't charge entrance fees so as not to prohibit anyone from visiting. Rachel, a visitor from Linlithgow, commented: "It's great fun catching sticklebacks. My brother got a leech that ate a fish! Loved it!"

Biodiversity in a tiny space

In only 4.2 hectares, we have managed to cram in many different habitats: wildlife gardens give people ideas of what they can do in their own outdoor space to encourage wildlife, grassland meadows, wetlands, freshwater ponds and woodlands. Since Jupiter's inception there have been approximately 360 species of plants recorded, 50 species of birds, 100's of species of invertebrates, 20 species of mammals and 4 species of amphibians. Some of the plant species we have here such as ox-eye daisy, *Leucanthemum vulgare*, and ragged robin, *Lychnis flos-cuculi*, are indicator species meaning that they show the presence and ecological health of an important habitat, in this case the meadow grasslands and wetlands around the ponds.

There are 4 species of orchid: common twayblade, *Neottia ovata*, northern marsh, *Dactylorhiza purpurella*, common spotted, *Dactylorhiza fuchsii* and broad-leaved helliborine, *Epipactis helleborine*. There are many water loving plants such as yellow flag iris, *Iris pseudacorus*, purple loosestrife, *Lythrum salicaria*, marsh marigold, *Caltha palustris*, water crowfoot, *Ranunculus aquatilis*, great reed mace, *Typha latifolia*, greater pond sedge, *Carex raparia*, and common reed, *Phragmites australis*. In early spring there is a sea of yellow primroses, *Primula vulgaris*, cowslip, *Primula veris*, and also cuckoo flower, *Cardamine pratensis*, helping pollinators that come out of hibernation, such as the early bumblebee. In summer the meadows are teeming with colourful sweet smelling plants such as tufted vetch, *Vicia cracca*, meadowsweet, *Filipendula ulmaria*, common knapweed, *Centaurea nigra*, viper's bugloss, *Echium vulgare*, betony, *Stachys officinalis*, wild basil, *Clinopodium vulgare*, and agrimony, *Agrimonia eupatoria*.

Most of the trees at Jupiter are species which are good colonisers such as silver birch, *Betula pendula*, goat willow, *Salix caprea*, and alder, *Alnus glutinosa*, many of which colonised naturally. There are also oak, ash, rowan, blackthorn and hawthorn, which were planted here. This natural colonisation, coupled with planting, has resulted in a strange mix of habitat types. Due to its industrial past, the top soil isn't great, and there is still ash and clinker over a layer of clay, so it is remarkable that we have so much diversity. This in turn supports a great diversity of animals with their nectar, leaves, berries and seeds.

At Jupiter there are an amazing assemblage of invertebrates. Thirteen species of butterfly have been recorded, a number which compares well with the wildest, most natural sites. During spring and summer months we carry out a weekly butterfly survey and submit the results to UK butterfly monitoring scheme. We also

carry out a monthly bumblebee survey with seven different species present at Jupiter including *Bombus pratorum*, buff-tailed, *Bombus terrestris*, white-tailed, *Bombus lucorum*, red-tailed, *Bombus lapidaries*, common carder, *Bombus pascuorum*, tree *Bombus hypnorum*, and garden, *Bombus hortorum*. The tree bumblebee is of significance as, formerly, its range was restricted to mainland Europe and Asia, but it made its way to southern England in 2001 and southern Scotland in 2013. It quite often makes its nest in bird boxes and is a great pollinator for our plants.

The cinnabar moth, *Tyria jacobaeae*, which appears on the UK BAP is a regular spot in summer and most recently a hummingbird hawkmoth, *Macroglossum stellatarum*, has been spotted feeding. In our extensive wetlands, there have been six species of dragon- and damsel-flies spotted in the past year, with dragon-flies such as common darter, *Sympetrum striolatum*, and common hawker, *Aeshna juncea*, and damsel-flies like common-blue, *Enallagma cyathigerum*, azure, *Coenagrion puella*, blue tailed, *Ischnura elegans*, and large red, *Pyrrhosoma nymphula*.

There are now 11 ponds in Jupiter. They support a great deal of life: frogs, toads, palmate, *Lissotriton helveticus*, and smooth newts, *Lissotriton vulgaris*, stickleback fish, pond and Ramshorn snails and a whole host of other invertebrates. They are fantastic places to teach about lifecycles as you can catch the larval/nymph form of an animal and also see the adults at the same time. So here you can see great diving beetle larvae, *Dytiscus marginalis*, eating a meal and the adult swimming around in the vegetation.

Figure 8. Grey heron at Jupiter in 2016
Credit: Clare Toner).



Over 50 species of birds have been recorded, particularly woodland species like tree creeper, *Certhia familiaris*, and great spotted woodpecker, *Dendrocopos major*, but also waterfowl like coot, *Fulica atra*, mallard, *Anas platyrhynchos*, and the occasional kingfisher, Alcedo atthis. Grey herons, *Ardea cinerea*, are regular visitors to the ponds to feed (Figure 8), this year the moorhens, *Gallinula chloropus*, are already on their second brood and we had a great recent sighting of a female mallard with ten ducklings! Bullfinch, *Pyrrhula pyrrhula*, and song thrush, *Turdus philomelos*, are two species that we regularly see at Jupiter. Both are on Falkirk's and the

UK's biodiversity action plan. This means they are rare species or are in decline, so

it's really important that we continue with our conservation efforts by providing food rich habitats and nesting space.

This year our intern, Iris Straastma, has been carrying out a comparative survey of blue tit breeding success between Jupiter and another Scottish Wildlife Trust reserve, Carron Glen, near Denny. She has monitored a total of 59 boxes at Jupiter and 36 at Carron Glen and found that 36% at Jupiter and 39% at Carron Glen have been used for breeding by blue tits, great tits and robins.

Jupiter borders the railway and is close to the M9 motorway. These act as wildlife corridors, allowing animals to move between habitats. Due to our perimeter fence, large mammals cannot get onto the reserve.

Figure 9. Young fox caught on trail camera footage at Jupiter Urban Wildlife Centre; August 2016 (Credit: Clare Toner).



There is, however, a small gap at the bottom of the fence, so anything that can squash itself under there or fly over can come in. We don't see many mammals by day as they are mostly nocturnal or crepuscular (just coming out around dawn & dusk). We have set up a remote sensitive camera to take pictures/videos of our night-time visitors, though, and so far we have

recorded foxes, rabbits, hedgehogs, moles, rats, wood mice, common shrew, bank voles and soprano and pipistrelle bats.

Twenty five years on

In May 2017 Jupiter celebrated its 25th anniversary. To commemorate this, the pupils of Grangemouth and Falkirk High schools designed and painted new murals for the outside of the visitor centre, and our mosaic mural was updated from the 20th anniversary. This delightful event was opened by the Scottish Parliament Cabinet Secretary for Environment, Climate Change and Land Reform, Roseanna Cunningham, and attended by staff and volunteers past and present, Falkirk Members group, our landlord, Calachem, and other local supporters, local MSPs, local school children and members of Jupiter's Wildlife Watch group (Plate 2/c). We spent the morning admiring the new art work, doing a bit of pond dipping and reminiscing about Jupiter's past and hope for the future.

What does the future for Jupiter look like? We would like to maintain and develop this great urban resource and provide greenspace and educational opportunities for local people of all ages. We would like to inspire local people to care for nature and give them the opportunity to connect with nature on their doorstep. After all there are so many wonderful things to discover and learn if you just take the time to look for them.

Acknowledgements

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FORTH AREA BIRD REPORT 2016

Neil Bielby

This is the 43rd bird report for the Upper Forth SOC (Scottish Ornithologists Club) recording area. The area covered by the report comprises the council areas of Falkirk, Clackmannanshire and Stirling but excludes parts of the Clyde drainage basin such as Loch Lomondside and the Endrick Water area (including Fintry and Balfron) all of which are covered by the Clyde bird report. The report consists of a summary of the main bird news from 2016 followed by detailed species accounts.

Chris Pendlebury, the current SOC recorder, can be contacted by e-mail at chris@upperforthbirds.co.uk; by leaving a message on 07798 711134; or by mail to 3 Sinclair Street, Dunblane FK15 0AH. Records can be provided through the BTO BirdTrack system or by an Excel spreadsheet that can be sourced from Chris. Details of what type of records are required for each species along with advice on writing descriptions and submitting records can be obtained from the deputy recorder, Neil Bielby at n64b68@gmail.com or by phoning 01786 823830.

In this report a coded summary of general distribution is included after the species name. The codes used in this report are:

- B Breeding status: widespread (present in more than five 10 km squares)
- b Breeding status: local, scarce (present in fewer than five 10 km squares)
- W Winter status: widespread or often in groups of more than ten
- w Winter status: local, scarce or usually fewer than ten in a group
- P or p Passage (used for species usually absent in winter); P and p used for widespread and local/scarce, respectively, as in winter status above
- S or s Summer visitor (used for species present in summer but which do not normally breed); S and s used for widespread and local/scarce, respectively, as in winter status above.
- Irr Irregular: less than annually.
- V Vagrant: does not normally occur.

Rarer species for which a full list of records are provided are highlighted with the use of an asterix (*). Records of rare species are subject to acceptance by the BBRC, SBRC or the local rarities panel. The latter currently consists of Graeme Garner, Cliff Henty, Mark Lewis, Duncan Orr-Ewing, Chris Pendlebury and Andre Thiel. A list of local rarities is available from Chris Pendlebury.

Much information and records - especially counts, rates and comparisons - come from the Wetland Bird Survey (WeBS) and Breeding Bird Survey (BBS) surveys carried out on behalf of the British Trust for Ornithology (BTO). In 2016 a total of 61 random km squares were surveyed for the BBS which, along with three Waterways BBS (WBBS) sites, resulted in 263 linear km's being perambulated – a new high. A total of 11,641 birds were recorded from 104 species by 38 surveyors with the coverage in each broad habitat type in the Upper Forth area being close to that of the actual.

The monthly **WeBS** counts (Sep – Mar) are split into estuary and inland with the former being co-ordinated by Dr M.V. Bell. The Forth Estuary counts are downstream from Cambus and are split into five sectors in which 112,913 wildfowl and waders were counted in the 7 months (Jan-Mar & Sep-Dec 2016). Inland, an average of 111 still sites and 148 km's of river and canal are counted by 45 volunteers producing 42,677 wildfowl and waders in the same 7 months.

Note: a detailed weather report for 2016 can be found elsewhere in this journal.

HIGHLIGHTS OF THE YEAR

January

A ♂ Smew was at Blairdrummond GPs (1st & 31st) and also at the confluence of the Forth and Teith (13th & 17th). A 1st winter Iceland Gull was at Blackness (3rd). Strong north-easterly winds brought an unprecedented influx of Little Auks which began with 58 at Blackness on the 4th followed by a single bird at the Skinflats TE the next day with two seen from there on the 6th when 15 were in the Blackness – Bo'ness area. Additionally, two Little Auks were on the R. Carron in the centre of Falkirk (4th) with others even further inland at Lyndoch, Killin (7th), one (dead) at the Lake of Menteith (12th) and two on the R. Balvag, Balquhiddy (15th). Mediterranean Gulls were at Kinneil (3rd) and at Skinflats Pools (16th). A Gannet, 16 Shags and three Little Gulls were at Blackness on the 4th with 24 Shags, four Common Scoters and a Guillemot present two days later. A Shag was well inland on Airthrey Loch (9th) while a Little Gull turned up at Kinneil the day after (10th). A White-tailed Eagle was at Invertrossachs (16th).

February

A Slavonian Grebe was at Kinneil (3rd) with a (the Blairdrummond) ♂ Smew on Gartmorn Dam (3rd – 28th) accompanied by a Slavonian Grebe (7th) and a Red-necked Grebe (7th-15th). An imm. ♂ Goshawk was at Blairdrummond Ponds when four Little Egrets were at Kennetpans (3rd). A 1st winter Iceland Gull was nr. Alva (8th) with a Golden Eagle above the

Spout of Ballochleam two days later. A Green Sandpiper was by the Allan Water nr. Kinbuck (13th) with 25 Snow Buntings at Inverlochlarig 2 days later. A Bearded Tit was at Cambus Pools (27th).

March

The ♂ Smew remained at Blairdrummond Ponds all month where the first Osprey of the year was sighted on the 6th. A Mediterranean Gull was at Blackness (2nd). One to two Goshawks were at Callendar Park (25th March – 3rd April). A Snow Bunting was at Blackness (26th). The first Sand Martins of the year were at Gartmorn Dam, Cambusmore/Gart GP & Cambus (27th) with the first Swallow of the year sighted at Blairdrummond Ponds (29th). One to two Black-throated Divers were intermittently on L. Tay at Killin (31st Mar – 4 Aug).

April

A busy month started with a Black-throated Diver at the head of L. Tay (3rd) along with a Dunlin present there during the first half of the month and where a Bar-tailed Godwit was a possible first record (18th). A Red-throated Diver, a 1st summer Mediterranean Gull and a Little Gull were at Blackness when a Little Gull was also seen at Skinflats Pools (3rd). Skinflats Pools also recorded the 2nd Ring-necked Duck for the area (a ♂, 15th-17th) along with a Little Ringed Plover (16th), the only Avocets of the year (two on the 20th & 25th) and two ♂ Garganey (20th). At Kinneil a ♂ Green-winged Teal was present from the 9th with a Marsh Harrier there from the 23rd to the 25th. These were followed by nine Whimbrel, the long-staying Spotted Redshank and seven Turnstones (26th) then a Curlew Sandpiper 3 days later. Powfoulis logged an offshore Red-throated Diver and two Sanderling (3rd) followed by an overflying Whimbrel (16th), a Ruff (23rd) and a White Wagtail (30th). An Iceland Gull was over Tullibody Inch (18th) with a Shag on the est. at Skinflats the next day. A Marsh Harrier was at the Blackdevon Wetlands (19th-30th) with a sub-adult ♂ at Tullibody Inch (24th April – 26 May). Summer migrant first dates were: Wheatear (3rd Sheriff Muir); House Martin (3rd L. Tay, Killin); Willow Warbler (9th Falkirk); Ring Ouzel (11th Comer); Cuckoo (14th Drumloist); Garden Warbler (14th Alva); Common Redstart (16th Killin Marshes); Common Sandpiper (20th R. Teith, Doune); Whinchat (20 Apr Polmont); Grasshopper Warbler (20th Skinflats Pools); Sedge Warbler (23rd Tullibody Inch); Common Whitethroat (24th Skinflats Pools); Wood Warbler (26th Killin Marshes) and Swift (30th Powfoulis).

May

The month began with some good passage birds at the head of L. Tay, Killin where there were two Dunlin, 54 Black-tailed Godwits, four Redshank and two Common Sandpipers (1st) followed by two ♂ Shovelers, 16

Redshank and three Turnstones (2nd). A Fulmar and 12 Sandwich Terns were off Blackness (2nd) followed by other Fulmars there (17th & 20th). A Goshawk was at Kilbryde (5th) with a Marsh Harrier at Cambus the day after. A Yellow Wagtail (race *feldegg*) was at Skinflats (12th & 13th). A Hawfinch in Dunblane (12th) was a rare sighting with seven at Logie Kirk (29th) even better. A ♂ Garganey was on Darnrigg Moss Pools (13th). A trip of three Dotterel on Stob Binnein was an unusual record (15th). Further summer migrant firsts were: Spotted Flycatchers (8th L. Venachar & G. Dochart); Lesser Whitethroat (9th Skinflats Pools); Reed Warbler (11th Skinflats Pools); Pied Flycatcher (14th Kilmahog) and Common Terns (15th Powfoulis). A (the) Red-necked Grebe was on Gartmorn Dam (16th).

June

Highlights were a Gull-billed Tern at Kinneil - which was only the 3rd record for the area (7th-25th) and a Little Gull at the head of L. Tay (3rd Jun- 4th Jul). Three Gannets and a Fulmar were offshore at Blackness and Kinneil respectively (4th). Three Arctic Terns were at Kinneil (16th) with the only Quail of the year heard nr. Thornhill (21st).

July

The month's highlight was an adult Mediterranean Gull W of Blackness Castle (20th). Other interesting records were an Arctic Tern at Kinneil (1st); three Whimbrel at Powfoulis (2nd); 15 Common Scoters on the Forth Estuary at Blackness (6th); a Short-eared Owl at Kinneil (9th); a Ruff at Skinflats when two singing Reed Warblers were heard at Longcarse (11th). The month ended with a Green Sandpiper in the Powfoulis area.

August

The most interesting sightings were at Skinflats Pools with a Little Stint (6th) followed by a Little Gull (8th), an adult Mediterranean Gull (17th), six Curlew Sandpipers and a Ruff (21st) with a Lesser Whitethroat the next day. A Curlew Sandpiper on the main pond at Skinflats TE was a site first (19th) with a Honey Buzzard flying E over Bo'ness (23rd). Some other records of interest were a Green Sandpiper at Tullibody Inch (11th); 4 Kittiwakes and c.40 Sandwich Terns at Kinneil (15th). An imm. Marsh Harrier and two Curlew Sandpipers were at Tullibody Inch (28th).

September

A very interesting month with the highlights being a Hoopoe at Lix Toll, Killin (16th) - only the 4th record for the Upper Forth and a Yellow-browed Warbler at Skinflats which was only the 2nd record for the area (25th). Other notable records were the only Arctic Skua of the year at Kinneil (6th) with a Fulmar there (9th) and a Black Tern at Blackness (15th) where a

Mediterranean Gull was offshore the following day. Guillemots were well inland at the Pool of Muckhart (12th), flying up Strathfillan (23rd) and at the nearby head of L. Tay two days later. Observed at Blackness were two Curlew Sandpipers and two juv. Gannets (16th) with two Curlew Sandpipers and 10 Sandwich Terns there (29th) followed by an adult Little Gull the next day. 42 Brent Geese were at Bo'ness (18th). Max. numbers of scarce species at Skinflats Pools during the month were: one Little Egret; a Marsh Harrier; two Ringed Plovers; six Grey Plovers; nine Curlew Sandpipers; a Little Stint; a Ruff; three Bar-tailed Godwits; a Greenshank; a Marsh Harrier and a Lesser Whitethroat. Some other records of interest were seven juv. Ringed Plovers and two Dunlin at L. Ellrig (4th); a juv. Sanderling at the head of L. Tay (5th); eight Grey Plovers in the Powfoulis area (24th); a Little Stint at Longcarse (28th) and a pair of Scaup (well inland) at the head of L. Tay (30th).

October

A Sandwich Tern was off Blackness when a Turnstone was well up the estuary at Kinneil (6th). An imm. Gannet was at Kinneil (9th) with single Long-tailed Ducks on the N. Pool at Skinflats and at Larbert Hospital Pond (16th) along with another on L. Ard (23rd). 16 Brent Geese flew SE over Skinflats (16th) with four at Blackness (28th). A ♂ Garganey (still in full breeding plumage) was on Gartmorn Dam (23rd). An imm/♀ Common Scoter was a site first for the Lake of Menteith (20th) when one was on L. Lubnaig. 20 Grey Plovers were at Skinflats Pools when an imm/♀ Scaup was on L. Ellrig and a ♂ Hen Harrier was below Thornhill (29th). Single White-fronted Geese were at Blackness (28th) and by Mid-Cambushinnie Fm. when a ring-tailed Hen Harrier was at Flander's Moss (30th).

November

The highlights this month began on the 1st with two Brent Geese at Blackness and a Goshawk over the A9 at Dunblane. A Mediterranean Gull was at Kennet Pans (26th) with a Common Scoter at S. Alloa the next day. Of much interest to many, November saw an influx of Waxwings which started with several small groups on the Braes of Doune (4th). More were then quickly reported from across the area with Dunblane seeming to be the epicentre where the maximum count was c.270 at Hanover PI (24th). Other sightings of particular note were: a Merlin just N of Carronshore (5th); two Gannets off Kinneil (6th); two Long-tailed Ducks at L. Coulter (10th) with one at the head of L. Tay and two on Blairdrummond Ponds (13th). An out of season Whimbrel was at Blackness (13th) with a Snow Goose at Powfoulis (26th) and a Long-eared Owl on Law Hill, Dollar (29th).

December

The Waxwings from the previous month remained fairly widespread and in good numbers with the max. count being 305 on yellow 'Joseph Rock' Rowan berries adjacent to Tesco's in Dunblane. A flock of c.250 were also noted in Grahamston, Falkirk (13th). Other highlights were a 2nd winter Iceland Gull over the R. Forth at Cambus (4th) with probably the same bird on the R. Forth in Stirling (18th). A Great Grey Shrike on the Braes of Doune (from 17th) was possibly the same bird seen there in March last year. A Slavonian Grebe was on the Forth at Bo'ness (17th). Some other records of note were c.40 Snow Buntings on Stob Binnein (4th). A Hen Harrier was on Sheriff Muir during the first week when 11 different Nuthatches (some colour-ringed) visited a feeder in Aberfoyle and c.60 Bramblings were near L. Watston (11th). The year ended on a high note with a ♀ Hawfinch at Blairlogie and a (the) Red-necked Grebe on Gartmorn Dam (30th).

CONTRIBUTORS

This report has been compiled from records submitted by the contributors listed below. Where initials are given, the contributors are listed in species entries of birds that are rare, uncommon or otherwise noteworthy. The editor is grateful to all the contributors for submitting their records. Apologies to anyone who has been inadvertently missed out.

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SYSTEMATIC LIST

Codes – F, C and S refer to Falkirk, Clackmannanshire and Stirling Council Areas. Names and species order: both the common and Latin names, along with the species order, have been in an ever increasing state of flux over recent years. To maintain some semblance of continuity (in order to make locating a species in the report a little easier) the same order as last year has been retained. As with the species order, there appear to be several different sets of common English names by different authorities, but for this report the British Birds 2016 list has been used with any additions to the vernacular English names in brackets.

Spring and autumn arrival and departure dates in this report have not usually been recorded systematically so that changes between years should only be seen as indicative and not interpreted as reflecting true phenological variation.

Abbreviations: ad (adult), aon (apparently occupied nest (s)), aot (apparently occupied territories), asl (above sea level), av (average), b (brood), b/lkm (birds per linear km), br (bridge), BoA (Bridge of Allan), BoD (Braes of Doune), cemy (cemetery), CVR (Carron Valley Reservoir), conf (confluence), CP (country park), crem (crematorium), Cres (crescent), Est (estuary), Fm (farm), fn (failed nest), F & C (Forth and Clyde), gdn (garden), Garg (Gargunnock), G (glen), GP (gravel pit), Hosp (hospital), Ho (house), imm (immature), juv (juvenile), Kinc. (Kincardine), km (kilometre), Lincs (Lincolnshire), L (loch), max (maximum), m (metres), nr (near), NE (nest with eggs), NH (new high), NR (nature reserve), NNR (national nature reserve), nr (near), no (number), NY (nest with young), occ (occasional), Pers Comm

(personal communication), Pl (Place), poss (possible/possibly), pr (pair), prob (probable/probably), QEFP (Queen Elizabeth Forest Park), res (reserve), resr (reservoir), ssp (sub-species), Sta (station), St (Stirling), temp (temporary), TE (tidal exchange), Tilly (Tillicoultry), Uni (University), W (winter) & y (young).

MUTE SWAN *Cygnus olor* (B, W)

Inland WeBS: 275 in Jan, 364 in Feb, 307 in Mar, 138 in Sep, 200 in Oct, 195 in Nov and 266 in Dec.

Forth Est. WeBS: 40 in Jan, 20 in Feb, 18 in Mar, 15 in Sep, 33 in Oct, 38 in Nov and 29 in Dec.

F Breeding: Callendar Park (8Y Sep); F & C Canal: The Wheel-Bonnybridge (8Y Jun) and Grahamston (5Y Sep). Larbert Hosp. Ponds (7y on 11 Jul then 2Y on 18 Sep). Union Canal: Redding (FN). Site max: 45 Skinflats Pools 4 Jan; 24 Helix Park 1 Nov & 12 Callendar Park 18 Sep.

C Breeding: Devonmouth Pool (5Y 1 Jun); Fire Station Pool, Alloa (4Y 7 Jun then 2Y on 1 Sep); Longcarse Pond (4Y 28 Jul) & S. Kersiepow Pond (3Y 1 Sep). Also pr's nesting at Blackdevon Wetlands & Cambus Village Pool. Site max: 157 (NH for UFBRA) R. Devon (Tullibody Br) 20 Feb; 29 Gartmorn Dam 16 Oct; 22 Blackdevon Wetlands 17 Apr; 17 Longcarse 23 Apr & 14 Alva Floods 22 Jan.

S Breeding: Doune Ponds (4Y 13 Jun); head of L. Tay (7Y 21 Aug) and Ochlochty Pond (3Y 21 Jul). Pr's nesting on main & lowest Ponds Cambusmore/Gart GP but no Y. Site max: 21 Blairdrummond Ponds 6 Feb & 20 Westleys, R. Forth 4 Dec.

WHOOOPER SWAN *Cygnus cygnus* (W)

Inland WeBS: 46 in Jan, 46 in Feb, 41 in Mar, 0 in Sep, 17 in Oct, 28 in Nov and 29 in Dec.

Forth Est. WeBS: 5 in Jan, 4 in Feb, 0 in Mar, 0 in Sep, 36 in Oct, 4 in Nov and 9 in Dec.

Spring departure: last 7 L. Dochart 26 Apr (NB). Autumn arrival: first 33 Bowtrees, Airth 16 Oct (SW, AB, MVB).

F Winter/spring site max: 15 Skinflats Pools 10 Jan; 12 Kinneil 19 Jan & 9 Little Denny Resr. 29 Oct. Autumn/winter site max: 33 Bowtrees, Airth 16 Oct & 9 Skinflats Pools 11 Dec.

C Autumn/winter site max: 20 Inch of Ferryton 2 Nov; 16 Longcarse 22 Oct & 6 Cambus 20 Nov.

S Winter/spring site max: 70 Dykehead (B8034) 9 Jan; 38 L. Dochart / Iubhair 16 Jan & 11 L. Arklet 11 Mar. Autumn/winter site max: 36 L. Dochart / Iubhair 9 Nov; 27 Strathyre 20 Oct & 10 N. Third Resr 29 Oct.

BEAN GOOSE *Anser fabalis* (W)

- F Regular wintering flock of Taiga race birds in the vicinity of the Slamannan Plateau. Winter/spring max: 263 Slamannan 23 Jan. Last 10 Feb (BGG). Autumn/winter max: 118 Slamannan 28 Oct (DMB).

PINK-FOOTED GOOSE *Anser brachyrhynchus* (W)

Spring departure: last 4 Tullibody Inch 26 May (DMB). Autumn arrival: first 25 > Falkirk 17 Sep (WP). Presumed summering birds: 1 Kinneil 3 Jun & 4 Higgin's Neuk 25 Aug.

Forth Est WeBS: 3,363 in Jan, 1,421 in Feb, 4,615 in Mar, 35 in Sep, 6,533 in Oct, 1,670 in Nov and 2,925 in Dec. (virtually all these birds are in fields above the high water mark. Although this species is recorded on inland WeBS counts most flocks spend the day grazing in non-wetland locations making the WeBS counts unrepresentative).

- F Winter/spring site max: 2,170 Skinflats 10 Jan; 1,135 S. Broomage 25 Sep & c.1,000 S. Alloa 4 Feb. Autumn/winter site max: c.10,000 Skinflats 1 Oct; c.8,330 Skinflats Pools fields 20 Nov & c.4,000 S. Broomage 30 Oct.

- C Winter/spring site max: c.2,270 Longcarse 9 Mar; c.1,550 Haugh of Blackrange 25 Feb & c.950 Cambus 31 Mar. Autumn/winter site max: c.6,000 Cambus 13 Oct; c.2,900 Inch of Ferryton 2 Nov & c.2,480 Longcarse 15 Oct.

- S Winter/spring site max: c. 2,500 Galmuir (Plean) 12 Feb; c.1,600 Fallin 25 Feb; c. 1,410 Gogar fields 9 Feb; c.1,000 Gartclush (Bannockburn) 13 Jan & c.800 Carse of Lecropt 13 Jan. Autumn/winter site max: c.1,500 Poldar Moss 4 Nov; c.1,500 Taylorton (Stirling) 27 Nov & c.900 Callander 31 Oct.

*WHITE-FRONTED GOOSE (Greenland race) *Anser albifrons* (w)

- F One Blackness 28 Oct (AC).

- S. One Mid Cambushinnie (Kinbuck) 30 Oct (CJP).

GREYLAG GOOSE *Anser anser* (b, W)

Icelandic birds normally depart in Apr and return in Oct but the exact spring departure and autumn arrival dates of these birds are muddled by the presence of an ever increasing number of resident feral birds whose wintering population probably matches the Icelandic one now.

Forth Est. WeBS: 14 in Jan, 4 in Feb, 2 in Mar, 1,159 in Sep, 518 in Oct, 421 in Nov and 385 in Dec (virtually all these birds are in fields above the high water mark. Although this species is recorded on inland WeBS counts many flocks spend the day grazing in non-wetland locations making the WeBS counts unrepresentative).

- F Winter/spring site max: c.1,000 F & C Canal fields (Bonnybridge) 4 Jan & c.250 Little Denny Resr. 9 Mar. Autumn/winter site max: c.810 R. Forth, Airth 18 Sep; 770 Forth est., Blackness 13 Nov & 331 Skinflats Pools 25 Aug.

- C Winter/spring site max: c.350 Collyland 29 Mar. Autumn/winter site max: c.5,000 Cambus 12 Oct; c.1,300 Longcarse 28 Sep & c.200 R. Devon, A907 on 22 Oct.
- S Winter/spring site max: 286 N. Third Resr 6 Feb & c.200 Blairdrummond Ponds 5 Mar. Summer (feral birds): 321 R. Forth, Banded 6 Aug & 362 on 22 Sep. Autumn/winter site max: 184 N. Third Resr. 6 Dec; 112 Cambusmore/Gart GP 6 Nov & 107 Claish Pool (Callander) 17 Nov.

CANADA GOOSE *Branta canadensis* (b W)

Numbers continue to increase.

Inland WeBS: 367 in Jan, 591 in Feb, 373 in Mar, 344 in Sep, 686 in Oct, 680 in Nov and 812 in Dec.

Forth Est. WeBS: 28 in Jan, 0 in Feb, 2 in Mar, 164 in Sep, 42 in Oct, 10 in Nov and 10 in Dec.

BBS: recorded at 0.1 b/lkm (1997-2015 average: 0.1 b/lkm).

- F Breeding: pr + 2 chicks Darnrigg Moss Pools 24 May (TF). Site max: 325 Skinflats Pools 30 Aug; c.100 Little Denny Resr 10 Feb & 77 St Helen's Loch (Bonnybridge) 15 Jan.
- C Site max: 146 Gartmorn Dam 24 Oct & 103 Cambus Village Pools 16 Aug.
- S Breeding: 15Y Cambusmore/Gart GP 5 Jun (NB). Site max: 292 R. Forth (A91-Fallin) 16 Dec; 281 L. Coulter 10 Nov; c.260 Blairdrummond Ponds 29 Oct; 207 Lake of Menteith 15 Nov; 161 Cambusmore/Gart GP 31 Jul; 152 L. Venachar 19 Oct; c.140 Drip Moss 25 Aug; 133 R. Forth, Banded 6 Aug & 90 L. Ard 19 Oct.

*BARNACLE GOOSE *Branta leucopsis* (w)

In our area it can be difficult distinguishing between wild migrants and feral birds resident in Britain but most records between Feb - Mar & Sep - Nov will be of wild birds on migration between Svalbard & the Inner Solway Firth.

- F One Skinflats Pools 10 Jan, 20 Feb & 19 Mar (poss. feral bird). 5 there 11 Mar with 4 on 3 & 19 Apr; 16> Darnrigg Moss Pools 8 Jan (unusual no for date); 1 Airth 18 Sep (prob. feral); 89>SW Bo'ness 78 Oct; 3 Powfoulis 23 Oct & 5 L. Ellrig 29 Oct.
- C 1 Gartmorn Dam 25 Feb (prob feral) & 4 Kennet Pans 12 Mar.
- S 1 W. Grange, R. Forth 25 Feb.

*BRENT GOOSE (light-bellied) *Branta bernicla hrota* (w)

- F 42 Bo'ness 18 Sep (JRC); 16 Blackness >SE 16 Oct (MVB) & 4 Blackness 28 Oct (AC).

SHELDUCK (Common) *Tadorna tadorna* (b, W)

Inland WeBS: 7 in Jan, 5 in Feb, 28 in Mar, 1 in Sep, 0 in Oct, 1 in Nov and 0 in Dec.

Forth Est. WeBS: 477 in Jan, 358 in Feb, 459 in Mar, 2,567 in Sep, 825 in Oct, 286 in Nov and 360 in Dec.

- F Breeding: broods of 12 & 8 Kinneil 25 Jun (CS). Moulting flock max counts: 4,210 Kinneil 1 Aug & 1,690 Skinflats 30 Aug (MVB). Other site max: c.160 Blackness 6 Jan.
- C Breeding - Tullibody Inch: brood of 11 chicks + 1 half-grown juv 18 Jun & 2 broods of 4 half-grown juv 12 Jul. C. 30 juv 28 Jul (NB). Site max. 122 R. Forth, Longcarse 9 Mar; 26 Cambus Village Pools 13 Mar; 6 Blackdevon Wetlands 17 Apr & 1 R. Devon (A907-Cambus Weir) 22 Feb.
- S Site max: 10 R. Forth (Bandeath) 20 Feb & 19 Mar; 5 Blackdub Floods 1 Jan with 4 on 3 Feb; 4 Drip Moss 7 Feb; 3 Westleys (Carse of Lecropt) 18 Feb & 2 L. Tay (Killin) 9 Jul.

*MANDARIN DUCK *Aix galericulata* (b, w)

It is unknown whether the following records relate to a bird(s) bred in the wild or escapees.

- C Single ♂ Gartmorn Dam 24 Sep (GG).
- S One ♂ Doune Ponds 13 Jan – 6 Feb (DAP, DOE) and at The Meadows, Callander 17 Sep (NB).

WIGEON (Eurasian) *Anas penelope* (s, W)

Inland WeBS: 376 in Jan, 267 in Feb, 296 in Mar, 54 in Sep, 248 in Oct, 429 in Nov and 497 in Dec.

Forth Est. WeBS: 1,432 in Jan, 821 in Feb, 472 in Mar, 212 in Sep, 723 in Oct, 1,142 in Nov and 1,729 in Dec.

- F Site max: 1,475 S. Alloa 27 Nov; 605 S. Alloa 4 Feb; 285 R. Forth (S. Alloa-Kinc. Br.) 15 Oct & 191 Skinflats 11 Dec
- C Site max: 1,196 R. Forth (Cambus-S. Alloa) 6 Dec; 145 Alva Floods 22 Jan & 105 Kennet Pans 3 Feb.
- S Site max: 163 Cambusmore/Gart GP 4 Dec; c.120 R. Forth (the Frews) 13 Mar; 115 L. Coulter 10 Nov & 101 Blackdub Floods 1 Jan.

GADWALL *Anas strepera* (s, w)

- F Skinflats Pools: monthly max of 7 in Jan; 3 in Sep & 2 in Nov. Two Kinneil 21 Feb.
- C Max. 6 Blackdevon Wetlands 23 Apr. Cambus Village Pools: monthly max of 4 in Mar and 8 in Apr. Two Gartmorn Dam 21 Sep and 6 on 23 Oct. Longcarse: monthly max of 4 in 5 Mar; 4 in May & 3 in Jun.
- S Three Gartmore Pond 20 Oct; 3 (2♂) Lake of Menteith 15 Nov & 3 (1♂) N. Third Resr. 10 Nov with 2 there 6 Dec.

TEAL (Eurasian) *Anas crecca* (b, W)

Inland WeBS: 1,065 in Jan, 1,502 in Feb, 925 in Mar, 568 in Sep, 1,252 in Oct, 1,908 in Nov and 1,731 in Dec.

Forth Est. WeBS: 1,539 in Jan, 1,429 in Feb, 1,193 in Mar, 1,147 in Sep, 2,725 in Oct, 4,255 in Nov and 2,958 in Dec.

- F Site max: c.930 R. Forth (S. Alloa-Kinc. Br.) 11 Dec; 683 Skinflats (WeBS) & 661 Kinneil (WeBS) 13 Nov; 273 S. Alloa 4 Feb & 109 R. Carron (Carron Ho.-A905) 20 Mar.
- C R. Forth (Cambus-Alloa) monthly max: 555 on 9 Jan; 787 on 21 Feb; 488 on 9 Mar; 163 on 14 Apr; 225 on 25 Aug; 492 on 18 Sep; 1,825 on 15 Oct; 2,242 on 15 Nov & 991 on 6 Dec. Other site max: 429 Kennet Pans 13 Nov & 116 R. Forth (Fallin-Cambus) 25 Feb.
- S Breeding: ♀ + 3Y L. Tay (Killin) 9 Jun (JPH). Site max: 527 R. Forth (The Frews) 18 Nov; 302 R. Forth (A91-Fallin) 25 Feb; 283 R. Forth (A91-Fallin) 16 Dec; 256 Allan Water (Cambushinnie-Ashfield) 13 Nov; 231 L. Coulter 6 Dec & 227 Cambusmore/Gart GP 6 Nov.

*GREEN-WINGED TEAL *Anas carolinensis* (v)

- F One ♂ Kinneil from 9 – 30 Apr (SW, DT *et al.*)

MALLARD *Anas platyrhynchos* (B, W)

Inland WeBS: 1,814 in Jan, 1,933 in Feb, 1,107 in Mar, 1,796 in Sep, 2,188 in Oct, 279 in Nov and 1,735 in Dec.

Forth Est. WeBS: 357 in Jan, 158 in Feb, 42 in Mar, 377 in Sep, 218 in Oct, 279 n Nov and 420 in Dec.

BBS: recorded at 0.52 b/lkm (1997-2015 av: 0.62 b/lkm; range 0.33 to 0.98 b/lkm). Unsurprisingly, the highest recording rate was on WBBS at 2.87 b/lkm.

- F Breeding recorded from Bantaskine (Falkirk), F & C Canal (The Wheel-Bonnybridge), Lionthorn & Skinflats Pools. Site max: 111 Callendar Park Loch 23 Aug.
- C Breeding recorded from Blackdevon Wetlands, Cambus Village Pool, Devonmouth Pool & Longcarse. Site max: 169 Kersiepow Pond 1 Oct & 106 Gartmorn Dam 16 Oct.
- S Site max: 114 Airthrey L. 21 Sep; 110 Lake of Menteith 11 Feb & 74 L. Dochart 16 Jan.

PINTAIL *Anas acuta* (W)

Forth Est. WeBS: 140 in Jan, 133 in Feb, 99 in Mar, 22 in Sep, 41 in Oct, 84 in Nov and 33 in Dec.

- F Site max: 163 Skinflats 24 Nov & 128 Skinflats 21 Feb. 1 R. Forth (S. Alloa-Kinc. Br.) 11 Dec.

*C Three Cambus 30 Jan; 1♂ Devonmouth Pool 30 Apr & 5 May; 2 Longcarse 24 Apr & 1 Kennet Pans 19 Sep (JRC, NB, DH, GG).

*S Three (1♂) Blackdub Floods 1–3 Jan (NB, DOE).

*GARGANEY *Anas querquedula* (s)

- F Two ♂ Skinflats Pools 20 Apr (SW) & a ♂ Darnrigg Moss 13 May (TF).

C One ♂ Gartmorn Dam (still in full breeding plumage) 23 Oct (MVB).

SHOVELER *Anas clypeata* (p)

- F Skinflats Pools (monthly max.): 1 on 1 Jan; 3 on 28 Feb; 1 on 29 Mar; 1 on 2 Apr; 3 on 31 Jul; 6 on 9 Aug (all ♀/juv); 9 on 25 Sep; 9 on 1 Oct; 4

on 27 Nov & 3 on 11 Dec (AB, AE, DOE, SW et al). ♂ St Helen's Loch (Bonnybridge) 15 Jan – 12 Mar & 1st W ♂ 10 Dec (AB, WT, NB). Singles Kinneil Lagoon 18 & 30 Aug; 18 Sep & 17 Dec (NB, MVB, AB, DOE). 1 R. Carron (Carronshore) 13 Dec (AB).

C One Cambus Village Pools 3 Apr, 3 on 16 Apr, 6 on 5 May & 1 on 1 Sep (JRC, GG, NB). 1 Gartmorn Dam 16 Oct (GG, SR). A pr Longcarse Pool 14 Apr, 17 May & 10 Dec (NB, JRC).

S 2 L. Tay, (Killin) 2 May (JPH).

POCHARD (Common) *Aythya ferina* (w)

Inland WeBS: 15 in Jan, 19 in Feb, 25 in Mar, 1 in Sep, 3 in Oct, 17 in Nov and 7 in Dec. Numbers have reduced greatly over the past 15 years. The peak monthly count in 1995 was 230 (Jan).

F Skinflats Pools (monthly max): 3 on 1 Jan; 1 on 8 Feb; 2 on 23 Apr; 5 on 24 Aug & 2 on 3 Sep.

C Gartmorn Dam (monthly max): 11 on 23 Jan; 32 on 27 Feb; 28 on 5 Mar; a ♂ on 11 Jun; 9 on 6 Sep; 24 on 22 Oct; 10 on 13 Nov & 5 on 18 Dec.

S Single ♂ from 1 Jan – 11 Sep Cambusmore/Gart GP then again on 4 Sep. 11 Carron Valley Resr. 17 Jan. Lake of Menteith (monthly max): 4 on 12 Jan and a ♂ on 11 Feb, 15 Nov & 8 Dec. L. Tay, Killin (monthly max): 4 Jan; 4 Feb; 4 Mar; 1 Sep; 1 Oct; 2 Nov & 3 Dec). One L. Mahaick 13 Nov.

TUFTED DUCK *Aythya fuligula* (B, W)

Inland WeBS: 281 in Jan, 475 in Feb, 445 in Mar, 195 in Sep, 392 in Oct, 411 in Nov and 525 in Dec.

F Site max: 40 N. Pool Skinflats 17 Apr; 27 St Helen's Loch (Bonnybridge) 10 Dec; 24 Callendar Park Loch 24 Jan & 21 Kinneil Ho. Pond 18 Dec.

C Breeding: ♀ with 1 chick Longcarse Fm. Pond 12 Jul (NB). Gartmorn Dam winter/spring max: 277 on 27 Feb & autumn/winter site max: 190 on 16 Oct.

S Breeding: 5 broods (2 of 6; 1 of 5; 1 of 4 & 1 of 3) Cambusmore / Gart GP 31 Jul (NB). Winter/spring site max: 62 L. Watson 6 Feb; 48 CVR 17 Jan; 44 Lake of Menteith 11 Feb; 32 Quarry Loch, Blairdrummond 12 Mar; 21 L. Lubnair 12 Jan; 21 Cultenhove Dam 15 Feb (NH) & 20 L. Coulter 14 Jan. Summer site max: 172 Cambusmore/Gart GP 31 Jul (moult flock). Autumn/winter site max: 88 Lake of Menteith 15 Nov; 68 Cambusmore/Gart GP 11 Sep; 66 Blairdrummond Ponds 17 Dec & 65 CVR 18 Dec.

*RING-NECKED DUCK *Aythya collaris* (v)

F One ♂ Skinflats 15 - 17 Apr. Only the 2nd record for the Upper Forth (AB, ACa, CN, RS, SW).

SCAUP (Greater) *Aythya marila* (s, w)

Forth Est. WeBS: 0 in Jan, 4 in Feb, 6 in Mar, 1 in Sep, 0 in Oct, 0 in Nov and 0 in Dec.

F Kinneil monthly max: 2 in Jan; 6 in Feb; 6 in Mar; 6 in Apr; 3 in Jun; 1 in Sep; 1 in Oct; 1 in Nov & 5 in Dec. 10 Powfoulis 11 Dec. Bo'ness: 4 on 21 Feb & 6 on 13 Mar. 1 Skinflats 22 Oct & an ♀/imm L. Ellrig 29 Oct.

C One Gartmorn Dam 18 & 20 Nov (JRC & GG).

S Seven imm/♀ Lake of Menteith 8 Dec (NB); 1 Blairdrummond Ponds 23 Apr (CJP & DOE) & a ♀ L. Tay (Killin) 13 Nov (JPH).

EIDER (Common) *Somateria mollissima* (s, w)

Forth Est. WeBS: 0 in Jan, 6 in Feb, 6 in Mar, 0 in Sep, 0 in Oct, 1 in Nov and 0 in Dec.

F Blackness max: 16 in Jan, 7 in Mar, 9 in May, 6 in Sep & 6 in Dec. Bo'ness max: 2 in Jan, 2 in Feb, 8 in Mar & 2 in Apr. Kinneil max: 6 in Jan, 1 in Feb, 4 in Mar, 3 in Apr, 3 in May, 3 in Jun, 4 in Jul, 6 in Aug, 8 in Sep, 4 in Oct & 1 in Nov. Other: 6 Carronmouth 21 Feb; 6 Higgin's Neuk 26 Apr & 2 Skinflats 6 May.

*LONG-TAILED DUCK *Clangula hyemalis* (w)

F ♀ Larbert Hosp Ponds 15-16 Oct (AB). 1 Skinflats Pools 16 Oct (MVB, SW).

C ♀/imm Gartmorn Dam 21 & 25 Sep; ♀ 18 Nov (JRC, GG, SR).

S Max. 2 ♀/imm Blairdrummond Ponds 12 Oct – 29 Dec (DOE, CJP); 2 ♀/imm L. Coulter 10 Nov (NB) & 1 juv. L. Tay (Killin) 13 Nov – 31 Dec (JPH).

*COMMON SCOTER *Melanitta nigra* (w)

F Two Blackness 6 Jan & 1 on 19 Jan (DMB, BW); 2 Bo'ness 6 Jan (DMB) & 1 S. Alloa 27 Nov (DMB).

S One L. Lubnaig 8 Jun (DA) & a ♀/juv Lake of Menteith 20 Oct (NB).

GOLDENEYE (Common) *Bucephala clangula* (W)

Inland WeBS: 240 in Jan, 518 in Feb, 497 in Mar, 2 in Sep, 60 in Oct, 345 in Nov and 470 in Dec.

Forth Est. WeBS: 60 in Jan, 43 in Feb, 33 in Mar, 0 in Sep, 0 in Oct, 4 in Nov and 20 in Dec.

F Site max: 55 R. Forth (S. Alloa-Kinc Br.) 10 Jan & 33 S. Alloa 27 Nov.

C Site max: 85 Gartmorn Dam 13 Feb; 64 (15♂) R. Devon (Tullibody Br.-Cambus Weir) 25 Feb; 46 R. Forth (Cambus-Alloa Inch) 10 Jan & 44 Devonmouth Pool 25 Jan.

S Site max: 152 (38 ♂) Lake of Menteith (10 Mar) & 39 CVR 18 Dec.

*SMEW *Mergellus albellus* (irr)

What was probably the adult ♂ from 2015 returned at the start of the year.

C Gartmorn Dam: 7 – 28 Feb (JRC, RS et al). It is highly likely that this was the Blairdrummond bird (which was absent from that site during this period).

- S Blairdrummond Ponds: virtually permanently from 1 – 31 Jan & 28 Feb - 9 Apr (DOE, CJP). The same bird was around the Forth/Teith conf. 13 - 17 Jan (RP, DMB, DOE).

RED-BREASTED MERGANSER *Mergus serrator* (B, W)

Inland WeBS: 7 in Jan, 2 in Feb, 0 in Mar, 1 in Sep, 0 in Oct, 0 in Nov and 1 in Dec.

Forth Est. WeBS: 40 in Jan, 45 in Feb, 20 in Mar, 29 in Sep, 14 in Oct, 37 in Nov and 47 in Dec.

- F Kinneil monthly max: 7 in Jan, 25 in Feb, 18 in Mar, 69 in Aug, 18 in Sep, 9 in Oct, 29 in Nov & 27 in Dec. Other site max: Skinflats Est. 20 on 11 Dec; 20 Bo'ness 9 Jan & R. Forth (S. Alloa-Kinc. Br.).

- C One R. Forth (Cambus S. Alloa) 21 Feb & 9 Mar. 1 R. Devon (Alva-Tullibody Br.) 20 Feb.

- S Breeding: L. Tay (Killin): ♀ with 16 ducklings 9 Jul reducing to 5 ducklings by 20 Jul. Pr. L. Arklet 12 May. Inland records: Forth/Teith conf: 4 on 17 Jan & 1 on 18 Dec; R. Forth (Lecropt): 2 on 16 Jan & 1 on 4 Dec; 1 L. Doine 21 Jan; 1 L. Tay (Killin) 24 Apr with 11 birds there on 21 Aug; 1 Killin Marshes 18 Sep & 1 Blairdrummond Ponds 20 Nov.

GOOSANDER *Mergus merganser* (B, W)

Inland WeBS: 106 in Jan, 94 in Feb, 154 in Mar, 73 in Sep, 129 in Oct, 239 in Nov and 146 in Dec.

Forth Est. WeBS: 21 in Jan; 8 in Feb, 18 in Mar, 13 in Sep, 9 in Oct, 13 in Nov and 7 in Dec.

- F Site max: 21 mouth of the R. Carron 1 Aug; 18 Black Loch (Limerigg) 10 Dec; 17 Kildean (R. Forth) 10 Dec & 16 R. Carron (M876 - Larbert) 11 Nov.

- C Gartmorn Dam: 18 Feb, 14 Sep, 88 Oct & 108 Nov (13th - record count for the U.F.). Other site max: 24 R. Forth (Longcarse) 5 Mar & 20 R. Forth at Cambus 6 Mar.

- S Breeding: ♀ + 6 ducklings G. Lochay Power Sta. 9 Jun. Site max: 22 R. Forth (Stirling Br-A91) 17 Dec; 20 R. Forth (Fallin) 19 Mar & 15 R. Forth (Teith-Allan conf's) 13 Nov.

RED GROUSE *Lagopus lagopus* (B, W)

BBS: recorded at 0.18 b/lkm (1997-2015 av: 0.14 b/lkm. Range: 0.03 to 0.37 b/lkm).

- S Site max: c.50 Spout of Ballochleam 1 Nov & 32 Cringate Moor 3 Mar.

*PTARMIGAN *Lagopus muta* (b, w)

- S One Twistin Hill (NN 3720) 8 May (NK); 1 Stuc a' Chroin 26 May & 4 Sep (AW, CME); 2 Beinn nan Imirean (NN 4130) 27 May & 2 Meall a' Churain (NN 4532) 27 May (AS); 1 Beinn a' Chroin (NN 3919) 11 Sep (ML); 2 Meall Ghaordaidh (G. Lochay) 19 Sep (SP) & 'present' Ben Lui 6 Nov (PPV).

*BLACK GROUSE *Tetrao tetrix* (b, w)

- S Three L. Katrine (NN 4210) 10 Apr (DK) & 3 Tom Dubh (Callander) 22 Apr (MH). Singles: Sheriff Muir 2 Apr (NB); Innischoarach (G. Lochay) 22 Apr (GK); Gleann Breac-nic (NN 6212) 7 May (CW) & L. Arklet 27 Sep (PS).

*RED-LEGGED PARTRIDGE *Alectoris rufa* (b, w).

It is thought unlikely that the small feral population is self-sustaining.

- S Six Dalkenneth 10 Oct (JHN) & 10 Sheriff Muir 8 Dec (DOE).

GREY PARTRIDGE *Perdix perdix* (b, w)

Has become very scarce during the last 20 years. A small number of releases helps sustain numbers.

- F Site max: 15 Powfoulis 27 Nov (AB); 12 Orchardhead (Skinflats) 9 Dec (MVB) & 9 Skinflats Pools 21 Sep (SW).

- C Site max: 2 Blackdevon Wetlands 30 Apr (NB).

- S Site max: 13 Kippenrait (Dunblane) 29 Sep (MVB – prob release); 4 Taylorton 27 Nov & 2 Sheriff Muir 8 Dec (DOE).

*QUAIL (Common) *Coturnix coturnix* (b)

- S One calling Thornhill 21 Jun (DHi).

(Common) PHEASANT *Phasianus colchicus* (B, W)

Large numbers released on shooting estates, otherwise widespread but in small numbers.

- BBS: recorded at 0.22 b/lkm (1997-2015 av: 0.53 b/lkm. Range: 0.22 to 0.8 b/lkm). The highest recording rate was on farmland at 0.53 b/lkm.

*RED-THROATED DIVER *Gavia stellata* (b, w)

- F One Blackness 6 Jan & 20 May (DMB, DOE); 1 Kinneil 8, 23 & 24 Jan (DMB et al); 1 Bo'ness 9 Jan & 20 Mar (DOE, JRC) & 1 Skinflats TE. 3 Apr (DOE).

- S One L. Arklet 7 Apr & 7 Jun (NB, JC); 2 L. Ard 27 May (MM); pr. at one undisclosed location in the Trossachs 7 Jun (ATP) & 2 L. Tay (Killin) 9 Jul (JPH).

*BLACK-THROATED DIVER *Gavia arctica* (b)

- S One Loch Tay (Killin) intermittently from 31 Mar – 4 Aug with 2 on 18 Jun (JPH). Also 2 present at one undisclosed location in the Trossachs 12 May (NB).

LITTLE GREBE *Tachybaptus ruficollis* (B, w)

Inland WeBS: 62 in Jan, 53 in Feb, 54 Mar, 116 in Sep, 103 in Oct and 92 in Dec.

- F Breeding: 4Y Darnrigg Moss Pools 21 Jul & 2Y St Helen's Loch, Bonnybridge 4 Sep. Site max: 10 Drumbowie Resr 4 Sep.

- C Site max: 10 R. Devon (Alva-Tullibody Br) 13 Mar.

- S Breeding: 2Y Cambusmore/Gart GP 31 Jul; 1Y L. Voil 17 Sep. 1Y W. Cambushinnie Pond 20 Sep. Site max: 41 Cambusmore/Gart GP 2 Oct; 16 L. Lubnaig 19 Dec; 14 L. Dochart 11 Feb & 9 L. Voil 25 Oct.

GREAT CRESTED GREBE *Podiceps cristatus* (b, W)

Inland WeBS: 0 in Jan, 28 in Feb, 36 in Mar, 36 in Sep, 23 in Oct, 13 in Nov and 19 in Dec.

Forth Est. WeBS: 7 in Jan, 2 in Feb, 11 in Mar, 10 in Sep, 5 in Oct, 5 in Nov and 6 in Dec.

F Monthly max: Blackness: 12 in Jan, 2 in May & 42 in Sep. Kinneil: 11 in Jan, 16 in Feb, 2 in June, 17 in Aug, 14 in Sep, 15 in Oct & 15 in Dec. Other site max: 4 N. Pool Skinflats 3 Apr; 4 Bo'ness 10 Feb; 2 Darnrigg Moss Pools 19 Apr & 1 L. Ellrig 13 Mar.

C Monthly max Gartmorn Dam: 5 in Jan, 10 in Feb, 8 in Mar; 5 in Sep, 16 in Oct, 12 in Nov & 6 in Dec.

S Breeding: up to 6 at Cambusmore/Gart GP 6 Mar-2 Oct with a max of 3 large Y 31 Jul. Monthly max at Lake of Menteith: 23 in Feb, 26 in Mar, 29 in Sep (which incl 2 x 50% grown juv and 'several' large Y) 9 in Oct, 4 in Nov & 13 in Dec. Other sites spring / summer: 2 Blairdrummond Ponds 12 Mar-2 Apr; 2 CVR 11 May with singles on 23 Feb & 13 Nov; 2 L. Venachar 7 Apr; 1 N. Third Resr 14 Mar & 2 on 7 Sep (incl. 1 large Y) & a juv L. Tay (Killin) 2 Oct.

*RED-NECKED GREBE *Podiceps grisegena* (v)

C One Gartmorn Dam 7 - 15 Feb, 16 May & 30 Dec (JRC, RAB, ECh).

*SLAVONIAN GREBE *Podiceps auritus* (irr)

F 1 Kinneil 3 Feb (DT) & 1 Bo'ness 17 Dec (DOE).

C 1 Gartmorn Dam 7-8 Feb (GG, RS).

*FULMAR (Northern) *Fulmarus glacialis* (irr)

F One Blackness 2, 17 & 20 May (EMcL, DMB, DOE) & 1 Kinneil 4 Jun & 9 Sep (CJP, DT).

*GANNET (Northern) *Morus bassanus* (p)

F One Blackness 4 Jan (RTW); 1 imm. Kinneil 9 Oct (CJP) & 2 Kinneil 6 Nov (CJP).

CORMORANT (Great) *Phalacrocorax carbo* (S, W)

Inland WeBS: 92 in Jan, 112 in Feb, 96 in Mar, 66 in Sep, 126 in Oct, 142 in Nov and 97 in Dec.

Forth Est. WeBS: 25 in Jan, 32 in Feb, 54 in Mar, 85 in Sep, 71 in Oct, 48 in Nov and 66 in Dec.

F Site max: 44 Kinneil 11 Dec; 42 Skinflats (WeBS) 18 Sep; 20 Blackness 3 Jan & 16 S. Alloa 4 Feb.

C Monthly max R. Forth (Longcarse): 16 in Jan, 11 in Feb, 34 in Mar, 20 in Jul; & 18 in Aug. Other site max: 24 Kennetpans 3 Feb; 20 R. Forth at Cambus 22 Feb & 20 Gartmorn Dam 13 Nov.

S Monthly site max: Lake of Menteith: 27 in Feb, 17 in Mar, 34 in Oct, 25 in Nov & 36 in Dec. CVR: 34 in Jan, 21 in Feb, 8 in Mar, 17 in Sep, 11 in Oct & 35 in Nov. Other site max: 47 R. Forth (A91-Fallin) 22 Mar; 37 L. Tay (Killin) 3 Dec.

*SHAG *Phalacrocorax aristotelis* (irr)

F Between 4 & 20 Blackness 5 – 9 Jan (RTW, DMB et al); 4 Bo'ness 6 Jan (DMB) & 1 Skinflats (est.) 19 Apr (SW).

S One Airthrey Loch 9 Jan (CJP)

LITTLE EGRET *Egretta garzetta* (w)

F Max 4 Higgin's Neuk / Kincardine Br area 3 Jan - 6 Mar. 1 Kinneil 15 Feb & 20 Mar then max. of 2 from 25 Aug – 2 Nov (a bird on 28 Aug was ringed (red J & yellow 9) at N. Coates, Lincs. on 20/05/2017). 3 Powfoulis 6 Nov. 2 – 3 intermittently at Skinflats Pools throughout the year. 3 Skinflats TE. 3 Jan then 1 on 20 Aug, 2 on 13 Nov & 11 Dec; 2 R. Forth (S. Alloa – Kinc. Br.) 10 Jan then 1 on 11 Dec & 2 S. Alloa 28 Nov.

*C Four Kennet Pans 3 Feb with 3 there 12 Mar.

GREY HERON *Ardea cinerea* (B, W)

Inland WeBS: 75 in Jan, 49 in Feb, 46 in Mar, 88 in Sep, 79 in Oct, 69 in Nov and 75 in Dec.

Forth Est. WeBS: 28 in Jan, 2 in Feb, 7 in Mar, 78 in Sep, 30 in Oct, 47 in Nov and 43 in Dec.

BBS: recorded at 0.11 b/lkm (1997-2015 av: 0.12 b/lkm. Range 0.03 to 0.18 b/lkm). Again unsurprisingly the highest recording rate was on WBBS at 0.4 b/lkm (there were no records from mountains & moorlands and urban habitats).

F Breeding: no nesting at Dunmore Wood & Kinneil Wood (trees felled). Site max: 32 Skinflats (WeBS) 18 Sep & 21 R. Forth (S. Alloa-Kinc. Br, WeBS) 11 Dec.

C Site max: 18 R. Forth (Cambus-Alloa) 18 Sep; 13 Kennet Pans 3 Feb; 9 Gartmorn Dam 21 Sep & 6 R. Devon (Dollar-Tilly) 10 Nov.

S Site max: 16 L. Venachar 19 Oct; 12 Blairdrummond Ponds 4 Jan; 11 Cambusmore/Gart GP 31 Jul & 21 Aug; 11 R. Forth (Teith-Allan conf's) 15 Sep; 8 Blackdub Floods 23 Jan & 6 L. Coulter 15 Feb.

RED KITE *Milvus milvus* (b, W)

*C 1 Skythorn Hill, Ochils (JHN).

S Breeding: of 33 pairs on territory 24 were known to lay eggs of which 17 nests hatched fledging at least 23 Y (DOE et al). Max of 45 Argaty 2 Jan & 20 Feb; 7 L. Mahaick 9 Feb & 4 Spout of Ballochleam 1 Nov. Regular around BoD, BoA, Callander, Cromlix, Dunblane, G. Dochart & Stirling. Occ. sightings in areas of CVR., Earlsburn Resr's, Fintry Hills, Flanders Moss, Gargunnoch & Menteith.

*WHITE-TAILED EAGLE *Haliaeetus albicilla* (s, w)

Likely to refer to a bird from the Fife reintroduction scheme.

S One Invertrossachs 16 Jan (DOE).

*MARSH HARRIER *Circus aeruginosus* (p, s)

F One Kinneil 23 & 25th Apr & 1 Skinflats 26 Sep (CJP, DMB).

C One Blackdevon Wetlands 19-30 Apr & 13 Sep (JRC, DMB, NB, MVB); 1 Cambus 6 May (DH); a sub-ad ♂ Tullibody Inch 24 Apr – 26 May & an imm bird 28 Aug (JRC, GG, NB, DMB).

*HEN HARRIER *Circus cyaneus* (b, w)

S Flanders Moss: ♂ 24 Jan (JDI), ♀/imm 7 Sep & ♂ 27 Sep (DAP), ♀/imm 27 Oct & ♂ 28 Oct (DAP, CS), ♀/imm 4 Nov & ♂ 19 Nov (CMcK, RD), ♀/imm 7 Dec & ♂ 9 Dec (AH, KMcC). Other records: ♂ Kippen N. 3 Jan (RJS); 1 Drumloist 28 Jan (DT); 1 G. Lochay 21 Sep (JG), 1 W. Carse, Gargunnock 6 Oct (CMcK), 1 Spout of Ballochleam 1 Nov (DMB), ♀/imm The Linns, Sheriff Muir 8 Nov (*pers comm*) & 1 Sheriff Muir 9 Dec (DOE).

*GOSHAWK (Northern) *Accipiter gentilis* (b, w)

F 1-2 Callendar Park (Falkirk) 25 Mar – 3 Apr (SW).

S Imm ♂ Blairdrummond Ponds 3 Feb (NB) & 1 Kilbryde 5 May (DOE).

SPARROWHAWK (Eurasian) *Accipiter nisus* (B, W)

Inland WeBS counts: 4 in Jan, 4 in Feb, 2 in Mar, 3 in Sep, 4 in Oct, 2 in Nov and 4 in Dec.

Thinly spread throughout the majority of the recording area. Contributors are encouraged to submit breeding records.

F Three broods of begging juv's Callendar Wood, Falkirk 30 Jul (CME).

BUZZARD (Common) *Buteo buteo* (B, W)

Recorded throughout the majority of the recording area. Contributors are encouraged to submit breeding records.

Inland WeBS counts: 33 in Jan, 45 in Feb, 47 in Mar, 45 in Sep, 41 in Oct, 46 in Nov and 45 in Dec.

BBS: recorded at 0.32 b/lkm (1997-2015 av: 0.37 b/lkm. Range: 0.24 to 0.55 b/lkm). The highest recording rate was on WBBS at 0.67 b/lkm (there were no records from urban habitats).

F Six Callendar Park 3 Apr & 5 Skinflats Pools 20 Nov.

S Five Blairdrummond 31 Jan, 2 May & 3 Jul; 6 Cambusmore / Gart GP 10 Apr; 6 Hill of Row 25 Apr & 6 Spout of Ballochleam 1 Nov.

*HONEY BUZZARD (European) *Pernis apivorus* (v)

F One Bo'ness 23 Aug (RS).

S Two records at a confidential location in the Trossachs (CMcI).

*GOLDEN EAGLE *Aquila chrysaetos* (s, w)

S 1 Spout of Ballochleam 10 Feb (RS).

OSPREY *Pandion haliaetus* (B)

Breeding: 19 pr's laid 16 clutches with 13 successful nests producing 29 fledged Y (DOE).

First records of the year: 1 Blairdrummond Ponds 6 Mar (DOE) & 1 L. Rusky 27 Mar (DT). Last record: 3 CVR 18 Sep (JS/AM).

F One Kinneil 9 Jun (CL).

C One Kennet Pans 19 Jun (JRC).

- S Summer: present throughout the district, particularly CVR, Callander, Doune, Menteith, L Tay & the Trossachs. 5 Lake of Menteith 5 Apr.

KESTREL (Common) *Falco tinnunculus* (B, W)

Inland WeBS counts: 2 in Jan, 4 in Feb, 5 in Mar, 2 in Sep, 2 in Oct, 4 in Nov and 4 in Dec. (Spread thinly throughout most of the recording area. Contributors are encouraged to submit breeding records).

F Max: 3 Kinneil 23 Jan.

C Max: 3 Kennet Pans 3 Feb.

S Max: 3 Sheriffmuir Inn 19 Nov & 3 Spout of Ballochleam 1 Nov. 1 at 900m a.s.l. Stuc a Chroin 4 Sep.

*MERLIN *Falco columbarius* (b?, w)

F Skinflats: 2 on 3 Jan, 1 on 15 Apr & 1 on 11 Dec (SW, AB, RS, MVB). 1 Higgin's Neuk 6 Mar & a ♀/imm Powfoulis 6 Nov (RWP).

C One Kennet Pans 12 Mar (JRC); 1 Law Hill, Dollar 19 Sep (KB) & 1 Cambus 10 Dec (JRC).

S One Lochan Mhàim man Carn (NN 3907) 25 May (ATP); 1 Creag Bhuidhe (Killin) 10 Oct (JHN) & 1 BoD 5 Nov (CMcK).

PEREGRINE FALCON *Falco peregrinus* (B, W)

Widespread outwith the breeding season but in small numbers, mostly in lowland areas (incl. town centres) and especially along the tidal R. Forth and estuary.

WATER RAIL *Rallus aquaticus* (b, w)

Greatly under-recorded.

F Site max: 3 Skinflats Pools 22 Jun; 2 Glen Marsh (Lionthorn, Falkirk) 5 Mar & 1 Kinneil Pond 10 Aug.

C Site max: 4 Blackdevon Wetlands 28 Apr; 4 Longcarse/ Tullibody Inch 28 Aug (recorded here throughout the year); 2 Cambus Pools 27 Feb & 3 Apr; 2 Cambus Village Pools 12 Mar, 16 Apr & 5 May and 1 R. Devon (Alva – Tilly) 12 Nov.

S Singles at Killin Marshes 12 Apr – 4 Sep & 1 R. Forth (Teith-Allan conf's) 18 Dec.

MOORHEN *Gallinula chloropus* (B,W)

Inland WeBS: 64 in Jan, 98 in Feb, 79 in Mar, 61 in Sep, 117 in Oct, 99 in Nov and 71 in Dec.

F Breeding: pr feeding 2 chicks Union Canal (Redding) 3 Jul; pr + 1 chick 4 Sep. Skinflats Pools monthly max: 14 in Jan, 9 in Feb, 10 in Aug, 14 in Oct, 25 in Nov & 12 in Dec. Other site max: 15 Callendar Park Loch 22 Mar & 6 Kinneil Ho. Curling Pond 16 Oct.

C Breeding: 2 Y Longcarse Pond 12 Jul. Site max: 13 R. Devon (Alva-Tullibody Br) 18 Dec & 9 Cambus Village Pools 3 Mar.

S Breeding: 1Y Ochloch Pond (Dunblane) 15 Jun & pr with a chick Killin Marshes 29 Jun. Monthly max Airthrey Loch: 8 in Jan, 21 in Feb,

11 in Mar, 14 in Sep, 12 in Oct, 17 in Nov & 14 in Dec. Other site max: 7 Cultenhove Dam 15 Feb & 6 L. Watston 1 Oct.

COOT (Common) *Fulica atra* (B, W)

Inland WeBS: 137 in Jan, 250 in Feb, 189 in Mar, 70 in Sep, 100 in Oct, 118 in Nov and 160 in Dec (wintering numbers have reduced greatly during the last decade).

- F Breeding: brood with 2 chicks Skinflats Pools 25 May (MVB) & 'at least 2 pr's bred' Callendar Park Loch (CME). Site max: 25 Skinflats Pools 20 Jan & 22 on 13 Nov.
- C Breeding: 2 Y Fire Sta. Pool (Alloa) 12 Jun & 1 Y Longcarse Pond 18 Jun (NB). Gartmorn Dam site max: winter/spring 52 on 27 Feb & autumn/winter 45 on 18 Dec.
- S Monthly site max Airthrey Loch: 85 in Jan, 75 in Feb, 53 in Mar, 43 in Oct, 41 in Nov & 43 in Dec. Lake of Menteith max: winter spring 54 on 11 Feb, autumn/winter 38 on 8 Dec. A Coot at Killin Marshes 26 Jan was unusual.

OYSTERCATCHER *Haematopus ostralegus* (B, W)

Inland WeBS: 1 in Jan, 262 in Feb, 243 in Mar, 0 in Sep, 5 in Oct, 0 in Nov and 6 in Dec. Forth Est. WeBS: 201 in Jan, 463 in Feb, 133 in Mar, 78 in Sep, 140 in Oct, 186 in Nov and 202 in Dec.

BBS: recorded at 0.24 b/lkm (1997-2015 av: 0.75 b/lkm. Range 0.24 to 1.64 b/lkm). Recorded in all habitat categories with the highest rate being on farmland at 0.6 b/lkm closely followed by WBBS with 0.53 b/lkm. Early inland spring return: 1 St Uni 7 Jan (BD); 1 Blairdrummond Ponds 16 Jan (DOE) & pr Dunblane 22 Jan (CJP).

- F Site max: 351 Kinneil 21 Feb; c.150 Blackness 6 Jan; c.240 Blackness 10 Feb & 101 Skinflats Pools 25 Aug.
- C Site max: 31 Cambus 15 May.
- S Breeding: Nesting Cambusmore/Gart GP 10 Apr & 1 fledged Keir roundabout Jul (NB). Site max: 125 Blairdrummond Ponds 5 Mar.

AVOCET (Pied) *Recurvirostra avosetta* (v)

- F 2 Skinflats Pools 20 – 25 Apr (SW, DN). This is the 13th record for the Upper Forth.

RINGED PLOVER *Charadrius hiaticula* (b, W)

Forth Est. WeBS: 0 in Jan, 0 in Feb, 22 in Mar, 6 in Sep, 0 in Oct, 4 in Nov and 0 in Dec.

- F Monthly max: Kinneil: 46 in Jan, 22 in Mar, 20 in Aug & 28 in Sep. Other records: 68 Blackness 20 May; 7 L. Ellrig (all juv's) 4 Sep; 1 Skinflats Pools 6 May with 2 on 3 Sep & 1 Darnrigg Moss 18 Mar.
- *C 33 Kennet Pans 18 May & 3 Longcarse 15 May.
- *S Monthly max Cambusmore/Gart GP: 5 on 10 Apr, 5 in May, 2 in Jun & 2 with 1 chick 31 Jul (NB).

GOLDEN PLOVER (European) *Pluvialis apricaria* (B, W)

Forth Est. WeBS: 5 in Jan, 0 in Feb, 0 in Mar, 14 in Sep, 468 in Oct, 360 in Nov and 22 in Dec.

F Monthly max Kinneil: c.220 in Jan, 407 in Oct & 354 in Nov. Other site max: c.120 Skinflats Pools 30 Oct.

S Probable breeding birds: 1 Sgiath Chuil (NN 4632) 7 May; 2 An Caisteal (8 May) & 2 Beinn nan Imirean (NN 4130) 27 May.

GREY PLOVER *Pluvialis squatarola* (p/w)

F Skinflats Pools monthly max: 4 on 20 Jan, 2 on 9 May, 1 on 31 Jul, 2 on 22 Aug, 6 on 25 Sep, 16 on 16 Oct; 12 on 20 Nov & 8 on 9 Dec. Other records: 8 Kinneil 9 Jan; 8 Powfoulis 6 Nov; 2 Blackness 29 Oct & 1 R. Forth (S. Alloa – Dunmore) 28 Nov.

DOTTEREL (Eurasian) *Charadrius morinellus* (v)

S Three Stob Binnein 15 May (GS). Only the 12th record since 1986.

LAPWING (Northern) *Vanellus vanellus* (B, W)

Inland WeBS: 349 in Jan, 202 in Feb, 107 in Mar, 182 in Sep, 80 in Oct, 45 in Nov and 314 in Dec.

Forth Est. WeBS: 1,246 in Jan, 555 in Feb, 18 in Mar, 1,116 in Sep, 1,290 in Oct, 1,295 in Nov and 1,023 in Dec.

BBS: recorded at 0.23 b/lkm (1997-2015 av: 0.76 b/lkm. Range 0.23 to 1.82 b/lkm). The highest recording rate was on farmland at 0.56 b/lkm, again closely followed by WBBS with 0.47 (there were no records from urban habitats).

F Breeding: ♀ scraping a nest & inviting copulation Upper Kinneil Fm (Bo'ness) 10 Apr (ABa). Kinneil monthly site max: c.1,240 in Jan, c.1,000 in Feb, c.1,340 in Aug, c.400 in Sep, 519 (WeBS) in Oct, 654 in Nov & 424 in Dec. Skinflats monthly site max: c.250 in Jan, 218 in Aug, 241 in Sep, 435 in Nov & c.350 in Dec.

C Breeding: pr fledged 2 Y Devonmouth Pool 29 Jul with 2 broods (4 & 3 chicks) Longcarse Pool 25 May (GG). Other site max: 595 Longcarse/Tullibody Inch 19 Sep & 8 Nov and c.230 Devonmouth Pool 7 Aug.

S Site max: c.320 over R. Teith (Doune) 26 Feb; 220 Cambusmore/Gart GP 4 Dec.; c.130 R. Teith (Carse of Lecropt) 23 Jan; & 77 Blackdub Floods 1 Jan.

KNOT (Red) *Calidris canutus* (W)

Forth Est. WeBS: 3,062 in Jan, 1,556 in Feb, 519 in Mar, 749 in Sep, 887 in Oct, 25 in Nov and 383 in Dec.

F Kinneil monthly max: c. 3,060 in Jan, c. 3,060 in Feb, 516 in Mar, 30 in April, 30 in May, 2 in Jul, 748 in Sep, c.1,500 in Nov & 383 in Dec. Other sites max: c.750 Bo'ness 10 Feb; 455 Skinflats 16 Oct & c. 30 Blackness 17 Dec.

*SANDERLING *Calidris alba* (p)

F One Skinflats TE. 3 Apr (DOE).

S Two L. Tay (Killin) 22 May and a juv. there 5 Sep (JPH).

*LITTLE STINT *Calidris minuta* (irr)

F One Skinflats Pools 6 Aug then 25-26 Sep (SW, AB, RS).

C One Longcarse 28 Sep (JRC).

*CURLEW SANDPIPER *Calidris ferruginea* (p)

F One Kinneil 29 Apr with 1 - 2 from 19 Aug – 25 Sep (SW, CJP et al). 7 Skinflats Pools 22 Aug, 6 on 2 Sep, 5 on 17 Sep & 3 on 26 Sep (RS, DOE, DMB).

C Two Longcarse 28 Aug (JRC).

DUNLIN *Calidris alpina* (b? W)

Forth Est WeBS: 3,444 in Jan, 3,196 in Feb, 390 in Mar, 1,085 in Sep, 1,837 in Oct, 2,707 in Nov and 5,293 in Dec.

F Kinneil monthly max: 3,430 in Jan, c.3,800 in Feb, c.700 in Mar, 14 in Apr, 65 in May, c.300 in Aug, 849 in Sep, c.970 in Oct, c.2,760 in Nov & 3735 in Dec. Skinflats Pools monthly max: c.300 in Jan, 1 in Apr, c.40 in May, 35 in Aug, 1,005 in Sep, c.1,000 in Oct, 1,000 in Nov & c.1,550 in Dec. Blackness monthly max: c.30 in Jan, 19 in May, c.60 in Sep, c.30 in Oct, 92 in Nov & c.70 in Dec. Other sites: 15 Skinflats TE. 17 Sep; 5 S. Alloa 4 Feb; 1 R. Forth (S. Alloa – Dunmore) 28 Nov & 2 L. Ellrig 4 Sep.

C Monthly max Longcarse: 12 in Jul, 14 in Aug, 10 in Sep, 3 in Oct, 5 in Nov & 2 in Dec. 103 Kennet Pans 13 Nov with 75 there 11 Dec.

S One L. Tay (Killin) 16 Apr then 1 to 5 birds till 7 Sep with 8 on 6 May (JPH).

*RUFF *Philomachus pugnax* (w, p)

F Kinneil: 1 on 2, 3, 10 & 23 Jan; 1 on 15 & 27 Aug; 3 on 14, 2 on 17 & 1 on 21 Sep with 1 on 25 Oct (DOE, CJP, JRC, DT, RS, MVB, LW). Skinflats Pools: 2 from 23-24 Apr; 1 on 11 July; 1 on 22 Aug & 4 on 18 Sep (SW, AB, RS, DOE, MVB). Powfoulis area: 2 on 23 Apr with 1 on 14 & 28 Aug (RTW, RS, RP, DOE)

C One Kennet Pans 14 Sep (GG)

*JACK SNIPE *Lymnocyptes minimus* (w)

Inland WeBS: 1 in Jan, 0 in Feb, 1 in Mar, 0 in Sep, 0 in Oct, 2 in Nov and 1 in Dec.

F One Skinflats Pools 3 Jan (DOE); 2 Kinneil 10 Jan (JRC); 1 S. Alloa 4 Feb & 27 Nov (DMB); 1 Higgins Neuk 4 Feb & 11 Dec (RS); 1 Powfoulis 23 Apr with 4 on 30 Oct (RP, AB) & 1 L. Ellrig 24 Nov (NB).

C One Blackdevon Wetlands 22 Oct (JRC).

S Singles Netherton Marsh 17 Jan & 18 Dec (DT); 1 Ashfield Pools 22 Feb (CJP); singles Flanders Moss Lochan 8 Mar & 1 Nov (DAP); 5 Torrie 1 Nov with 1 on 30 Nov (DA, DOE) & 2 Poldar Moss 4 Nov (CM).

SNIPE (Common) *Gallinago gallinago* (B, W)

Inland WeBS: 36 in Jan, 206 in Feb, 46 in Mar, 24 in Sep, 176 in Oct, 160 in Nov and 20 in Dec.

Forth Est. WeBS: 15 in Jan, 3 in Feb, 0 in Mar, 4 in Sep, 11 in Oct, 43 in Nov and 8 in Dec.

BBS: recorded at 0.19 b/lkm (1997-2015 av: 0.9 b/lkm. Range 0.03 to 0.19 b/lkm). The highest recording rate was on mountains & moorland at 0.35 b/lkm.

F Site max: 39 Gardrum Moss 29 Oct & 17 L. Ellrig 24 Nov.

C Site max: 56 R. Devon (Tilly-Alva) 25 Feb; 26 Kennet Pans 13 Nov & 19 Longcarse 5 Dec.

S Site max: 78 Cambusmore/Gart GP 2 Oct; 75 Netherton Marsh 22 Feb; 64 R. Forth (Br of Frew-E. Frew) 18 Nov; 47 R. Forth (Br of Frew-E. Frew) 21 Feb & 36 L. Coulter 10 Nov.

WOODCOCK (Eurasian) *Scolopax rusticola* (B, W)

Inland WeBS: 2 in Jan, 2 in Feb, 0 in Mar, 0 in Sep, 0 in Oct, 1 in Nov and 1 in Dec

*F Singles Kinneil 11 Mar & Carrubber Mill (R. Avon) 15 Mar (DT, AB).

C Singles R. Devon (Dolliar-Tilly) 15 Jan & Cambus Pools 16 Jan (HMCL, GG).

S C.60 Edra (L. Katrine) 30 Nov (DOE) & 3 Inchie Wood (Lake of Menteith) 17 Feb (DT). Singles at Blairdrummond, Cambusmore/Gart GP, Carse of Lecropt, Kippenrait Glen, L. Rusky, Lanrick (R. Teith), Luib (G. Dochart), Netherton Marsh, Ochtertyre Moss, Taylorton, Torrie & Waltersmuir Wood (NB, BD, DK, DT, CM, IMcP, DOE, DT).

BLACK-TAILED GODWIT *Limosa limosa* (W)

Forth Est. WeBS: 198 in Jan, 30 in Feb, 318 in Mar, 831 in Sep, 610 in Oct, 208 in Nov and 408 in Dec.

F Kinneil monthly max: c.580 in Jan, 295 in Feb, c.50 in Mar, c.200 in Apr, 225 in May, 266 in Jul, 658 in Aug, 777 in Sep, c.520 in Oct, 273 in Nov & 355 in Dec. Skinflats Pools monthly max: 197 in Apr, 48 in May, 27 in Aug, 36 in Sep, 104 in Oct & 215 in Nov. Other sites max: 85 R. Forth (S. Alloa-Kinc Br) 11 Dec.

C Kennet Pans: c.370 on 3 Feb & 175 on 13 Apr. Cambus Pools monthly max: 2 in Feb, 22 in Aug & 12 in Sep. Longcarse monthly max: 3 in Mar, 4 in Aug & 31 in Sep.

S 54 L. Tay (Killin) 1 May (incl. a colour ringed bird).

BAR-TAILED GODWIT *Limosa lapponica* (W)

Forth Est. WeBS: 234 in Jan, 298 in Feb, 47 in Mar, 2 in Sep, 126 in Oct, 84 in Nov and 1 in Dec.

F Kinneil monthly max: 234 in Jan, 297 in Feb, c.50 in Mar & c.100 in Oct. 21 Skinflats Pools 23 Jun & c.40 on 10 Sep. Other site max: 65 Bo'ness 3 Feb, c.20 Blackness 29 Oct & 1 R. Forth (S. Alloa- Kinc Br) 11 Dec.

- C One Kennet Pans 3 Jan with 1 on 21 Apr.
 S One L. Tay (Killin) 18 Apr.
- WHIMBREL *Numenius phaeopus* (p)
- F Powfoulis: 17 on 24 Apr, 9 on 30 Apr & 3 on 2 Jul (RP). Kinneil monthly max: 6 in Apr, 2 in May, 1 in Jun, 1 in Jul, 1 in Aug & 1 in Sep (DMB, DT, AB, JRC). Skinflats Pools: one from 1 – 12 May with 4 on 11 May (SW, RS et al). Singles on 28 Aug, 11 & 23 Sep (DOE, AB, SW). Blackness: 2 on 17 May then singles 31 Jul, 5 Aug, 4 Sep & 13 Nov (DMB, EML, AC, GC, NB).
- C Longcarse: 12 on 24 Apr & 4 on 1 May (JRC, GG). Other sites: 4 Cambus 16 Apr; 1 Gartmorn Dam 17 Apr & 2 Blackdevon Wetlands 19 Apr (GG, JRC).
- S One L. Tay (Killin) 22 Apr & 5 May (JPH).
- CURLEW (Eurasian) *Numenius arquata* (B, W)
- Inland WeBS: 116 in Jan, 179 in Feb, 280 in Mar, 13 in Sep, 173 in Oct, 73 in Nov and 90 in Dec.
 Forth Est. WeBS: 919 in Jan, 970 in Feb, 592 in Mar, 999 in Sep, 947 in Oct, 665 in Nov and 930 in Dec.
 BBS: recorded at 0.35 b/lkm (1997-2014 av: 0.64 b/lkm. Range 0.34 to 0.98 b/lkm). The highest recording rate was on mountains & moorland at 0.53 b/lkm closely followed by 0.46 b/lkm on farmland and 0.33 b/lkm on WBBS (there were no records from conifer and urban habitats).
- F Skinflats monthly max: c.480 in Jan, 111 in Jul, 568 in Feb, 215 in Aug, 283 in Sep, 291 in Oct, c.180 in Nov & 367 in Dec. Kinneil monthly max: 215 in Jan, 138 in Feb, c.200 in Mar, c.390 in Aug, 375 in Sep & 235 in Dec. Other site max: 305 R. Forth (s. Alloa-Kinc. Br.) 15 Oct & c.120 Blackness 9 Jan.
- C Longcarse monthly max: 315 in Jan, 238 in Feb, 167 in Mar, 143 in Jul, c.160 in Sep, c.320 in Oct & 141 in Dec. Other site max: 387 Kennet Pans 3 Feb & c.200 Cambus Village Pool 11 Nov.
- S 275 Carse of Lecropt 4 Mar & 103 R. Teith (W. Row-Forth conf) 13 Mar.
- COMMON SANDPIPER *Tringa hypoleucos* (B)
- BBS: recorded at 0.06 b/lkm (1997-2015 av: 0.07 b/lkm. Range 0.05 to 0.12 b/lkm). Again unsurprisingly, the highest recording rate was on WBBS at 0.33 b/lkm (there were no records from mountains & moorlands and urban habitats).
- First of year: 1 R. Devon, Dollar 8 Apr (KB) & 1 Carronshore 16 Apr (AE). Last of year: 1 Kinneil Lagoon 3 Oct (DT). 2 overwintering birds were at Kinneil 3 Jan with another on the R. Forth (Allan conf-St Br) 30 Nov (SW, GF).
- F Site max: 6 Kinneil 4 Jul.
 C Site max: 5 Longcarse 12 Jul.

- S Breeding: Juv Kirkton Fm (Tyndrum) 3 Jul (JPH). Site max: 9 Cambusmore/Gart GP 5 Jun; 8 L. Tay (Killin) 26 May; 6 Blairdrummond Ponds 27 Apr & 3 L. Arklet 12 May.

*GREEN SANDPIPER *Tringa ochropus* (w, p)

- F One Gilston (Polmont) 10 Mar & 1 Powfoulis 31 Jul (RS, RP).
C Singles Blackdevon Wetlands 23 Apr; Tullibody Inch 11 Aug & Cambus 21 Aug (DMB, GG, JRC).
S One Kinbuck 13 Feb & 1 Cambushinnie Loch 20 Sep (CJP, NB).

*SPOTTED REDSHANK *Tringa erythropus* (p)

- F One Kinneil 23 Jan – 30 Apr (DMB, BW, DT *et al.*) and 18 Sep – 13 Oct (RS, JRC). One R. Forth (S. Alloa-Kinc.Br.) 10 Jan (RDG); singles Skinflats Pools 23 Aug, 17 Sep & 13 Nov. 1 Skinflats TE. 23 Aug (DOE).

GREENSHANK *Tringa nebularia* (w, p)

- F Kinneil monthly max: 4 in Jan, 7 in Feb, 2 in Mar, 4 in Apr, 1 in May, 3 in Jun, 2 in Jul, 4 in Aug, 9 in Sep, 5 in Oct, 3 in Nov & 4 in Dec. One Skinflats Pools 10 Jan – 19 Mar & 13 Aug – 11 Dec. Skinflats TE: 1 on 15 May, 1 on 19 Aug & 2 on 11 Dec. Other sites: 2 Bo'ness Bay 27 Mar; 1 Blackness 13 Nov; singles Higgin's Neuk 13 Mar & 28 Aug and 2 Powfoulis 31 Jul.
C Two Longcarse 28 Aug; 1 Cambus Village Pool 9 Sep & 1 Devonmouth Pool 15 Sep.
S One Cambusmore/Gart GP 10 Apr & 2 L. Tay (Killin) 16 Apr.

REDSHANK *Tringa totanus* (B, W)

Inland WeBS: 0 in Jan, 4 in Feb, 2 in Mar, 2 in Sep, 0 in Oct, 0 in Nov and 0 in Dec

Forth Est. WeBS: 1,757 in Jan, 1,252 in Feb, 1,153 in Mar, 1,813 in Sep, 2,959 in Oct, 1,977 in Nov and 1,915 in Dec.

- F Kinneil monthly max: 825 in Jan, 451 in Feb, 537 in Mar, 509 in Apr, 32 in May, 58 in Jun, c.740 in Aug, 828 in Sep, 1,814 in Oct, c.200 in Nov & 543 in Dec. Skinflats monthly max: c.880 in Jan, 669 in Feb, c.50 in Apr, 19 in May, 23 in Jun, 955 in Sep, 1,068 in Oct, 1,155 in Nov & 1,210 in Dec. Other site max: c.100 Blackness 17 Dec; 82 R. Forth (S. Alloa-Kinc. Br.); c.70 Skinflats TE. 3 Jan; 45 Bo'ness 10 Feb; 15 Higgin's Neuk 29 Mar; 15 S. Alloa 4 Feb; 1 Gardrum Moss 13 Mar (MC) & 1 Darnrigg Moss Pools 8 Aug (TF).

- C Site max: 59 R. Forth (Cambus-Alloa) 21 Feb & 8 Blackdevon Wetlands 23 Apr.

- *S One Kinbuck 20 & 27 Mar; 1 Ashfield 8 May (CJP); 3 Cambusmore/Gart GP 10 Apr (DT); 3 L. Tay (Killin) 23 Mar with 16 on 2 May & 1 on 7 Sep (JPH).

TURNSTONE *Arenaria interpres* (W)

Forth Est. WeBS: 1 in Jan, 0 in Feb, 9 in Mar, 5 in Sep, 0 in Oct, 2 in Nov and 4 in Dec.

F Site max: 12 Bo'ness 6 Jan (DMB); 9 Kinneil 20 Mar (JRC); 4 Skinflats 11 Dec (MVB) & 4 Blackness 5 Aug (AC).

*S Three L. Tay (Killin) 2 May (JPH).

*ARCTIC SKUA *Stercorarius parasiticus* (p)

F One Kinneil 6 Sep (DT).

*KITTIWAKE *Rissa tridactyla* (P, w)

F Two Skinflats Pools (ad + 1st W) 4 Jan (AB); 1 Blackness 9 Jan & 2 on 19 Jan (DOE, BW) & 4 Kinneil 15 Aug (DT).

BLACK-HEADED GULL *Chroicocephalus ridibundus* (B,W)

Inland WeBS: 2,528 in Jan, 767 in Feb, 1001 in Mar, 547 in Sep, 567 in Oct, 1250 in Nov and 945 in Dec.

Forth Est. WeBS: 477 in Jan, 540 in Feb, 198 in Mar, 147 in Sep, 501 in Oct, 167 in Nov and 1,321 in Dec.

BBS: recorded at 0.12 b/lkm (1997-2015 av: 1.07 b/lkm. Range: 0.12 to 2.97 b/lkm). The highest recording rate was on farmland at 0.46 b/lkm (there were no records from mountains / moorlands and deciduous woods etc. habitats).

F Breeding: c.75 prs Darnrigg Moss Pools 13 May (TF). Site max: c.920 Kinneil 30 Aug; 618 Higgin's Neuk 25 Aug & 431 Skinflats Pools 25 Aug.

C Breeding: 12 aon Fire Station Pool (Alloa) 30 Apr with 45 Y on 12 Jul (NB). Site max: c.340 Longcarse 17 Dec & c.250 Gartmorn Dam 13 Mar.

S Site max: c.1,450 E. Gogar fields 23 Jan; c.500 Drip Moss 7 Feb; 412 Blackdub Floods 1 Jan & 40 L. Tay (Killin) 31 Mar.

*LITTLE GULL *Hydrocoloeus minutus* (irr)

F Three Blackness 6 Jan with 1 >W 2 Apr (DMB, EMcL); 1 Bo'ness 6 Jan (DMB); 1 Kinneil 10 Jan (JRC); singles Skinflats Pools 3 Apr & 8 Aug (AB, SW).

S Ad in breeding plumage L. Tay (Killin) 3 Jun – 4 Jul (JPH).

*MEDITERRANEAN GULL *Larus melanocephalus* (w)

F Blackness: 1 on 2 Mar with a 1st summer bird 3 Apr & an ad in summer plumage 31 Jul (EMcL). 1 Kinneil Lagoon 3 Jan (CJP, SW). 1 Skinflats Pools 17 Aug.

C Ad Kennet Pans 26 Nov (GG).

COMMON GULL *Larus canus* (B,W)

Inland WeBS: 161 in Jan, 473 in Feb, 527 in Mar, 173 in Sep, 207 in Oct, 199 in Nov and 372 in Dec.

Forth Est. WeBS: 144 in Jan, 17 in Feb, 13 in Mar, 35 in Sep, 54 in Oct, 26 in Nov and 966 in Dec.

BBS: recorded at 0.26 b/lkm (1997-2015 av: 1.48 b/lkm. Range: 0.18 to 3.31 b/lkm). The highest recording rate was on farmland at 0.49 b/lkm (there were no records from conifer and urban habitats).

F Site max: c.200 L. Ellrig 13 Mar.

- S Breeding: 6 aon Killin Marshes 26 Apr (NB). Site max: c.700 Drip Moss 7 Feb; c.450 Stirling 27 Mar; 165 Pendreich Pool 9 Feb & 164 L. Tay (Killin) 19 Jul.

LESSER BLACK-BACKED GULL *Larus fuscus* (w, b, S)

Inland WeBS: 27 in Jan, 28 in Feb, 93 in Mar, 1,180 in Sep, 820 in Oct, 368 in Nov and 83 in Dec.

Forth Est. WeBS: 13 in Jan, 4 in Feb, 5 in Mar, 78 in Sep, 20 in Oct, 4 in Nov and 4 in Dec. BBS: recorded at 0.53 b/lkm (1997-2015 av: 1.01 b/lkm, range: 0.53 to 1.89 b/lkm). The highest recording rate was in urban habitat at 5.35 b/lkm but it was recorded in all six broad habitat types.

- F Breeding: Falkirk town centre 20 Jul (CME). Site max: 102 Gardrum Moss 4 Sep; 53 Little Denny Resr 4 Sep & 51 Skinflats Pools 25 Aug. Winter: 18 R. Carron (Carron Ho-A905).

C Site max: 110 Longcarse 28 Jul.

- S Site max: Gartartan (Aberfoyle): 292 on 10 Mar (all but four were ad's), 544 on 5 Apr (all ad's) & 709 10 Sep (c.10% juvs). 625 Lake of Menteith 20 Oct; 308 (85% ad's) Shannochill (Aberfoyle) 21 Aug; 132 L. Coulter 7 Sep & c.100 Cambusmore/Gart GP 5 Jun. Winter: singles / small numbers at Airthrey Loch, Allan Water, CVR, Gartartan, L. Coulter & the Meadows (Callander).

HERRING GULL *Larus argentatus* (b, W)

Inland WeBS: 41 in Jan, 632 in Feb, 67 in Mar, 8 in Sep, 320 in Oct, 77 in Nov and 64 in Dec.

Forth Est. WeBS: 567 in Jan, 157 in Feb, 42 in Mar, 815 in Sep, 241 in Oct, 141 in Nov and 325 in Dec. BBS: recorded at 0.36 b/lkm (1997-2015 av: 0.53 b/lkm, range: 0.1 to 4.17 b/lkm). The highest recording rate was in urban habitat at 1.74 b/lkm (there were no records from mountains / moorlands).

Numbers much reduced in recent years following the closure of open refuse tips and greater recycling of food waste.

F Site max: 535 Kinneil 10 Jan.

C Site max: Ditch (Tullibody): c.770 on 17 Jan & 785 on 27 Feb.

S Site max: 157 R. Forth below Kippen 16 Oct.

*ICELAND GULL *Larus glaucooides* (irr)

F One Blackness 3 Jan (DOE).

C A 1st winter Alva 8 Feb (JRC); a 1st year Tullibody Inch 18 Apr (GG) & a 2nd winter Cambus 4 Dec (BG's).

S One Craigforth (M9 Stirling) 18 Dec (BG's).

GREAT BLACK-BACKED GULL *Larus marinus* (S,W)

Inland WeBS: 4 in Jan, 4 in Feb, 2 in Mar, 11 in Sep, 7 in Oct, 4 in Nov and 14 in Dec.

Forth Est WeBS: 17 in Jan, 1 in Feb, 2 in Mar, 6 in Sep, 4 in Oct, 11 in Nov and 17 in Dec.

Recorded in small numbers. Scarce inland.

- F Site max: 12 Kinneil 2 Jan; 4 Blackness 3 Jan; 4 Higgin's Neuk 3 Jan; 2 Darnrigg Moss 28 Mar; 2 L. Ellrig 13 Feb; singles Little Denny Resr. & St Helen's Loch (Bonnybridge) 3 Jan.
- C Site max: 8 Gartmorn Dam 21 Sep; 5 Tullibody Inch 28 Jul & a 1st summer bird feeding on a dead sheep Cambus Village Pool 28 Jul.
- S Site max: 4 L. Coulter 13 Sep; 4 Lake of Menteith 8 Dec; 2 Cambusmore/Gart GP 4 Dec & 2 L. Tay (Killin) 18 Jun. Singles at Blackdub Floods 1 Jan & 3 Feb; Cullen Loch (Cromlix) 22 Mar; Gartartan (Aberfoyle) 8 Dec; R. Forth (Cambus) 19 Mar; R. Forth (Kildean) 17 Jan & 18 Dec and R. Forth (Kippen) 17 Jan.

SANDWICH TERN *Sterna sandvicensis* (s, P)

- F Site max: 40 Kinneil 15 Aug (DT); c.25 Skinflats TE 14 Aug (DOE); c.20 Blackness 5 Aug (AC); 12 Bo'ness 21 Sep (EMcL) 7 Skinflats 28 Aug (DOE). Last record: Blackness 29 Sep (KH).

*GULL-BILLED TERN *Gelochelidon nilotica* (v)

- F A bird in breeding plumage at Kinneil Lagoon from 3 – 30 Jun was only the 3rd record for the UFBRA (DT et al).

COMMON TERN *Sterna hirundo* (S)

First of year one Bo'ness 2 May (EMcL); last of year 2 Skinflats 10 Sep (DMB).

- F Site max: 35 R. Carron mouth (incl. 2 juv being fed) 16 Jul; 25 Kinneil 21 May; 20 Skinflats Pools 6 May; c.20 Blackness 5 Aug; 8 Bo'ness 21 May & 6 Skinflats TE 15 May.

- *C 12 Kennet Pans 18 May & 24> W R. Forth (Cambus) 16 Aug.

*ARCTIC TERN *Sterna paradisaea* (irr)

- F Three Kinneil 16 Jun & 1 on 1 Jul (LW, CJP).

*LITTLE AUK *Alle alle* (v)

An unprecedented large wreck (in recent times) on strong E winds took place in early Jan with several birds being seen well inland.

- F 58 Blackness 4 Jan with last one dead on beach 7 Jan (RTW, AB, SW, SMcG et al); 6 Bo'ness 6 Jan (DMB); 2 R. Carron (Carron) 4 Jan (SW); 4 Skinflats TE 3 Jan with 1 on 4 Jan & 2 on 6 Jan (DOE, AL, RWP) and 3 over Skinflats Pools 4 Jan (AB, SW).

- S One Lyndoch (Killin) 6 Jan (DW); 1 Lochearnhead 10 Jan (DWa); 1 dead Lake of Menteith 12 Jan (DT) & 2 R. Balvag (Balquidder) 15 Jan (PM).

* GUILLEMOT (Common) *Uria aalge* (s, w)

- F One Blackness 7 Jan (SMcG); 1 Bo'ness 6 & 10 Jan (DMB, JRC) & 1 Kinneil 25 Oct (DT).

- C One Pool of Muckhart 12 Sep (PL).

- S One L. Tay (Killin) 25 Sep & 3 Oct (JPH). One flew up Strath Fillan (Tyndrum) 23 Sep (JPH).

FERAL PIGEON *Columba livia* (B,W)

BBS: recorded at 0.029 b/lkm (1997-2015 av: 1.02 b/lkm, range: 0.29 to 2.19 b/lkm). The highest recording rate was in urban habitat at 2.43 b/lkm (there were no records from mountains / moorlands and WBBS habitats).

- F Max: 35 Bantaskine Estate (Falkirk) 29 Jan.
- C Max: c.170 Craigmie Fm. 1 Dec & 41 Blackdevon Wetlands 2 Jan.
- S Max: c.50 Carse of Lecropt 4 Mar & 41 Castleton (Cowie) 17 Jan.

STOCK DOVE *Columba oenas* (B, W)

Widely but thinly spread in farmland areas. Usually encountered in groups of <4.

BBS: Recorded at 0.04 b/lkm (1997-2015 av: 0.05 b/lkm, range: 0.01 to 0.12 b/lkm). The highest recording rate was on farmland habitat at 0.14 b/lkm.

- F Breeding: possibly Hallglen & Westquarter Glen. Max: 8 Kinneil 8 Aug.
- C Max: c.50 Tullibody Inch 21 Feb.
- S Site max: 42 Blairdrummond 4 Apr; 25 Bandeath 20 Feb & 10 Holme Hill (Dunblane) 23 Jan.

WOOD PIGEON *Columba palumbus* (B, W)

BBS: recorded at 2.58 b/lkm (1997-2015 av: 3.57 b/lkm, range: 2.48 to 4.53 b/lkm). It was recorded in all six broad habitat types with the highest recording rate in urban habitat at 10.28 b/lkm.

- F Max: c.500 S. Alloa 27 Nov.
- C Max: 131 Jellyholm (Sauchie) 18 Oct.
- S Site max: 6,645 Braes of Doune 2 Nov; 1,514 Brae of Boquhapple 6 Nov; c.1,200 Blairdrummond 4 Jan; c.1,050 Greenyards (Dunblane) 1 Dec; c.570 Kippenross (Dunblane) 29 Sep & 253 Stronachlachar 30 Oct..

COLLARED DOVE *Streptopelia decaocto* (B, W)

BBS: recorded at 0.26 b/lkm (1997-2015 av: 0.26 b/lkm). The highest recording rate was in urban habitat at 2.29 b/lkm.

- F Max: 10 Blackness 3 Jan.
- S Max: 11 Blairdrummond 27 Dec.

CUCKOO (Common) *Cuculus canorus* (B)

BBS: recorded at 0.14 b/lkm (1997-2015 av: 0.08 b/lkm, range: 0.03 to 0.14 b/lkm). Recorded fairly evenly across all habitats except urban where there were none.

First spring records: 1 Drumloist 14 Apr (DOE) - (6 year range 14 to 27 April).

Last record: 1 Kirkton Annet 19 Jun (DOE).

- F One Darrnrigg Moss 2 Jun & 1 Carron Glen 17 Jun ('heard on several occasions').
- C One Hillfoot Hill (20 May) & 2 Menstrie Glen 22 May.
- S Widespread in the 'highland glens' along with the lowland moors and mosses. Site max: 5 L. Arklet 6 May & 5 G. Lochay 15 May. Less usual sites: 2 Claiash Fm (Callander) 8 May & Ochiltree (Dunblane) 11 Jun.

BARN OWL *Tyto alba* (b, w)

F One Carronshore 17 Feb.

C No records.

S Singles at: Argaty 29 Sep; Cringate Moor 15 Nov; Hill of Row 18 Nov; Easter Lix (G. Dochart) 31 Jan; Easter Rossburn (Drip Moss) 25 Feb; Forthbank (Stirling) 8 Jan; Kirkton (Strath Fillan) from 27 May to 12 Dec with 2 on 3 Oct & 8 Nov; M80 Easterton 9 Jan & Middle Kerse (Kippen) 11 Feb.

TAWNY OWL *Strix aluco* (B, W)

Widespread but under-recorded.

F Recorded from: Callendar Park, Carronshore, Camelon & Parkfoot (Falkirk).

C Recorded from Menstrie.

S Breeding: juv's heard calling Killin 16 May to 19 Jul (JPH). Max: 3 Buchany 11 Jun. Recorded from: Balquhider, around Dunblane, Callander, G. Lochay, Keir Estate (Dunblane), Killin, Lecropt & Strathyre.

*LONG-EARED OWL *Asio otus* (b, w)

Under-reported.

C One Law Hill (Dollar) 29 Nov (KB).

S Present Br of Allan 28 Mar (JBa).

*SHORT-EARED OWL *Asio flammeus* (b, W)

F Kinneil: 2 on 1 Jan, 4 on 8 Jan, 5 on 9 Jan, then 1-3 from 17 Jan – 7 Apr (RS, CJP, MVB, BG's, DT, SW, ACC, BW). Skinflats: singles 16 Jan, 7 Feb & 20 Apr with 2 on 19 Apr (JN, BG's, SW). Other sites: 1 Blackness 9 Jan (AC, DOE) & 1 Pow Burn (Airth) 22 Oct (DOE).

C One to two Blackdevon Wetlands 25 Feb – 30 Apr (IA, JRC, NB). 1 Cambus 29 Mar (GG); 1 Clackmannan Carse (13 Feb (GG) & 1 Longcarse 14 Apr (NB).

S Sheriff Muir: 1 on 3 Feb, 1 on 23 Oct & 3 on 19 Nov (MVB, DOE, KD). 1 Jerah (Ochils) 12 Oct (CMcK).

SWIFT (Common) *Apus apus* (B)

Recorded throughout the area. BBS: recorded at 0.13 b/lkm (1997-2015 av: 0.44 b/lkm, range: 0.13 to 0.98 b/lkm). The highest recording rate was in urban habitat at 0.83 b/lkm. First for year: 1 Powfoulis 30 Apr (RWP). 10 year range 24 April to May. Last: 5 Skinflats Pools 24 Aug (SW).

F Max: 10 Blackness 20 May.

C Max: c.40 Gartmorn Dam 21 May & c.40 Cambus 7 Aug.

S Max: 26 A907 (Manor Powis) 8 Aug; 24 Dunblane Hydro 20 Jul & c.20 Blairdrummond 3 Jul.

*HOOPOE (Eurasian) *Upupa epops* (p)

- S One Killin 16-17 Sep (DL, GH) was only the 4th record for the Upper Forth after the 1st at Menstrie (1896); 2nd Gargunnoch (1984) & 3rd Thornhill (2006).

KINGFISHER (Common) *Alcedo atthis* (b, w).

Inland WeBS: 3 in Jan, 2 in Feb, 2 in Mar, 4 in Sep, 7 in Oct, 6 in Nov and 3 in Dec.

- F Breeding: Recorded from: Blackness, F&C Canal (Haggs), Kinneil, R. Carron (Falkirk), Skinflats Pools, Skinflats TE & Union Canal.
C Recorded from: Cambus Village Pools.
S Recorded from: Allan Water (Ashfield, Dunblane & Kinbuck), Blairdrummond Ponds, Cambusmore/Gart GP, Garbh Uisge (Pass of Leny), L. Tay (Killin), Lake of Menteith, R. Lochay (Killin), R. Teith (Blair Drummond, Callander, Deanston, Doune & Lanrick) & Strath Fillan.

GREEN WOODPECKER *Picus viridis* (B, W)

- F Recorded from: Callendar Park, Gilston (Polmont) & Kinneil Wood.
C Recorded from: Alva Glen, Dollar Glen, Menstrie & Woodhill (Alva).
S Recorded from: Aberfoyle, Airthrey, Auchtubh (Balquhidder), Blackwater Marshes, Bracklinn Falls (Callander), BoA, Brig o' Turk, Cambusmore/Gart GP, Cocksburn Resr, Killin, Sheriff Muir, Manor Powis & Pass of Leny.

GREAT SPOTTED WOODPECKER *Dendrocopos major* (B, W)

BBS: recorded at 0.08 b/lkm (1997-2015 average: 0.06 b/lkm, range: 0.0 to 0.13 b/lkm). The highest recording rate was in conifer habitat at 0.14 b/lkm. Recorded throughout the area and year.

- F Breeding: ad ♂ Plean CP visiting a nest hole with vocal Y inside (AB) & 3 territories Callendar Park 2 Apr (CME). Max: 4 Callendar Park 25 Mar.
S Max: 3 Cromlix 18 Jun.

SKYLARK *Alauda arvensis* (B, W)

BBS: recorded at 1.6 b/lkm (1997-2015 av: 1.69 b/lkm, range: 1.25 to 2.71 b/lkm). The highest recording rate was in the mountain & moorland habitat at 2.96 b/lkm where it was the 2nd most numerous species after Meadow Pipit.

F Max: c.100 Powfoulis 23 Oct.

- S Breeding: 9 singing ♂♂ Gartrenich 17 Apr. Max: c.80 Carse of Lecropt 7 Feb.

SAND MARTIN *Riparia riparia* (B)

BBS: recorded at 0.81 b/lkm (1997-2015 av: 0.54 b/lkm, range: 0.02 to 1.34 b/lkm. The wide annual range is largely due to changing colony locations). First for year: 14 Gartmorn Dam; 4 Cambusmore/Gart GP & 1 Cambus 27

Mar (WT, DT, DH) (11 year range of 4 Mar to 11 Apr). Last: 1 Cocksburn Resr 25 Sep (MVB).

F Site max: c.100 Skinflats Pools 14 Apr.

C Site max: c.700 Gartmorn Dam 17 Apr & 65 Longcarse 25 Aug.

S Breeding: 62 AON Cambusmore/Gart GP 5 Jun (NB). Site max: c.150 Blairdrummond Ponds 4 Apr; c.150 L. Dochart 26 Apr; c.140 Cambusmore/Gart GP 26 Apr & '100's' L. Tay (Killin) 13 Aug.

SWALLOW (Barn) *Hirundo rustica* (B)

BBS: recorded at 1.0 b/lkm (1997-2015 av: 2.28 b/lkm, range: 1.0 to 3.53 b/lkm). The highest recording rate was in farmland habitat at 2.48 b/lkm closely followed by urban habitat with 2.43 b/lkm. First for year: 1 Blairdrummond 29 Mar (DOE). Last: 1 Cambus 22 Oct flying S! (GG). Breeding records please.

F Max: 105 Powfoulis 18 Sep.

C Max: c.1,450 Tullibody Inch 15 Sep (pre roost count). C.70 Cambus Village Pool 1 Oct.

S Max: 72 Shannochill (Aberfoyle) 21 Aug & c.50 Stirling Uni. 21 Sep.

HOUSE MARTIN *Delichon urbicum* (B)

BBS: recorded at 0.23 b/lkm (1997-2015 average: 0.79 b/lkm, range: 0.23 to 1.29 b/lkm). The highest recording rate was in urban habitat at 0.83 b/lkm closely followed by farmland with 0.65 b/lkm. More breeding records please. First of year: 1 Killin Marshes 2 Apr (JPH) & 2 Cambusmore/Gart GP 3 Apr (DT). Last: 3 Doune 27 Sep (DOE).

F Breeding: 5 AON Polmont 11 Jun (CME). Max: c.50 Hallglen (Falkirk) 5 Jun.

S Max: c.60 Shannochill (Aberfoyle) 21 Aug & 39 R. Forth below Kippen 12 Sep.

TREE PIPIT *Anthus trivialis* (B)

BBS: recorded at 0.21 b/lkm (1997-2015 av: 0.07 b/lkm, range: 0.0 to 0.21 b/lkm). The highest recording rate was in deciduous wood / scrub etc. habitat at 0.51 b/lkm. First of year: 2 Skinflats Pools 7 Apr (RS).

F 1 Kinneil 23 Apr.

C 2 Menstrie Glen & 1 Woodhill (Alva) 22 May.

S Max: 7 G. Lochay Power Sta. 9 Jun. Widespread to N & W of Stirling, scarcer elsewhere. Heard at the summit of Beinn Each (813m asl) 4 Sep.

MEADOW PIPIT *Anthus pratensis* (B, W)

BBS: recorded at 7.38 b/lkm (1997-2015 av: 4.79 b/lkm, range: 2.71 to 7.38 b/lkm). The highest recording rate was in mountain & moorland habitat at 14.95 b/lkm but was recorded in all habitats at over 1.5 b/lkm except urban where there were none.

F Max: c.80 Orchardhead (Skinflats) 18 Sep & c.50 Lionthorn (Falkirk) 3 Apr.

C Max: c.50 Longcarse 22 Sep.

S Max: 176 Strath Fillan 2 May; c.100 Dumyat 8 Oct; c.90 Drumloist 14 Apr; 75 Kildean 10 Dec & 48 Killin Marshes 22 Aug.

*ROCK PIPIT *Anthus petrosus* (w)

F One Blackness 9 & 19 Jan then 13 Mar (ATP, BW, DOE) with 2 Kinneil 25 Sep & 1 on 1 Oct (CJP, RS).

C 1 R. Forth (Cambus-Tullibody Inch) 10 Jan (GG) & 1 Longcarse 10 Dec (JRC).

GREY WAGTAIL *Motacilla cinerea* (B, w)

Recorded in small numbers in suitable habitat throughout region but as would be expected most frequent on WBBS at 0.33 b/lkm. A partial migrant. Inland WeBS: 8 in Jan, 3 in Feb, 21 in Mar, 25 in Sep, 6 in Oct, 9 in Nov and 12 in Dec.

F Breeding: pr feeding a juv Beancross (Polmont) 13 May (CME).

S Breeding: Max: 17 Doune Sewage Works 1 Aug; 7 R. Forth (below Kippen) 10 Apr & 5 R. Teith (Lanrick Est.) 19 Mar.

*YELLOW WAGTAIL *Motacilla flava* (v)

F One Skinflats Pools (ssp *feldegg*) 12 May (AB, SW).

PIED WAGTAIL *Motacilla alba yarvelli* (B, w)

Recorded throughout the area. BBS: recorded at 0.35 b/lkm (1997-2015 av: 0.35 b/lkm, range: 0.17 to 0.77 b/lkm). Found in all six broad habitat sites but most frequent in farmland at 0.81 b/lkm.

F Max: 15 Carron (Falkirk) 20 Nov & 10 Skinflats Pools 10 Sep.

C Max: 18 (mostly juv's) Longcarse 12 Jul.

S Max: c.127 head of L. Tay 4 Sep & 13 Gartartan Fields (Aberfoyle) 5 Apr.

WHITE WAGTAIL *Motacilla alba alba* (p)

F One to two Skinflats TE 29 Mar – 8 May & present Skinflats Pools 15 Apr – 12 May with a max of 7 on 19 Apr.

C Three Longcarse 24 Apr.

S Present L. Tay (Killin) 22 Apr - 18 May with a max of 11 on 30 Apr.

WAXWING *Bombycilla garrulus* (w)

2016/2017 was a 'Waxwing Winter' throughout lowland areas from 4 Nov and continuing into 2017. The first records were of 13 & 9 in Doune and 9 & 4 on the Braes of Doune on the 4 Nov (BG's, Trek).

F Max: c.250 Grahamston (Falkirk) 13 Dec; c.210 Grangemouth 14 Dec; 92 Airth 9 Dec; 46 Polmont 15 Dec & c.40 Grangemouth 16 Dec.

C Max: c.30 Dollar 30 Dec; 18 Pool of Muckhart 21 Dec & 15 Gartmorn Dam 4 Dec.

S Max: 305 Dunblane 5 Dec; 193 Stirling 19 Nov; c.80 Cambuskenneth 20 Nov; c.40 BoA 22 Nov & 1 Killin 25 Nov.

DIPPER *Cinclus cinclus* (B, W)

Recorded on suitable watercourses throughout the region.

Inland WeBS: 65 in Jan, 46 in Feb, 35 in Mar, 36 in Sep, 56 in Oct, 46 in Nov and 58 in Dec.

- F Breeding: AON Wallace's Cave (R. Avon) 15 Mar & 2 AON under br at Strath Ho. (R. Avon) 15 Mar (ABa); ad taking food to nest Westquarter Glen (Falkirk) 24 Apr & 'strongly suspected' in Redding (Falkirk) 11 Apr (CME). Max: 7 R. Carron (M876-Larbert) 17 Jan & 15 Oct; 7 R. Avon (Heritage Trail) 15 Mar.
- C R. Devon: Dollar-Tillicoultry monthly max: 15 in Jan, 13 in Feb, 8 in Mar, 16 in Sep, 21 in Oct, 13 in Nov & 16 in Dec. Vicar's Br-Dollar monthly max: 13 in Jan, 12 in Feb 6 in Sep, 8 in Oct, 11 in Nov & 10 in Dec.
- S Allan Water (Ashfield-Dunblane): 8 on 17 Jan & 7 on 18 Dec. Other max: 6 on R. Teith (Lanrick) 19 Mar & 23 Oct. 5 R. Fillan (G. Fillan) 20 Mar.

WREN *Troglodytes troglodytes* (B, W)

Widespread and common. BBS: recorded at 1.78 b/lkm (1997-2015 av: 1.90 b/lkm, range: 0.78 (2011) to 2.37 b/lkm (2000)). The highest recording rate was in deciduous wood / scrub etc. at 3.93 b/lkm closely followed by WBBS with 3.33 b/lkm. Recorded in all six broad habitat categories.

- F Breeding: of 5 nests monitored in Callendar Park (Falkirk) 3 were successful (CME).
- C Ten Blackdevon Wetlands 17 Apr.
- S Max: 30 Kingshouse – Lochearnhead (old railway) 2 Jul & 17 Doune Ponds 13 Jun.

DUNNOCK *Prunella modularis* (B, W)

Widespread and common. BBS: recorded at 0.31 b/lkm (1997-2015 av: 0.46 b/lkm, range: 0.28 to 0.76 b/lkm). The highest recording rate was in urban habitat at 1.6 b/lkm but recorded in all habitats except mountain & moorland.

- F Breeding: 3 nests fledged in Callendar Park & 1 in Redding (CME).
- S Eight Holme Hill (Dunblane) 28 Feb.

ROBIN *Erithacus rubecula* (B,W)

Widespread and common. BBS: recorded at 1.14 b/lkm (1997-2015 av: 1.19 b/lkm, range: 0.79 (2011) to 1.52 b/lkm (2004)). The highest recording rate was in deciduous wood / scrub etc. at 3.0 b/lkm closely followed by conifer woodland habitat with 2.45 b/lkm. Recorded in all six broad habitat categories.

- F Max: 14 Callendar Park 28 Mar & 11 Skinflats Pools 1 Oct.
- C Max: 12 Gartmorn Dam 19 Apr.
- S Max: 10 Holme Hill (Dunblane) 23 Jan, 28 Feb & 30 Mar.

COMMON REDSTART *Phoenicurus phoenicurus* (B)

First spring record: 2 Killin Marshes 16 Apr (JPH). Last: 2 L. of Menteith 10 Sep (NB).

F One Higgin's Neuk 8 Aug.

S Max: 6 G. Lochay 15 May.

WHINCHAT *Saxicola rubetra* (B)

BBS: recorded at 0.12 b/lkm (1997-2015 average: 0.09 b/lkm, range: 0.01 (2007) to 0.22 b/lkm (1997)). Recorded mostly to the N & W of Stirling.

First spring record 20 Apr Polmont (JD). Last Skinflats Pools 7 Sep (SW).

F Max: 5 Skinflats Pools 14 Aug. Also recorded from Powfoulis 30 Apr & Strathavon Fm (Slamannan) 24 May.

C Max: 17 singing ♂♂ Menstrie Glen 22 May.

S Max: 5 Gartrenich (Aberfoyle) 2 Jun & 3 singing ♂♂ Gleann a' Chlachain Gorge (NN 3630) 2 Jun (JPH).

STONECHAT (European) *Saxicola rubicola* (b, w)

This species is still recovering well from the prolonged cold spells during the winters of 2009 and 2010 with a doubling of the recording rate in 2016 from the previous year and being reported from many suitable habitats year round.

F Non-breeding records: 1-2 Kinneil Jan & Feb then Nov & Dec. Gardrum Moss, Skinflats Pools, Strathavon Fm., (Slamannan) & Slamannan plateau.

C Breeding: 2 Colsnaur Hill 14 Apr. Max of 3 Blackdevon Wetlands 23 Nov.

S Breeding: broods of 4 & 2 Gartrenich Moss 2 Jun (NB). Non-breeding: party of 7 (incl. 4 juv) Lake of Menteith 10 Sep.

WHEATEAR (Northern) *Oenanthe oenanthe* (B)

BBS: recorded at 0.13 b/lkm (1997-2015 av: 0.18 b/lkm, range: 0.17 to 0.3 b/lkm). Recorded mostly on mountains and moorlands at a rate of 0.23 b/lkm.

First spring record 1 Bolfornought (Stirling) 4 Apr (JD). Last 1 on Dumyat 8 Oct was a Greenland bird of the ssp *O. o. Leucorhoa* (CMcK).

F Passage: 1-2 Higgin's Neuk, Kinneil, Powfoulis & Skinflats Pools from 17 -29 Apr. The following were probably 'Greenland' birds: 3 Higgin's Neuk 5 May; 14 Kinneil 5 May & 1 Skinflats Pools 5 - 11 May. Return passage: 1st Kinneil 8 Aug & 1 Muirmailing (Plean) 14 Sep.

C Longcarse: 1 on 14 Apr with 10 on 1 May with the latter also probably 'Greenland' birds. 2 Blackdevon Wetlands 30 Apr & 1 Ben Cleuch 26 Jul.

S Max: 5 Hill of Row 25 Apr. Single birds at Argaty, Hill of Row 3 May and the head of L. Tay 30 Apr - 18 May were also probably 'Greenland' birds. Return passage: 1 Lake of Menteith 10 Sep, 2 R. Forth (Kippen) 12 Sep & 1 Kirkton (Tyndrum) 13 Sep. Recorded near the summits of Ben Ledi, Ben Lui, Meall Glas & Stuc a' Chroin.

***RING OUZEL** *Turdus torquatus* (b)

- S One Gleann Gaoithe (nr Comer) 11 Apr (RAB). 'Present' Gleann nan Caorran (Tyndrum) 19 Apr (ATP); 1 Gargunock Hills 22 Apr; 4 Craighruie (L. Voil) & 1 Meall Ghlas 7 May (DI, NK); 2 Meall a' Churain 27 May & 1 Ben Lui 28 May (AS); 1 Beinn Bhreac 5 Jun (CW) & 3 G. Ample 4 Sep (CME).

BLACKBIRD (Common) *Turdus merula* (B, W)

Widespread and common. BBS: recorded at 1.28 b/lkm (1997-2015 av: 2.19 b/lkm, range: 1.28 to 2.72 b/lkm). The highest recording rate was in urban/suburban areas at 7.57 b/lkm but was recorded in all six broad habitat categories.

- F Breeding: 5 nests Callendar Park (3 successful); 2 nests Mavisbank (Falkirk) & 3 failed nests Polmont Burn (CME). A bird in full song Falkirk Town centre 31 Jan (CME). Max: c.40 S. Alloa-Dunmore 28 Nov & c.20 S. Alloa 27 Nov.
 C Max: 8 Blackdevon Wetlands 15 May.
 S Max: 14 Holme Hill (Dunblane) 8 Oct.

FIELDFARE *Turdus pilaris* (W)

Last spring record of c.200 Burn of Cambus 14 Apr (DOE) was within 10 year range: 25 Mar to 14 May. First autumn record of 1 Sheriff Muir 4 Oct (Trek) was within the 10 year range: 3 Sep to 22 Oct.

- F Max: c.150 Skinflats 23 Jan & c.500 S. Alloa 27 Nov.
 C Max: c.70 Gartmorn Dam 2 Jan & 62 Longcarse 8 Nov.
 S Site max: c.150 Carse of Lecropt 18 Feb; 1,000+ Strath Fillan 20 Oct; c.500 Crianlarich 23 Oct; c.300 Braeleny 12 Nov & 296 Stronachlachar 30 Oct.

SONG THRUSH *Turdus philomelos* (B, W)

Widespread. BBS: recorded at 0.49 b/lkm (1997-2015 av: 0.52 b/lkm, range: 0.24 to 0.82 b/lkm). The highest recording rate was in deciduous wood / scrub etc. at 1.42 b/lkm but was recorded in all six broad habitat categories.

- F Breeding: 2 nests Callendar Park Wood both failed (CME). Five singing ♂♂ Dunmore 31 Mar (AB). 1 singing Parkfoot (Falkirk) at 06.08 hours 13 Dec (CME).
 S Max: 53 Holme Hill (Dunblane) 8 Oct.

REDWING *Turdus iliacus* (W)

Last spring record of c.20 Kirkton (Tyndrum) 11 Apr (JPH) is within the previous 10 year range: 7 Mar to 1 May. First autumn record of 3 Skinflats Pools 26 Sep SW) is a day earlier than the previous 9 year range: 27 Sep to 12 Oct.

- F Max: c.30 Skinflats TE 13 Mar & c.200 S. Alloa 27 Nov.
 C Max: c.40 Gartmorn Dam 2 Jan & c.80 Cambus 27 Oct.
 S Max: c.100 Bandeath 20 Feb) & 215 Glenhead (Dunblane) 12 Oct.

MISTLE THRUSH *Turdus viscivorus* (B, W)

Widespread. BBS: recorded at 0.09 b/lkm (1997-2015 av: 0.17 b/lkm, range: 0.06 to 0.3). Somewhat surprisingly, the highest recording rate was on WBBS at 0.33 b/lkm. Not recorded in urban / suburban areas.

F Breeding: 3 prs probably bred in Callendar Park (CME). Max: 8 Skinflats Pools 22 Oct.

S Max: 19 Cauldhame (S of Sheriff Muir) 16 Aug; 16 Strath Fillan 4 Mar; 15 G. Ample 4 Sep; 12 head of L. Tay 16 Oct & 12 Burn of Cambus 23 Oct.

GRASSHOPPER WARBLER *Locustella naevia* (b)

First spring record of 1 Skinflats Pools 20 Apr (MM). [10 year range of 17 to 27 Apr]. Last: Last 1 Skinflats 14 Aug (RS).

F One to two Kinneil 28 Apr-16 Jun. 1 S. Alloa 4 Aug.

C One to two Blackdevon Wetlands 26 Apr-19 Jun. 1 Cambus 23 Apr & 5 May.

S Recorded from: Aberfoyle, Auchessan (G. Dochart), Auchtubh (Balquhidder 2), Cornton, Dunblane, E. Lodge (L. Venachar), Killin Marshes 22 May-14 Jul, Hill of Row, Innischoarach (G. Lochay), Kirkton (Tyndrum), Little Drum Wood (Brig o' Turk) & Stronachlachar (2).

SEDGE WARBLER *Acrocephalus schoenobaenus* (B)

BBS: recorded at 0.04 b/lkm (1997-2015 av: 0.11 b/lkm, range 0.04 to 0.26 b/lkm). The highest recording rate was on WBBS at 0.47 b/lkm. Scarce elsewhere with no records from mountain / moorland and urban / suburban habitats. First spring record: 1 Longcarse 23 Apr (NB) [10 year range of 21-31 Apr]. Last: 4 Skinflats Pools (SW).

F Max: 20 Skinflats Pools 6 May & 7 Kinneil 21 May.

C Max: 10 Tullibody Inch 26 May.

S Max: three Killin Marshes 9 May.

*REED WARBLER *Acrocephalus scirpaceus* (b)

Breeding of the species in the Upper Forth area was first confirmed in 2011.

First spring record: 1 Skinflats Pools 11 May (GR).

Last 1 Skinflats Pools 28 Aug was ringed (IL).

F Skinflats Pools: 1-2 from 11 May-11 Jul (GR, RS, SW, AB, DOE, DT, AB).

C Three Cambus Pools 15 May with singles on 27 & 28 May (JRC, KW) & 1-3 Longcarse / Tullibody Inch 15 May-12 Jul (JRC, GG, DMB, NB).

BLACKCAP *Sylvia atricapilla* (B)

Found throughout the area. BBS: recorded at 0.11 b/lkm (1997-2015 av: 0.15 b/lkm, range: 0.07 to 0.22 b/lkm). The highest recording rate was in conifer woodland at 0.24 b/lkm but this was closely followed by 0.21 b/lkm in both the deciduous / scrub etc and farmland habitat categories. First spring record: 1 singing Hallglen (Falkirk) 16 Apr (CME). [10 year range 23 Mar to 13 Apr].

Last 1 Skinflats 22 Oct (DOE). In spring it is difficult to separate the few overwintering birds from E. Europe with the genuine summer migrants.

F Max: 7 territories Callendar Wood 15 May & 5 Skinflats Pools 15 May.

S Max: 7 Blairdrummond Ponds 3 Jul. Winter records: ♀ in Broomridge gdn (Stirling) 15 & 17 Jan with a ♂ visiting the same gdn 16-30 Mar (DT).

GARDEN WARBLER *Sylvia borin* (B)

Recorded throughout the area in small numbers.

First spring record of 1 Alva 14 Apr (AE) [10 year range 15 Apr to 2 May]. Last 1 Kinneil 27 Aug (DT).

S Max: 3 Killin 29 May.

COMMON WHITETHROAT *Sylvia communis* (B)

BBS: recorded at 0.17 b/lkm (1997-2015 av: 0.21 b/lkm, range: 0.11 to 0.32 b/lkm). The highest recording rate was on WBBS at 0.73 b/lkm and was not recorded on either mountain / moorland or conifer woodland habitat categories. First spring record 1 Skinflats Pools 24 Apr (SW) [10 year range 9 Apr to 2 May].

Last: 2 Kinneil 28 Aug (DT).

F Max: 10 Kinneil 21 May & 6 Skinflats Pools 9 May.

C Breeding: family party of 4 Blackdevon Wetlands 30 Jul (NB).

S Max: 6 Argaty 23 May.

*LESSER WHITETHROAT *Sylvia curruca* (b?)

F One Skinflats Pools 9-15 May & 22 Aug (SW, AB, DOE).

WOOD WARBLER *Phylloscopus sibilatrix* (B)

First spring record 1 Killin Marshes 26 Apr (NB). [10 year range: 17 Apr to 5 May]. Last 1 E end L. Katrine 23 Jun (NB).

F One Larbert Pond 3 & 10 May.

C One Dollar Glen 15 May.

S Max: 8 G. Lochay Power Sta 9 Jun. Also recorded from: Auchessan (G. Dochart), Barr Wood (Stirling), Ben A'an, Blackwater Marshes, Brig o' Turk, Callander: Craggs & Bracklinn Falls, Craighuie (L. Voil), E. end L. Katrine, Gillies Hill (Cambusbarron), G. Lochay (6), Killin, Kilmahog (4), L. Venachar (4) & Menteith Hills (3).

CHIFFCHAFF (Common) *Phylloscopus collybita* (B)

BBS: recorded at 0.14 b/lkm (1997-2014 av: 0.13 b/lkm, range: 0.01 (1997) to 0.26 b/lkm (2012)). The highest recording rate was in urban areas at 0.9 b/lkm but was not recorded on mountain / moorland or on WBBS. Numbers have increased over the past 20 years with a few birds overwintering. First spring record: 1 S. Broomage (Falkirk) 20 Mar (SW). [10 year range 11 to 31 Mar].

F Winter records: 2 Bantaskine (Falkirk) 8 Nov. Breeding: min 13 territories Callendar Wood 15 May (CME). Max: 7 Callendar Park 3 Apr; 6 (singing ♂♂) Hallglen (Falkirk) & 5 (singing ♂♂) Dunmore 31 Mar.

C Max: 7 Gartmorn Dam 19 Apr & 4 Cambus 15 Sep.

S Max: 6 Argaty 23 May; 6 Blairdrummond 9 Apr & 6 Dunblane 3 Apr.

WILLOW WARBLER *Phylloscopus trochilus* (B)

BBS: recorded at 1.67 b/lkm (1997-2015 av: 1.68 b/lkm, range: 1.15 to 2.84 b/lkm). The highest recording rate was in deciduous wood / scrub etc. at 4.79 b/lkm followed by conifer woodland habitat with 3.22 b/lkm and WBBS at 3.2 b/lkm. Recorded in all six broad habitat categories. First of year 3 Carron (Falkirk) 9 Apr (WT). [10 year range 3-18 Apr]. Last: 2 Skinflats Pools 1 Oct (SW).

C Max: 9 Gartmorn Dam CP 17 Apr.

S Max: 10 Blairdrummond 23 Apr with 10 Balquhidder Sta & Lochearnhead 2 Jul.

*YELLOW-BROWED WARBLER *Phylloscopus inornatus* (v)

F One Skinflats Pools 25 Sep (AB, SW). This is only the 2nd record for the Upper Forth after 1 in Buchlyvie on 30/05/1960.

GOLDCREST *Regulus regulus* (B, W)

Widespread. BBS: recorded at 0.23 b/lkm (1997-2015 av: 0.5 b/lkm, range: 0.17 to 1.07 b/lkm). The highest recording rate was in conifer wood at 1.49 b/lkm. Recorded in all broad habitat categories except urban.

F Breeding: confirmed in Callendar Park & Falkirk Crem. Max: 14 Callendar Park 3 Apr.

S Breeding: confirmed in Stank Glen (Ben Ledi) & around Aberfoyle. Max: 12 Lanrick Est. 11 Dec; 10 Blairdrummond 13 Nov & 10 L. Mahaick 31 Dec.

SPOTTED FLYCATCHER *Muscicapa striata* (B)

First spring record 1 E. Lodge (L. Venachar) & G. Dochart 8 May (DH, JPH). [10 year range: 2 to 20 May]. Last: 1 Skinflats Pools 25 Sep (AB, SW). Found in increasingly low numbers – mostly to the N & W of Stirling.

F Recorded from Callendar Park 29 May & Kinneil 24 Jul.

C Recorded from Gartmorn Dam 4 Jun & Cambus Pools 5 Jun.

S Breeding: started building a nest on a security light in Tyndrum 23 May (IMcP) & family party in Pass of Leny 31 Jul (CME). Also 1 Plean CP 1 Aug.

*PIED FLYCATCHER *Ficedula hypoleuca* (b)

S One Kilmahog 14 May (AW); 1 ♂ G. Lochay 15 May (JPH) & 1 L. Achray 26 Jul (SM).

*BEARDED TIT *Panurus biarmicus* (b?)

C Monthly max at a probable, confidential breeding location: 5 in Apr; 2 in May; 2 in Jun, 11 in Aug (incl. 5 juvs); 1 in Oct & 3 in Dec (JRC, DMB, GG, DT). 'Present' Fallin 25 Feb (ACC) & 1 Cambus Pools 27 Feb (JRC).

LONG-TAILED TIT *Aegithalos caudatus* (B, W)

Widespread. BBS: recorded at 0.08 b/lkm (1997-2015 av: 0.15 b/lkm, range: 0.03 to 0.38 b/lkm). The highest recording rate was in deciduous wood /

scrub etc. at 0.26 b/lkm. No records from the conifer woodland, WBBS or urban habitat categories.

F Breeding: two nests (both destroyed) Callendar Park; one nest successful (b3) but 2 failed at chick stage Callendar Wood; one nest successful but 1 failed at the chick stage Redding and 2 nests failed with 1 'probably' successful Hallglen (CME). Max: c.20 Kinneil 15 Jan.

C Max: 14 Cambus 12 Mar.

S Max: 20 Brig O Turk 10 Sep & 14 Lanrick (R. Teith) 23 Oct & 14 Carse of Lecropt 4 Dec.

BLUE TIT *Cyanistes caeruleus* (B, W)

Widespread. BBS: recorded at 0.8 b/lkm (1997-2015 av: 1.61 b/lkm, range: 0.08 to 2.51 b/lkm). Recorded in all six broad habitat categories with all but mountain / moorland at similar rates and deciduous wood / scrub etc. being the highest at 1.79 b/lkm.

F Max: 17 Callendar Park 11 Mar.

S Max: 21 Holme Hill (Dunblane) 23 Jan & 15 Blairdrummond 3 Jul.

GREAT TIT *Parus major* (B, W)

Widespread. BBS: recorded at 0.73 b/lkm (1997-2015 av: 0.87 b/lkm range: 0.41 to 1.32 b/lkm). Recorded in all six broad habitat categories with all but mountain / moorland at similar rates and deciduous wood / scrub etc. being the highest at 1.81 b/lkm.

F Max: 23 Callendar Park 27 Mar.

C Max: 10 Gartmorn Dam 22 Feb.

S Max: 18 Blairdrummond 3 Jul & 12 Edra (L. Katrine) 6 Mar.

COAL TIT *Periparus ater* (B, W)

Widespread. BBS: recorded at 0.43 b/lkm (1997-2015 av: 0.5 b/lkm, range: 0.14 to 1.00). The highest rate was in conifer woodland at 3.08 b/lkm and was recorded in all six broad habitat categories except urban. No notable records.

NUTHATCH (Eurasian) *Sitta europaea* (B)

After the first record in 1999 and first breeding recorded in 2009, the species has spread widely if thinly.

F Breeding: min of 7 territories in Callendar Wood with a juv begging for food 11 Jun (CME).

C Max: 5 Menstrie Glen 3 Sep.

S Breeding: pr + 3Y Dunblane Golf Course 18 Jun (DTh). Max: 7 Aberfoyle E 9 Dec.

TREECREEPER (Eurasian) *Certhia familiaris* (B, W)

Widespread in small numbers.

F Breeding: min of 11 territories Callendar Wood with 2 confirmed breeding. Also confirmed breeding in Hallglen area (CME).

S Max: 6 Blairdrummond 24 Apr, 27 Nov & 27 Dec & 5 Ochertyre Moss 4 Nov.

*GREAT GREY SHRIKE *Lanius excubitor* (irr)

S One L. Mahaick 17 & 27 Dec (DOE).

JAY (Eurasian) *Garrulus glandarius* (B, W)

Widespread in small numbers.

C 8 Gartmorn Dam CP 21 Sep.

S Breeding; 2 Juv were at a Crianlarich bird table 3 Sep (IMcP). Max: 10 R. Teith (Lanrick) 14 Apr with 8 on 11 Dec & 6 Inchie Wood (Menteith) 17 Feb.

MAGPIE *Pica pica* (B, W)

Widespread in Falkirk and Clackmannan districts and Stirling area. Very unusual N of the Highland Line. BBS: recorded at 0.4 b/lkm (1997-2015 av: 0.5 b/lkm, range: 0.31 to 0.75 b/lkm). Most numerous in urban/suburban habitats at 3.06 b/lkm.

F Breeding: 2 active nests Callendar Park 2 Apr (CME). Max: 12 Kinneil 24 Feb & 10 Bridgeness 13 Mar.

S Max: 23 St Ninians 19 Jan; 21 Ochiltree (Dunblane) 29 Feb; 17 Dykedale (Dunblane) 11 Oct & 10 Carse of Lecropt 4 Dec. 'Present' at c.800m on Ben Lui 6 Nov – a very unusual record (PVV).

JACKDAW *Corvus monedula* (B, W)

BBS: recorded at 1.56 b/lkm (1997-2015 av: 2.49 b/lkm, range: 1.56 to 3.27 b/lkm). Recorded in all six broad habitat categories but most frequent in urban/suburban areas at 5.69 b/lkm closely followed by farmland at 4.05 b/lkm.

F Site max: c.320 Callendar Park 24 Jan (pre roost gathering); c.250 Glen Village 11 Dec; c.200 Carronshore 21 Jul (roost flight) & c.100 Righead (Avonbridge) 20 Jan.

S Site max: c.450 Doune 31 Oct; c.130 Blairdrummond 27 Dec & c.100 Killin 4 Sep (roost flight).

ROOK *Corvus frugilegus* (B, W)

BBS: recorded at 1.37 b/lkm (1997-2015 av: 3.48 b/lkm range: 1.37 to 5.99 b/lkm). Recorded in all six broad habitat categories but most frequent on WBBS at 5.4 b/lkm followed by farmland at 3.49 b/lkm.

F Breeding 30 aon Muiravonside 15 Mar (AB) & 20 aon Kaemoor Fm (Avonbridge) 15. Mar. Site max: c.200 Kingseat Pl (Falkirk) 28 Nov.

C. Max: 162 Jellyholm (Sauchie) 18 Oct & c.140 Longcarse 10 Jan.

S Breeding: 343 nests Dunblane in Apr - an increase of 10 on 2015 & 41 compared to 2015 (MVB). Max: c.200 Carse of Lecropt 4 Dec.

CARRION CROW *Corvus corone* (B, W)

Ubiquitous. BBS: recorded at 2.25 b/lkm (1997-2015 av: 3.27 b/lkm, range: 2.03 to 6.22 b/lkm). Recorded in all six broad habitat categories but most frequent in urban/suburban areas at 6.6 b/lkm followed by farmland at 4.75 b/lkm.

F Max of c.100 Callendar Wood 19 Nov (roost) & 54 Skinflats Pools 9 Dec.

S Max of c.150 Plean Castle 17 Jan & 51 Kippen Carse 13 Mar.

HOODED CROW *Corvus cornix* (b, w)

Hybrids with Carrion Crow are common in a fairly narrow transition band running E-W across the area to the N of Callander.

C A hybrid was at Kennet Pans 23 Jan.

S Pure birds found in far northwestern part of the area. Max: 26 Strath Fillan 11 Jan was a mixture of pure & hybrid birds. Hybrids at Gartartan (Aberfoyle) 5 Apr & 2 on 8 Dec were out of the normal range.

RAVEN (Common) *Corvus corax* (B, W)

BBS: recorded at 0.14 b/lkm (1997-2015 av: 0.09 b/lkm, range: 0.01 (2000) to 0.17 b/lkm (2015)). Only absent from urban/suburban areas.

F Breeding: Callendar Wood 2Y ringed & fledged 13 Mar. Recorded in small numbers (max 2) from: Callendar Park (Falkirk), Higgin's Neuk, Skinflats Pools, Slamannan plateau, S. Alloa & S. Broomage.

C Recorded in small numbers (max 2) from: Dollar Glen, Gartmorn Dam, Longcarse, Menstrie & the Ochils.

S Recorded in small numbers throughout. Max: 15 Spout of Ballochleam 1 Nov; 12 The Lodge (Aberfoyle) 14 Mar & 10 L. Mahaick 14 Mar.

STARLING (Common) *Sturnus vulgaris* (B, W)

BBS: recorded at 2.08 b/lkm (1997-2015 av: 5.14 b/lkm, range: 2.08 to 10.70 b/lkm). Most frequent in urban/suburban areas at 18.06 b/lkm (the highest rate for any sp's in any habitat) and only absent from mountain and moorland.

F Site max: c.150 Powfoulis 25 Jan & c.100 Strathavon Fm 5 Apr & 29 Oct.

S Site max: c.250 Blairdrummond 27 Oct; c.200 E Flanders Moss 30 Oct; c.200 Burn of Cambus 23 Dec & c.150 Carse of Lecropt 3 Jan.

HOUSE SPARROW *Passer domesticus* (B, W)

BBS: recorded at 1.2 b/lkm (1997-2015 av: 1.73 b/lkm, range: 1.20 to 2.93 b/lkm). Most frequent in urban/suburban areas at 11.46 b/lkm then 2.59 b/lkm on farmland but very scarce elsewhere.

F Max: 25 Skinflats Pools 14 Aug.

C Max: 28 Jellyholm (Sauchie) 18 Oct.

S Max: c.150 E Flanders Moss 30 Oct & c.60 Chalmerston Road (Drip Moss) 25 Aug.

TREE SPARROW *Passer montanus* (B, W)

BBS: recorded at 0.10 b/lkm (1997-2015 average: 0.10 b/lkm, range: 0.00 to 0.28 b/lkm).

F Max: 15 Powfoulis 25 Jan.

C Max: 28 Blackdevon Wetlands 31 Oct.

S Site max: c.40 Keirarnhall 24 Mar & Kippenross (Dunblane) 4 Feb; 35 Carse of Lecropt 15 Sep; c.30 Bandedeath 20 Feb; c.20 E Flanders Moss 30 Oct; Taylorton 27 Nov & Hill of Row 3 Dec.

CHAFFINCH (Common) *Fringilla coelebs* (B, W)

BBS: recorded at 3.12 b/lkm (1997-2015 av: 3.93 b/lkm, range: 2.94 to 5.15 b/lkm). Recorded in all six broad habitat categories but most frequent in conifer woodland at 7.98 b/lkm followed by deciduous wood / scrub etc at 6.7 b/lkm.

- S Site max: c.350 Greenyards (Dunblane) 1 Dec; c.270 Stonehill (Dunblane) 22 Nov; c.200 Landrick (Dunblane) 16 Jan & c.100 Drip Moss 4 Jan; Ashfield 10 Jan & Cambushinnie 10 Jan.

BRAMBLING *Fringilla montifringilla* (W)

Last spring record 1 in a Dunblane gdn 14 Apr (NB). First autumn record 1 Cocksburn Resr 13 Oct (CMcK).

- F Recorded from Bo'ness, Kinneil & S. Broomage.

C Only record: 1 Dollar 11 Apr.

- S Site max: c.80 Ashfield 10 Jan; c.60 L. Watston; 52 Landrick Wood 16 Mar & c.30 Greenyards (Dunblane) 1 Dec. Also recorded from Blairdrummond, Brae of Cessintully, Cambushinnie, Crianlarich, Doune, around Dunblane, Keir Estate & Hill of Row.

GREENFINCH *Carduelis chloris* (B, W)

Still widespread but numbers have fallen by c.90% in the last decade largely due to the parasite *Trichomonosis gallinae*. BBS: recorded at 0.07 b/lkm (1997-2015 av: 0.52 b/lkm, range: 0.07 (2016) to 1.07 b/lkm (2005)). The highest recording rate was in urban/suburban areas at 0.63 b/lkm.

- F Site max: c.20 S. Alloa & 10 Langlees (Falkirk) 10 Mar.

- S Site max: c.180 Dykedale (Dunblane) 25 Oct – feeding on seeds of Noble Fir; c.40 Ashfield 10 Jan; 15 Carse of Lecropt 4 Mar; 10 Airthrey 20 Feb & Doune 17 Jan.

GOLDFINCH *Carduelis carduelis* (B, W)

BBS: recorded at 0.33 b/lkm (1997-2015 av: 0.45 b/lkm, range: 0.12 (1988) to 1.00 (2010)). The highest recording rate was in urba/suburban areas at 1.88 b/lkm.

- F Site max: c.130 Skinflats Pools 10 Sep; 57 Kinc. Br. 10 Jan; c.40 Higgin's Neuk 3 Jan; c.30 Kinneil 25 Aug & c.30 Kingseat Pl (Falkirk) 18 Dec.

- C Site max: c.160 (mixed ad & juv feeding on thistle seeds) Blackdevon Wetlands 30 Jul.

- S Site max: c.60 Glenhead 22 Oct & 45 The Crescent 7 Feb (both Dunblane).

SISKIN *Spinus spinus* (B, W)

BBS: recorded at 0.37 b/lkm (1997-2015 av: 0.34 b/lkm, range: 0.1 to 0.75 b/lkm). As would be expected, the highest recording rate was in conifer woodland at 1.39 b/lkm. Not recorded in urban/suburban areas this year.

- F Breeding: min of 15 territories in Callendar Wood 27 Mar (CME).

- S Site max: c.30 Cambusmore/Gart GP 4 Dec & Riverside (Stirling) 22 Dec.

LINNET *Linaria cannabina* (B, W)

BBS: recorded at 0.11 b/lkm (1997-2015 av: 0.29 b/lkm, range: 0.05 to 0.83 b/lkm). Essentially a farmland bird where it was recorded at 0.51 b/lkm.

- F Site max: c.190 Powfoulis 18 Sep; c.110 Blackness 17 Dec & c.100 Slamannan plateau 28 Oct.
- C Breeding; chicks heard in nest at Tullibody Inch 13 Jun (GG). Site max: c.130 Gartmorn Dam 14 Jan.
- S Site max: c.500 Landrick 16 Jan; c.450 Stonehill 30 Nov; c.250 Glenhead (Dunblane) 22 Oct & Greenyards 1 Dec (all Dunblane) & c.200 Cambushinnie 10 Jan.

TWITE *Linaria flavirostris* (b, W)

- F Site max: 95 Higgin's Neuk area 13 Jan; 50+ Powfoulis 1 Jan & c.70 Skinflats saltmarsh 9 Dec. Also recorded from Kinneil & S. Broomage. Only a single bird was recorded on BBS.
- C Max: c.150 Gartmorn Dam 14 Jan & 15 Cambus Pools 24 Jan. Also recorded from Menstrie Glen.
- S Max: c.30 Plean Castle 16 Jan & c.20 Ben More 10 Sep. Also recorded from Beinn Bhreac (Callander), Brown Hill (Ochils), Cambushinnie, Meall nan Tarmachan, G. Dochart, G. Lochay & Strath Fillan.

LESSER REDPOLL *Acanthis cabaret* (b, W)

BBS: recorded at 0.12 b/lkm (1997-2015 av: 0.10 b/lkm, range: 0.01 to 0.35 b/lkm). The highest recording rate on BBS was on WBBS at 0.51 b/lkm (riverside alders?).

- F Max: 23 Lionthorn (Falkirk) 16 Jan; 12 Kinneil 8 Jan & 31 Mar.
- C Max: 24 Menstrie 14 Feb.
- S Site Max: c.130 Landrick (Dunblane) 20 Jan; 35 Balquhidder 18 Sep; 17 Sheriff Muir 20 Oct & 16 L.Mahaick 5 Mar. A Common (Mealy) Redpoll (*c. flammea*) was at L. Mahaick 24 Jan (DOE).

COMMON CROSSBILL *Loxia curvirostra* (b, W)

BBS: recorded at 0.06 b/lkm (1997-2015 av: 0.10 b/lkm, range: 0.00 to 0.49 b/lkm). As expected, the highest recording rates were in conifer woodland (0.29 b/lkm) and deciduous wood/scrub etc (0.21 b/lkm).

- F Max: 4 Bo'ness 3 Jan. Also recorded at Auchengean Wood & Parkfoot (both Falkirk).
- *C Two Gartmorn Dam 22 Oct (GG).
- S Max: 18 L. Mahaick 23 Oct & 10 Wester Lix 6 Dec. Recorded in small numbers at several other sites.

BULLFINCH *Pyrrhula pyrrhula* (B, W)

Recorded in low numbers in the lowlands.

- F Breeding: 3 prs Callendar Wood with 1 juv 17 Jul (CME). Max: 11 Callendar Wood 11 Dec & 8 Dunmore 31 Mar.
- C Max of 8 Gartmorn Dam CP 16 Oct.
- S Max of 16 Brig o' Turk 13 Jan & 10 Burn of Cambus 16 Jan.

*HAWFINCH *Coccothraustes coccothraustes* (v)

- S One Atholl Pl, Dunblane 12 May; 7 Logie Kirk 29 May & 1 ♀ Blairlogie 30 Dec (KD, DJ, JRC).

*SNOW BUNTING *Plectrophenax nivalis* (W)

- F One Blackness 26 Mar (BG's).
- S 25 Inverlochlarig 15 Feb (ES); 1 Kirkton Fm (Tyndrum) 6 May; 1 Gleann a' Chlachain 3 & 20 Feb & 2 Meall Buidhe (Tyndrum) 15 Nov (all JPH).

YELLOWHAMMER *Emberiza citrinella* (B, W)

BBS: recorded at 0.40 b/lkm (1997-2015 av: 0.46 b/lkm, range: 0.08 to 0.62 b/lkm). Recorded in all six broad habitat categories but most frequent on farmland at 1.6 b/lkm.

- F Site max: 28 Skinflats Pools 10 Jan & 25 Airth 9 Dec.
- S Site max: c.50 Carse of Lecropt 18 Dec; c.40 Bandeath 20 Feb; 35 Kippenross (Dunblane) 4 Feb & c.30 Hill of Row 3 Dec.

REED BUNTING *Emberiza schoeniclus* (B, W)

BBS: recorded at 0.16 b/lkm (2004-2015 av: 0.23 b/lkm, range: 0.10 to 0.45 b/lkm). Recorded fairly evenly in all habitat categories except conifer woodland but was most frequent on WBBS 0.6 b/lkm.

- F Site max: 15 L. Ellrig 13 Mar; 12 Skinflats Pools 24 Nov & 10 Kinneil 11 Nov.
- C Max: 10 Longcarse 25 Sep.
- S Site max: 30 Greenyards (Dunblane) 1 Dec; 11 R. Forth (Meiklewood) 14 Feb & 10 Drumloist 28 Feb.

ESCAPED SPECIES

BAR-HEADED GOOSE *Anser Idicus*

- C One Longcarse 22 & 28 Sep (NB, JRC).
- S Two Callander 6 Feb (DOE) & 2 Lake of Menteith 11 Feb (NB).

HOODED MERGANSER *Lophodytes cucullatus*

- S One free flying ♂ Blairdrummond Safari Park 3 Feb & 28 Mar (NB, DOE).

PLANT REPORT, 2016.
CENTRAL SCOTLAND'S THREE 'WEE' ORCHIDS.

Roy Sexton and Sarah Longrigg.

Introduction

There are about 28,000 species of orchids in the world, the vast majority of which are found in the tropics. Europe has approximately 250 species, the British Isles 56, Scotland 28 and Central Scotland 17. The three local species that are the subject of this article (Table 1) are tiny and all have been found flowering when less than 8cm in height. They are all inconspicuous, having small green or white flowers, and are difficult to find even when the location is known. Local naturalists would consider all these species to be rare finds though only two of them, coralroot orchid and small white orchid, have 'British Red Data List' *vulnerable* status (Cheffings and Farrell, 2005).

Table 1. Some characteristics of the three orchids described in this account.

Species	Height	Flower colour	Records in last decade	Red Data List status
Bog Orchid	2- 8cm	Yellow Green	10 sites	
Coralroot Orchid	5-13cm	White Purple	2 sites	Vulnerable
Small White Orchid	8-15cm	White Green	1 site	Vulnerable

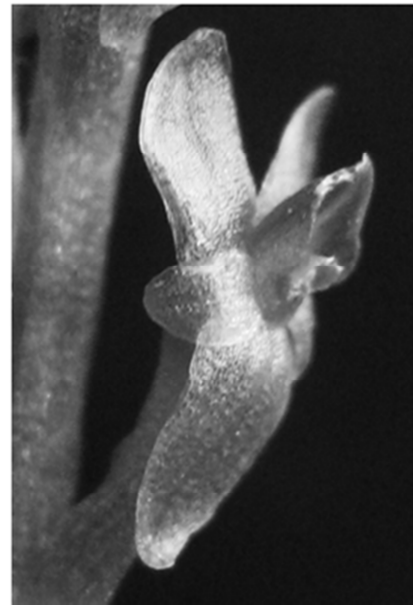
The records are for the two Vice Counties of Stirlingshire VC 86 and West Perthshire VC87.

The Bog Orchid *Hammarbya paludosa*

This is the smallest of our local orchids, which can be fully grown at 2.5 cm though its normal height is from five - eight centimetres (Figure 1). As its name implies this orchid is usually found growing near sphagnum bogs. It requires a site that never dries out and has a slow flow of water through it. In many of its local locations it is found on bare peaty mud along the sides of runnels in amongst smaller sedges, grasses, and mosses. The plant's Latin generic name is derived from the summer home of Linnaeus who catalogued most of our European plants.

Bog orchid plants are very hard to spot and sites need to be approached with great caution to avoid trampling on them. At the base of the plant and partially embedded in the moss or mud is a pea sized 'pseudobulb' which is usually surrounded by two or three 1 cm long boat shaped leaves. These have granular propagules around the edges, which detach and grow to produce new plants.

Figure 1. Left: A flowering and a non-flowering plant. Right: Propagules along the edges of a basal leaf. Bottom right: A close up of a flower.



The flower spikes carry from eight to 22 yellowish green flowers. These are tiny 2 mm wide and 4 mm tall and are visited for their nectar by gnats and tiny flies. The local flowering period is quite long and records extend from between the 12th July to the 1st September.

In Scotland most of this orchid's locations are on the NW side of the country. During the last ten years it has been found at 10 discrete sites in VC 86 Stirlingshire and VC 87 West Perthshire. These include Conic Hill (NS 424 917), Inverlochlarig near Loch Voil (NN 433 183) and Glen Falloch (NN 363 238).

The Coralroot Orchid *Corallorhiza trifida*

Coralroot orchid plants are leafless, usually consisting of small groups of thin pale green flowering stems up to 13 cm high which grow from a creeping branched cream-coloured subterranean rhizome. Each stem supports 7-19 pale yellow-green strap shaped flowers which may droop down towards the stem (Figure 2). The flower consists of a 7 mm long ovary which bears at its tip six 4 mm long petals. The lip or largest petal is white and spotted with maroon dots. Our local orchids are all the woodland form which is predominately greenish unlike those found in dune slacks which have brown stems.

In the UK this plant is largely confined to Scotland, particularly the eastern side. Since 1936 it has only been recorded at two sites in VC 87. Pam Murdoch found it in the damp birch-alder woods of Leny Flushes SSSI (NN 598 085) north of Callander where it flowered in June during 2009 and 2011 but has not been found since. In mid-June 2017 three more spikes were discovered in VC 86 near Milngavie (NS 549 757) by William Parkes. A colony of more regular flowering plants can be found during mid-June just north of VC 87 at the northern end of Loch Tay Marshes SSSI (NN 580 341).

Coralroot is one of three native orchids that have no leaves. The other two are the birds nest orchid (*Neottia nidus-avis*) which can be found at a number of sites in our area (Plant Report 1) and the elusive ghost orchid (*Epipogium aphyllum*) which is confined to Southern England. Although the flowering stems of the coralroot orchid are pale green they have recently been shown to be practically incapable of photosynthesis like the entirely brown flower stalks of the bird's nest orchid (Cameron et al. 2009).

These orchids used to be a topic in the syllabus of advanced school biology courses because they posed the question of how the orchid obtained the food necessary for growth when unlike normal green photosynthetic plants they lacked the capacity to use light energy to convert carbon dioxide to complex organic compounds.

The clue to the orchid's mode of nutrition was provided by microscopic examination of their underground tubers, the tissues of which were full of invasive fungal hyphae. These soil fungi seem to attack the orchid tissues which respond by producing toxic chemicals which kill the invader.

Figure 2 Left: A Coralroot orchid plant. Right: An individual flower showing maroon spots on the labellum. Bottom right: A drooping flower side view.



It is assumed that the dead remains of the fungi provided the 'food' for the orchid's growth. This fungal-plant relationship is not symbiotic since the fungus derives no benefit from it. Coralroot orchids are properly referred to as myco-heterotrophic plants i.e. they derive both their energy and complex organic and nitrogenous compound from *myco*-fungi.

During the last twenty years Sheffield University biologists have used modern technologies to investigate the nutrition of coralroot orchids using plants from the sand dune slacks of Tentsmuir in Fife. They sequenced the fungal DNA found in seedling and adult coralroot plants. A search of the GenBank database which contains DNA sequences from over 300,000 organisms revealed that the 28 most closely similar were all in the family of fungi known as the *Thelephoraceae*. For example the corresponding sequence from a fruiting body of the fungus *Tomentella* (a member of this family) was 94% identical, suggesting these fungi were close relatives. (McKendrick et al. 2000a).

It has long been suspected that coralroot orchids obtain their carbon from associations with fungi that also form ectomycorrhizas with trees. The fungi in the *Thelephoraceae* are thought to be exclusively found in such symbiotic mycorrhizal associations with the roots of trees. In these mutually beneficial relationships the fungal partner is found as extensive thread-like mycelial networks in the soil. The roots of the trees become wrapped in these fungal hyphae which do not enter the cells of the plant (ectomycorrhizas) unlike the fungi that penetrate orchid's tubers (endomycorrhizas). The tree releases organic nutrients from its roots which are absorbed by the fungus and promote its growth. The mycorrhizal fungal hyphae in turn bring water and essential mineral nutrients like phosphate and nitrogenous compounds to benefit the tree.

Campbell (1970) using microscopical techniques traced the thread-like hyphae from the tree roots to the orchid tissues. Zelmer and Currah (1995) extracted the fungus from inside the orchid tissues and showed the isolated fungus would form ectomycorrhizas round the roots of seedling trees. This raises the question of whether the coralroot orchid can indirectly obtain compounds necessary for its growth from the tree. In an experiment McKendrick et al. (2000b) took seedling Coralroot orchid plants naturally infected with endomycorrhizas and planted the sterile roots of seedling willow and birch into close contact with them in the laboratory. After 25 weeks the fungus associated with the orchid had formed ectomycorrhizas around the tree roots. They then fed the leaves of the seedling trees with radioactive $^{14}\text{CO}_2$ gas which was converted into radioactive carbon compounds in the tree leaves by photosynthesis.

These radioactive compounds moved from the tree tissues into the mycorrhizas and then into the tissues of the seedling coralroot orchids. The results provided experimental confirmation that growth of the coralroot orchids could be sustained by a photosynthetic partner tree, the transport between the two being provided by the linking fungal mycelia. This means the orchid can grow on the floor of dark woodlands as long as the canopy of its associated tree is in the sunlight.

Small White Orchid *Pseudorchis albida*

Had this article been written two years ago, the Small White orchid would not have been included since the first record of its presence in VC 86 and VC87 for more than 25 years was made in June 2016. While examining the route of a proposed upgrade of the footpath to the Craggs east of Callander, John Snodin and Roy Sexton found five plants in an area of short turf right at the edge of the exiting track (NN 636 092). This area of upland northern hay-meadow just to the west of the Braeleny road is rich in orchids and this find brings the total to eight species. Despite of its lack of statutory protection we are only aware of two better orchid meadows in our area each with nine species: Morenish SSSI (NN 609 354) on the north side of Loch Tay which includes the small white orchid and Quoiggs Meadow SSSI just south of Greenloaning (NN 830 053). The small white orchid is largely confined to the west side of Scotland and is also found in the Lake District and Wales. The easiest place to see the plant locally is in SWT's Keltneyburn reserve near Aberfeldy (NN 773 494).

This orchid's flowering period recorded in our area is from June 11th – 23rd. The flower spike is from eight to 15 centimetres in height, the apex being covered with 18 to 50 tightly packed small creamy flowers. The main petal or lip is broader than it is long and is deeply three lobed, the central lobe being curved like the lip of a jug. At the base of the stem are four to six shiny green oval-lanceolate leaves. The flowers produce abundant nectar but the pollinator has not been identified. In Central Scotland the small white orchid is usually found in upland pastures in the short turf associated with bare rocks and small heather plants. At Morenish SSSI there were 46 plants in 2011 and 10 plants in 2016, the decline in part being attributed to an overgrowth by bracken. The Braeleny population may be threatened by a change from winter to summer grazing.

Figure 3. Small white orchid plants in flower. Left: Morenish SSSI and Right: Braeleny, Callander.



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Associate Editor Dr. Neville Dix

DUNBLANE WEATHER REPORT, 2016

Neil Bielby and John Holland

The weather station is my suburban back garden in Ochiltree, Dunblane. This is situated 50 m to the east of the Dunblane Hydro ridge, 100 m a.s.l., in a shallow, sheltered valley. (G.R. NN 78990143).

I have been recording the weather since 1995 and all averages etc. refer to the last 22 years. (Note: because there is much variation from year to year in Britain in the parameters used to define climate, climatological averages are usually taken over periods of 30 years for temperature and 35 years for rainfall. Therefore, all averages in this report should be viewed with some caution). I am indebted to Dr. John P. Holland for providing Met Office (via their automatic weather station) and additional weather records from Kirkton Farm, Strathfillan (NN 359283; 170 metres above sea level) and Killin. Weather recording began in 1991 at Kirkton Farm and means etc. for this site date from that year. Killin means date from 2000. The data from Kirkton allows for some interesting meteorological comparisons between the far north-west and central areas of our region.

Daily rainfall (> 0.1mm, 'rain days'), maximum and minimum temperatures, barometric pressure, cloud cover, wind direction and speed (Beaufort scale) are recorded. All except the maximum daily temperature are recorded at 09.00 hours. A brief description of the day's weather is also noted along with exceptional and unusual weather phenomena across the UK. Unless indicated otherwise, daily (24 hour) rainfall amounts are measured from 09.00 hours on the date mentioned until 09.00 hours the following morning (Plate 3/a).

2016 in Dunblane was slightly warmer and drier than average. The mean temperature of 8.59°C was 0.11°C above the norm with precipitation of 1004.8 mm (39.6 inches) being 116.4 mm (10%) below the mean. The wettest month was January with 178.5 mm whilst the driest was March with 42.0 mm. The warmest month was July and the coldest February. The highest recorded temperature was 28.8°C (19th July) and the lowest -8.0°C (24th Nov.). There were 71 air-frosts (mean 70) while snow lay on the ground at 09.00 hours on 18 occasions (mean 21). Temperatures of over 25°C were recorded on three days (two in June and one in July).

Table 1. Temperature and precipitation 2016. Climatological Station Dunblane / Kirkton.

	Temp mean minima	Temp mean maxima	Number of air frosts	Total precipitation (mm)	Greatest 24 hour total (mm)	Number of days of measurable precipitation
January	0.7/0.5 (0.2)	4.4/5.7 (4.5)	14/13 (14)	178.5/441.2 (125.7/365.2)	17.5/73.6	26/30 (21)
February	-1.2/-1.5 (0.2)	4.9/6.0 (5.9)	17/18 (13)	100.2/306.6 (96.6/253.6)	17.1/44.8	18/23 (17)
March	1.0/0.6 (1.3)	9.4/9.1 (8.6)	11/14 (11)	38.9/129.0 (75.1/227.4)	8.2/25.2	14/21 (16)
April	1.7/0.6/(3.3)	11.2/10.1 (12.3)	10/15 (5)	48.1/114.8 (62.4/151.5)	12.3/26.8	11/20 (15)
May	6.4/5.0 (5.8)	17.5/16.2 (16.1)	1/3 (2)	60.2/134.8 (69.7/140.7)	13.3/37.2	9/11 (16)
June	9.6/9.3 (8.9)	19.2/17.9 (19.1)	0/0 (0)	76.9/120.4 (74.2/116.9)	19.4/21.2	17/22 (15)
July	10.5/9.9 (10.8)	19.7/16.9 (20.9)	0/0 (0)	125.3/170.8 (89.3/129.2)	31.3/19.0	19/27 (16)
August	10.8/9.3 (10.5)	19.4/17.6 (19.9)	0/0 (0)	66.2/171.2 (86.9/149.8)	15.0/35.4	18/23 (16)
September	10.5/10.1 (8.4)	17.4/16.6 (16.1)	0/0 (0)	109.0/279.2 (83.2/194.7)	17.7/45.0	20/25 (16)
October	5.3/4.6 (5.3)	12.4/12.6 (11.8)	1/3 (1)	44.6/83.8 (128.4/262.6)	31.2/20.8	14/19 (21)
November	-0.2/-1.4 (2.0)	5.5/6.5 (7.3)	12/17 (8)	55.4/136.6 (112.9/281.0)	14.2/30.4	14/21 (20)
December	3.0/2.9 (0.0)	7.1/8.9 (4.3)	5/5 (14)	101.5/294.2 (115.9/332.3)	21.5/40.6	19/25 (20)
Year	4.8/4.2 (4.8)	12.3/12.1 (12.2)	71/88 (70)	1004.8/2382.6 (1127/2604.9)	31.3/73.6	199/267 (209)

The climatological means for Dunblane are shown in (). Where either two 2016 values or climatological means are given, the first relates to Dunblane and the second to Kirkton. Figure in parenthesis in the 'Greatest 24 hour total (mm)' table refer to the highest ever 24 hour value for that month (09.00 hours to 09.00 hours). Temperatures are given in degrees Celsius.

There were 199 (55%) 'rain days' (mean 208) and the highest 24 hour total was 31.3 mm measured at 09.00 hours on 20th July – the only day when 25 mm (one inch) or more of precipitation occurred. The average barometric pressure was 1013 mb (mean 1011 mb) with a high of 1040 mb (27th Dec.) and a low of 966 mb (8th Feb.). Turning to the seasons: winter (Dec. 2015 – Feb. 2016) was milder (+0.85°C) and wetter (+59%) than average. Spring (Mar. – May) was drier than the norm (-29%) with average temperatures. Summer (June – July) was very slightly cooler (-0.1°C) and wetter (+7%) while both the average temperature and rainfall total were within 1% of the norm in autumn.

The main features of the weather at Kirkton during 2016 were a wet January and February; a dry and sunny spring (March to mid-June); a relatively damp but warm summer (mid-June to September), which proved ideal for grass growth on the farm; and an unusually dry and comparatively calm autumn and early winter (October to mid-December). The weather was more settled in 2016 compared to 2015, with considerably less rainfall (well below the 25 year average), fewer rain days, higher summer temperatures and fewer storms.

The total rainfall recorded at the Met Office automatic station at Kirkton in 2016 was 2,382.6 mm (93.8 inches) which was 231.2 mm less than the 1991-2015 twenty five year average (2613.8 mm). This was 1203.2 mm less than the rainfall in 2015. Killin, only 14 miles east of Kirkton, recorded 1674.5 mm, 70% of the Kirkton total). The wettest month was January when a total of 441.2 mm (17.37 inches) of rainfall was recorded. The rainfall was above average in January and February, and during the summer months of June, July, August and September. The driest month was October with 83.8 mm of rainfall (only 31% of the 25 year average). The 136.6 mm of rainfall recorded in November was the lowest November rainfall since records began in 1991 (47.6% of the 25 year average). The highest rainfall over a calendar Week (Monday to Sunday) was 235.6 mm between the 25th and the 31st January. The highest rainfall in a single 24 hour period (09:00 GMT to 09:00 GMT) was 73.6 mm on the 28th January. This was the only day in 2016 when more than 50 mm of rainfall was recorded. The highest rainfall in a single half-day 12 hour period (21:00 GMT to 09:00 GMT) was 52.0 mm again on the 28th January. The total number of rain days was 267 (73%). There were 22 days when there was more than 25 mm of rainfall recorded. There was no recorded rainfall between the 5th May and the 16th May (a period of 12 days); and there was only one rain day between the 23rd May and the 5th June (Plate 3/b).

The lowest temperature recorded during 2016 was on the 25th November when the temperature fell to -9.5°C . This is the fifth year in a row that the temperature has not fallen below -10.0°C . The lowest maximum temperature was recorded on the 8th January (-0.6°C). This was the only day during 2016 when the temperature failed to rise above freezing. An air-frost was recorded on a total of 88 days. The highest temperature recorded was on the 6th June (26.7°C). June was the warmest month with a mean temperature of 13.64°C and a mean maximum temperature of 17.94°C . Temperatures of 25°C or above were recorded on three days while temperatures above 20°C (but less than 25°C) were recorded on a further 25 days: eight days in May, eight days in June, three days in July, three days in August and three days in September. Sleet or snow was recorded falling at the weather station on 32 days during 2016 and lying snow (recorded at 09:00) was noted on 24 days. A depth of 12 cm of lying snow was recorded on the mornings of the 17th and 18th January.

There were five storms when sustained gale force winds were recorded at the farm (28th and 29th January - storm 'Gertrude'; 1st and 2nd February - storm 'Henry'; 28th September; 23rd and 24th December - storm 'Barbara'; and 25th and 26th December - storm 'Conor'). Thunder and lightning was recorded on three days (19th July; 3rd and 19th August).

January was a little milder but with more precipitation than average. The mean temperature of 2.55°C was 0.24°C above the norm with a mean high of 4.39°C and a mean low of 0.71°C . The highest day-time temperature was 11.3°C (24th) and the lowest night temperature was -7.8°C (16th - when the maximum day-time temperature was -1.4°C). There were 14 air-frosts (mean 14) and snow lay on the ground at 09.00 hours on 10 occasions (mean seven). Precipitation of 178.5 mm was 42% above the norm with 10 % falling as snow.

For the first eight days of the month a stationary depression over the UK resulted in an easterly airflow over Scotland which brought virtually continuous rain to the east coast and especially Aberdeenshire (eastern Perthshire was also badly affected). This rain (29.8 mm Kirkton, 3rd), falling on already heavily saturated ground, quickly fed into the still swollen Dee, Don and Ythan rivers causing several more road closures and flooded homes with Inverurie, Elphinstone and Ellon the worst affected. Rare clear skies during the night resulted in frosty mornings on the 8th and 9th (-5.1°C , 9th). Heavy rain / sleet resumed on the afternoon of the 10th as yet another low pressure system (968 mb) settled over Scotland. Snow started falling at 16.30 on the 13th with five cm having accumulated by 09.00 the following morning. Developing high pressure (1030 mb, 16th) with associated clear skies resulted in four days in which the temperature struggled to breach 0°C (max of -1.4°C , 16th). Night frosts were increasingly severe culminating in -7.8°C (-8.4°C Kirkton, 16th). There was a dusting of snow during the night of the 13th/14th with a further two cm during the afternoon/evening of the 16th and another

centimetre during the night of the 17th/18th. Thereafter a slow thaw ensued with damp, overcast, raw days which the word 'dreich' describes perfectly. Heavy rain during the early hours of the 22nd combined with a rapid increase in temperature (10.1°C, 18th) removed virtually all of the remaining snow. A short, relatively calm and remarkably mild spell followed with an unusually high night 'low' of 11.9°C (24th/25th). The 25th and 26th were particularly wet at Kirkton with 69.0 mm of rain.

The remnants of storm 'Janus', which had deposited large amounts of snow along the eastern seaboard of the USA, arrived in the UK on the 26th. Accompanied by gale force winds, it brought heavy rain (17.5 mm) during the first 12 hours of the day, causing disruption on Scotland's roads. Locally, the M9 was closed due to flooding at Stirling while further afield, two lorries were blown over when crossing the bridge over the River Tyne on the A1 east of Haddington and a carriageway on the M8 was closed when two Portacabins blew off a lorry. Further south the A66 over the Pennines was also closed due to overturned lorries, a situation which carried over to the following day. On the 27th further heavy rain during the morning (17.5 mm; 73.6 mm Kirkton) resulted in several roads in the Borders and Dumfries and Galloway being closed due to flooding. Colder conditions saw this rain fall as snow above 300 metres.

'Gertrude', the eighth named storm of the winter, hit Scotland in the early hours of the 29th. Although accompanied by heavy rain the storm force winds were the major factor. These peaked at 77 mph at 08.00 hours in the Stirling area but gusted at 91 mph on the Forth Road Bridge; 105 mph in Lerwick and 144 mph on Cairngorm. As would be expected, these winds caused major disruption and damage. All schools in the Western and Northern Isles were closed for the day while only the Bute and Cumbrae ferries operated. Many rail services were either cancelled or disrupted. The Forth and Tay road bridges were closed to all traffic during the morning with the other major bridges being closed to high-sided vehicles. A lorry was blown over on the M9 at 06.50 where it crosses the Carse of Stirling. Power lines were brought down leaving some 1,200 homes in the north of Scotland without power for two days. The A82 was blocked for most of the morning at Letterfinlay on the side of Loch Lochy by a landslide. Kirkton had 45.8 mm of rain on the 31st. On the morning of the 30th we awoke to a 'winter wonderland' with a snow covering of seven centimetres.

February was colder than usual but with average precipitation. The mean temperature of 1.89°C was 1.11°C below the norm with the mean low being 1.33°C and the mean high 0.93°C below their norms. There were 17 air-frosts (mean 10) and snow lay on the ground at 09.00 on five occasions (mean 5). Precipitation of 123.7 mm (av. 171.2 mm across Scotland) was 4 % above the norm with recordable amounts on 18 days. Mean barometric pressure of 1004

mb was 5 mb below the average with a high of 1028 mb and a low of 971 mb. The mean temperature for Scotland of 2.2°C was 0.5°C below the long-term average while precipitation was 31 % above the average with it being particularly wet in the SW. Sunshine was 21 % above the average. This past winter (December 2015 – February 2016) saw an average of 760 mm of precipitation across Scotland (Argyll was the wettest area) the highest since records began in 1910.

The month started with yet another named storm 'Henry' during the night of the 1st/2nd (83.6 mm Cassley, Sutherland). South-westerly gales gusting up to 90 mph in the Western Isles left some 3,000 homes in the North of Scotland without power. The winds peaked at 100 mph on the Tay Road Bridge causing some structural damage. The 3rd was a rare sunny day before another succession of Atlantic depressions brought more wind and rain.

Being in the centre of the low pressure system (966 mb, 8th) the Central Belt largely escaped the strong winds (96 mph, the Needles) and heavy rain which the 10th named storm of the winter, 'Imogen' brought to the southern half of England on the 8th. Night frosts and mostly sunny days pertained from the 10th – 12th before snow showers in the early morning of the 13th continued until 13.00 by which time five cm of wet snow had accumulated. Clear skies under rising pressure (1031 mb, 16th) resulted in three successive sharp night frosts (-7.5°C, -14.1°C Braemar 14th) which enabled the lying snow to remain until the 19th (10 cm Aviemore, 15th). Atlantic fronts then brought rain on raw south-westerly winds until the 22nd. Rainfall amounts in Dunblane were moderate (15.7 mm from the 18th – 21st) but much heavier further west (44.8 mm, 16th; 27.2 mm, 19th Kirkton). High pressure then settled over Scotland (1026 mb, 28th) giving seven days of dry, mostly sunny weather with nightly frosts (-6.1°C; -8.2°C Kirkton, -9.8°C Glascarnoch, Highland 28th) on a light, northerly airstream. This dry spell was broken by heavy rain during the night of the 29th / 1st March (20.0mm, 43.0 mm Kirkton).

March had a mean temperature in of 5.22°C was 0.3°C above the LTA (long-term average) with the mean high being 0.84°C above and the mean low being 0.23°C below their LTA's. The highest temperature during the month was 14.1°C (22nd; 14.7°C Kirkton, 14th) and the lowest -5.4°C (6th). There were 11 air-frosts and one ground frost. Precipitation of 38.9 mm was only 52 % of the LTA and the third lowest for March after 35.7 mm (2012) and 37.8 mm (2006). There were measurable amounts on 14 days (LTA 16) and snow lay on the ground at 09.00 hours on one occasion. Average pressure was 1013 mb (LTA 1012) with a high of 1038 mb and a low of 984 mb. Scotland wide the mean temperature was 0.4°C above the LTA with precipitation only 62% of the average. Fair Isle recorded gusts of up to 84 mph (27th) while storm 'Katie' brought damaging winds to the SE of England the following day with a gust of 106 mph recorded at the Needles (Isle of Wight).

Early March saw largely sunny weather with several night frosts (-5.4°C 6th; -6.2°C Kirkton, 10th) and only occasional rain (8.0 mm 3rd). Two cm of snow at 09.00 on the 2nd (11 cm Tulloch Br.) quickly melted. It was often calm while any wind was mostly light. With high pressure (1038 mb, 14th) becoming established over Scotland the weather continued to be very settled with a mixture of sunny, calm, spring like days and overcast (occasionally damp) ones when cloud drifted in from the North Sea on light north-easterly winds. It was largely frost-free after the 11th (-1.6°C, 20th) with daytime temperatures peaking at 14.1°C on the 22nd (18.7°C Braemar, 17th – the highest in the UK during the month). This settled spell lasted until the 23rd when Atlantic fronts pushed in as the high pressure system deteriorated. From midnight to midnight on the 26th 25.2 mm of rain fell at Kirkton compared to only 8.9 mm at Dunblane. The weather remained unsettled until the month end with a mixture of sunshine and showers.

April was colder and drier than usual with the mean temperature of 6.43°C being 1.36°C below the norm. The mean high of 11.15°C was 1.16°C below the average with a high of 17.5°C (21st) while the mean low of 1.71°C was 1.56°C below the average with a low of -3.0°C (28th). There were 10 air-frosts (average 5) and one ground frost. Averaged over the past two decades, April has been the driest month and the total precipitation of 54.7 mm this month was only 77 % of the norm thus enhancing its position. There were measurable amounts (>0.2 mm) on 11 days (mean 15) with snow lying at 09.00 hours on one occasion. The mean barometric pressure was 1012 mb with a high of 1032 mb (20th) and a low of 993 mb (6th).

Increasingly heavy rain on the 1st produced 9.4 mm from midnight to midnight in Dunblane but 26.8 mm at Kirkton. The weather continued unsettled with the occasional dry, sunny day and normal temperatures until the 10th. From the 10th until the 17th a north-easterly, then northerly airstream brought colder but drier weather with night frosts on the 15th/16th (-2.5°C). A high pressure system then built over the UK (1032 mb, 20th) bringing dry, calm, sunny and warmer conditions for 5 days with temperatures peaking at 17.5°C (16.8°C Kirkton, 21st) – perfect spring weather. A northerly air-stream then developed causing temperatures to drop. The winds continued from this airt until the month end giving mostly sunny but cold weather with the occasional brief flurry of hail. The 28th was an exception when spells of rain, sleet, hail, some sun and then snow gave us four seasons in 24 hours and brought to an end 10 days with no measurable precipitation.

May was warmer and drier than usual with the mean temperature of 11.96°C being 1.02°C above the average making it the warmest May since 2008 (12.46°C). The minimum temperature was -1.3°C (14th, the only air-frost) and the maximum 24.2°C (31st). Precipitation of 63.9 mm was 14 % below the

norm with measurable rain on only 9 days (average 16). Across Scotland the mean temperature was 1.0°C above the 1981-2010 average with rainfall being 7 % below the norm. Apart from two wet spells, at the start of the month and between the 17th – 22nd, a dry easterly airstream dominated.

The often marked difference in rainfall totals between the lowland area and the 'Highland' north-west of our three council districts was again illustrated on the 2nd when Dunblane received 11.4 mm compared to Kirkton's 37.2 mm (81.2 mm Alltdearg Ho, Skye, 1st). The unsettled spell continued until the 5th when warmer weather moved up from the south (17.1°C 6th) although sunshine was still scarce. After a damp start to the 8th the clouds cleared at noon to give a sunny and very warm afternoon (23.0°C – the highest temperature of the year to date). This proved to be the prelude to 8 days of virtually unbroken sunshine with no rain.

Temperatures peaked at 23.0°C again on the 9th (27.7°C Plockton) and reached 21.0°C on the following 3 days (23.1°C Kirkton, 11th). Fresh north-easterly breezes down Scotland's east coast during this period depressed maximum temperatures by 10°C until a light, northerly airstream saw temperatures fall across the whole of the country with a frost during the early hours of the 14th (-1.3°C; -3.4°C Kirkton; -5.7°C Tulloch Br.). The spell of 9 days without measurable rain came to an end at 16.00 on the 17th. Rain every day until the 22nd then produced 41.7 mm – disliked by some but welcomed by gardeners. Largely dry weather then ensued until the end of the month with 1.4 mm on the 27th (brought in on easterly winds) the only rain. In contrast, the west remained dry and warm with Stornaway enjoying 15.9 hours of sunshine. The late May bank holiday weekend was sunny and warm. The fine weather continued until the month end with the 31st recording the warmest day of the year so far, 24.2°C and Leuchars receiving 16.0 hours of sunshine – the months highest.

June was warmer and slightly wetter than the norm. The mean temperature of 14.41°C was 0.42°C above the average with a high of 25.9°C (7th) and a low of 4.1°C (3rd). Rainfall of 87.4 mm was just 4% above the average with measurable amounts on 17 days (mean 15). Average pressure of 1014.5 mb was exactly equal to the norm. Across Scotland the mean temperature was 0.9°C above the LTA but this hid a marked east / west split with the former's mean maximum average was close to normal while that of the latter was well above. Aberdeenshire had twice its normal June rainfall but Scotland overall had only 7% more than usual. Sunshine totals were slightly below average but Shetland was unusually sunny.

The fine weather continued until the 10th. On some mornings overcast conditions took a while to clear but all afternoons were sunny and warm with temperatures peaking at 25.9°C on the 3rd (26.7°C Kirkton and 27.3°C

Glasgow, 6th). Mornings were generally calm with easterly breezes in the afternoon. Rain on the 10th ended a run of 13 dry days with only 1.4 mm in the past 19 days.

With the jetstream directly above the UK a spell of unsettled weather then ensued with rain most days until the month end. Amounts were generally moderate apart from the evening of the 14th when torrential spells contributed heavily to a 24 hour total of 19.5 mm. North-easterly breezes predominated during the early part of this period – mostly in the afternoon following calm mornings – but a south-westerly airstream became established from the 20th with an accompanying rise in temperatures which peaked at 20.3°C (23rd).

July was cooler and wetter than usual with the mean temperature of 15.1°C being 0.73°C below the average. The maximum daytime temperature was 28.8°C (19th) and the night-time low was 6.1°C (2nd). Total rainfall of 125.3 mm was 40 % above the norm with measurable amounts on 19 days (average 16). Scotlandwide the mean temperature was 0.2°C below the 1981-2010 mean with a low of 0.5°C at Altnaharra (2nd). Rainfall was 44% above the norm with the east coast, along with the Western and Northern Isles, being particularly wet. In the UK, a maximum temperature of 33.5°C was recorded at Brize Norton in Oxfordshire (19th).

The weather continued unsettled with spells of rain as successive Atlantic low pressure systems with associated fronts crossed Scotland. Amounts were generally moderate apart from 22.00 hours (7th) to 10.00 (8th) when 18.0 mm fell (there was a further 17.8 mm on the 10th). Winds were from the south-west and there was the occasional dry day when sunshine pushed the temperature up to 22.1°C (14th). A plume of warm, humid air pushing up from the south raised temperatures to a year high of 28.8°C on the 19th (26.5°C Kirkton; 29.8°C at Floors Castle and in Motherwell). This humidity resulted in an electrical storm on the morning of the 20th which deposited 31.3 mm of rain in 2 hours from 09.00 – 11.00 (97.9 mm at Nunraw Abbey, E. Lothian during the day). These storms were widespread across Scotland with lightning striking a church spire in Denny and hailstones ‘as large as gobstoppers’ damaging cars in Annan. The weather remained warm with some sun, but thankfully a little less humid, until the 24th when a day of rain produced 11.6 mm. The rest of the month was reasonably warm (daily max’s of c.20°C) with some good sunny periods and only a little rain.

August was drier than normal with average temperatures. The mean temperature of 15.09°C was only 0.07°C below the average with a high of 25.0°C (16th) and a low of 3.3°C (10th). Rainfall of 66.2 mm was 76 % of the norm with measurable amounts on 18 days (average 16). The mean temperature for Scotland was 0.3°C above the LTA with rainfall 9 % above the mean. It was wetter than normal on the Hebrides but drier in Aberdeenshire and Fife. The UK mean temperature was 15.5°C which is 0.6°C above the 1981-2010 LTA. The UK maximum temperature was 34.1°C at Faversham, Kent (23rd) with a minimum temperature of -1.5°C at Kindrogan, Perthshire (10th). In the 24 hours to 09.00 on the 11th, 70.2 mm of rain fell at Loch Shiel.

The unsettled weather with regular Atlantic lows and accompanying fronts continued for 13 days. Thunder and lightning during the early hours of the 3rd was followed by increasingly heavy rain during the afternoon and evening producing 24.2 mm in total. The 7th was a very windy day with a gust of 115 mph recorded on Cairngorm. Although rainfall amounts in Dunblane were at most moderate, Kirkton received 35.4 mm and the NW of Scotland had much heavier and more continuous rain which eventually caused a landslip to close both the Fort William to Mallaig railway and the adjacent A830 west of Arienskill on the 10th. A plume of warm air coming up from France brought more summery weather from the 14th – 18th with temperatures peaking at 25.0°C (24.2°C Kirkton, 16th) and 27.4°C Kinlochewe (17th). A touch of autumn quickly followed on the 19th with a maximum temperature of only 15.6°C. An Atlantic depression crossed the UK over the weekend of the 19th-21st but with the centre passing over Scotland we escaped the strong winds around it and, despite dire warnings, only received 7.5 mm of rain. It was then often overcast but with little rain and normal temperatures until the month end.

September was warmer and wetter than normal with the mean temperature of 13.98°C being 1.69°C above the average making it the warmest September to date (replacing the 13.93°C in 2014). The month high of 24.2°C (7th) was the 2nd hottest after 24.5°C (2005) while the average daily low of 10.52°C also set a new high as did the lowest temperature of 6.1°C (17th). Rainfall of 109.0 mm was 31% above the norm with measurable amounts on 20 days (average 16). The mean barometric pressure of 1011.8 mb was 2.6 mb above the norm. Across Scotland the mean temperature was 1.8°C above the LTA making it the second warmest September since 1911. Rainfall was 6 % above average being wetter in the west and drier in the east than the norm. At Alltdearg House (Skye) 92.4 mm of rain fell in the 24 hours ending at 09.00 on the 12th. The UK mean temperature of 14.6°C was 2.0°C above the 1981-2010 LTA making it the 2nd equal warmest since 1910. A maximum temperature of 34.4°C was recorded at Gravesend (Kent, 13th) – the highest for September since 2011.

The unsettled weather continued with rain every day until the 10th. Some torrential downpours on the 8th produced c.16.0 mm between 09.00 – 12.00 hours. Temperatures were mostly above the norm for early September with the 7th being particularly warm and humid (24.2°C; 25.0°C Fyvie Castle, Aberdeenshire) with a night low of 15.7°C which was a year high. Another plume of unseasonally warm air from the south raised temperatures to 22.7°C on the 12th but the associated humidity produced 12.5 mm of rain in the early hours of the 13th (32.0mm Kirkton). Also on the 13th, heavy rain in the Manchester area caused widespread flooding with several shopping centres inundated and Manchester City's Champions League match to be postponed. It remained warm and humid producing a morning of dense fog on the 15th which only started to clear after midday when temperatures at Kirkton reached a monthly high of 22.1°C. On the 15th and 16th further torrential downpours caused widespread chaos in the south and east of England with much disruption on both rail and road. These, along with lightning strikes, saw 38,000 homes in NE England without power.

A weak front crossed Scotland during the night of the 15th/16th introducing fresher and brighter weather behind it with the 17th being a day of unbroken sunshine. Three days without rain followed with temperatures peaking at 18.1°C (20th). Unsettled weather returned on the evening of the 21st with the 24th being a day of wind and rain (17.7 mm, 34.8 mm Tyndrum). The West of Scotland was particularly affected on the 24th with water pouring off the hillsides closing the A85 near Oban. The south-westerly airstream persisted until the last day of the month with rain every day until then. Strong winds on the 27th-29th (max. 71 mph Loch Glascarnoch) caused disruption to rail, road and sea communications in the northern half of Scotland with 45.0 mm of rain falling on Kirkton on the 28th.

October was an unusually quiet month, slightly warmer but much drier than usual. The mean temperature of 8.84°C was 0.28°C above the norm (+0.5°C for Scotland) with a high of 16.5°C (19.4°C Port Henderson, Ross & Cromarty; 4th) and a low of -0.1°C (-1.6°C Kirkton, 2nd; -5.0°C Tulloch Br. 25th). There was one ground and one air frost. Rainfall of 44.6 mm was only 35% of the average making this the 2nd driest October at this station (after 23.1 mm in 2003). Only 14 days had measurable rain which equals the previous low. Average barometric pressure of 1023.6 mb set a new high for October here being 14 mb above the norm with a high of 1036 mb (5th). Excepting Aberdeenshire, Scotland had only 37% of the average rainfall making it the 4th driest since records for rainfall began in 1910.

The weather was very settled until light rain during the morning of the 11th ended a spell of 11 consecutive dry days. This was thanks to a high pressure system which peaked at 1036 mb (5th – the highest since 1038 mb on 16 March). There were many sunny days and the first frost of the autumn (-

0.1°C, -1.6°C Kirkton, 2nd). There were then varying amounts of rain every day till the 19th. Increasing barometric pressure (1027 mb, 20th) resulted in another mainly dry spell until the month end. An easterly airstream of varying strength predominated until the 27th when south-westerly winds brought driven drizzle. The continental high pressure system re-established itself (1033 mb 29th) and brought mild, calm but overcast weather.

November was colder and much drier than normal with the mean temperature of 2.62°C being 2.01°C below the average and precipitation of 60.4 mm being only 49% of the norm. There was a high daytime temperature of 13.1°C (14th; 14.1°C Aboyne) and a night-time low of -8.0°C (24th; -12.1°C Braemar, 21st). There were 12 air-frosts and 4 ground frosts while the daytime temperature didn't rise above freezing on the 21st and 24th. Measurable precipitation occurred on 14 days with a high of 14.2 mm (16th) while snow lay on the ground at 09.00 hours on the 9th. The average barometric pressure was 1014 mb with a high of 1034 mb (28th) and a low of 987 mb (18th). Across Scotland the mean temperature was 1.6°C below the 1981-2010 average while rainfall was 69% of the norm. It was Scotland's sunniest November in a series dating from 1929. The first named storm of the winter (Angus) battered the south of England on the 19th/20th with 20 mm of rain falling on Exeter in 1 hour. Another weather system caused flooding in the north of England on the 21st when 70.0 mm of rain was recorded at Chillingham, Northumberland.

High pressure continued for the first two days with much sunshine and ground frosts. As it slipped eastwards across the North Sea strong, cold northerlies developed in its wake on the 5th & 6th. These days were mostly sunny but the strong winds caused several organized bonfire night firework displays to be cancelled due to safety fears. After two sunny days an Atlantic front produced the first snow of the winter during the night of the 8th/9th. This melted during the 9th at lower levels but the hills were 'plastered' and looked splendid during the 10th which was a sunny day with very clear air. Quite heavy rain during the night of the 11th/12th (12.6 mm; 30.4 mm Kirkton) quickly cleared before breakfast to give a sunny and milder day (8.9°C). Frequent showers, some heavy, deposited 23.4 mm (25.6 mm Kirkton) during the 16th/17th but as the barometer dropped quickly to 986 mb (18th) the weather surprisingly improved with several dry and mostly sunny days along with a succession of night frosts (-6.3°C, 21st). A series of high pressure systems from the 21st (1034 mb, 28th) produced very calm, settled weather with some sharp frosts (-8.0°C 24th; -9.5°C Kirkton, 25th) and good periods of winter sunshine until the month end. Temperatures remained below freezing throughout the 21st and 24th.

December was much milder and a little drier than usual with the mean temperature of 5.03°C being 2.86°C above the norm with a high of 12.0°C (7th). There were five air-frosts (mean 14) with a low of -3.9°C (20th). Rainfall

of 105.7 mm was 87 % of the norm with measurable amounts on 19 days (mean 19.6 days). The average barometric pressure was 1020.0 mb (norm 1010.0 mb) with a high of 1040 mb (27th). With the high pressure system remaining virtually stationary over Scotland the weather remained dry and calm with good spells of sunshine until the 6th when rain from mid-afternoon heralded a damper but much milder spell (13.5°C, 14.2°C Kirkton, 7th). High pressure re-established itself (1032 mb, 17th) providing a prolonged spell of quiet weather but with little sun or wind and temperatures mostly above the average for mid-December. This quiet spell came to an abrupt end as the second named storm of the winter, 'Barbara' hit Scotland during the 23rd with the north and west bearing the brunt as winds gusted to 80 – 90 mph causing most ferry services to be cancelled and several bridges closed to high-sided vehicles. 70.0 mm of rain fell between the afternoon of the 20th and noon on the 26th. The weather was much quieter from then until the month end with the night low of 9.4°C on the 31st being the highest of the month.

Neil Bielby (Dunblane) and John Holland (SRUC Hill & Mountain Research Centre, Kirkton & Auchtertyre Farms)

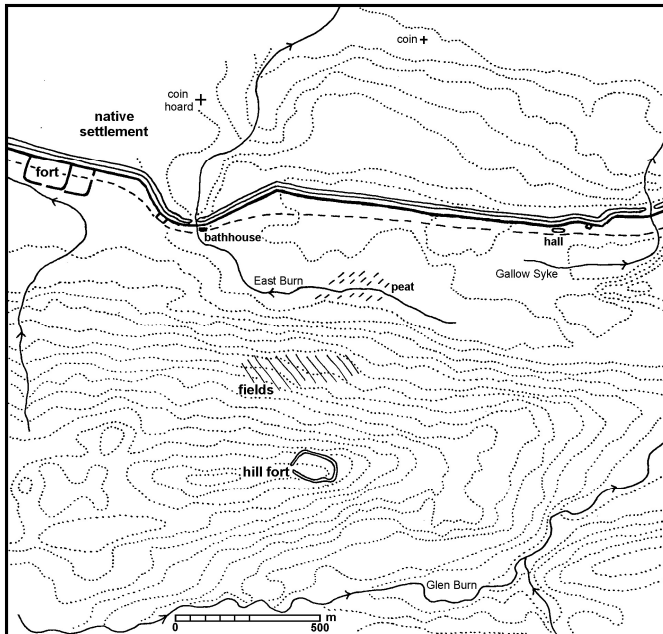
HERE IS THE SHADE OF A WELL PEOPLED WOOD - CALLENDAR PARK

Geoff B Bailey

Introduction

Callendar Park occupies the northern part of the walled estate policy belonging to the historic seat of Callendar House; the southern portion, being woodland, is now owned and maintained by the Forestry Commission; and an area in the North East consists of a business park. The policy rests on a North facing hill slope on the southern side of the Central Valley, with the land falling from 110 metres to 35 metres over a distance of 900 metres. It is bounded to the North by a glacial esker overlooking the carselands. The Gallow Syke arises from the eastern end of the park and flows north eastwards to join the Almond Pow. Not far away is the source of the East Burn, but it flows westward, separating the park from the town of Falkirk. The distance from the Falkirk Steeple, in the town centre, to Callendar House is only 1.1 km.

Figure 1. Contour plan of the Callendar Park area (contours omitted from the area of the town).



The northern part of the Callendar Policy formed the pleasure grounds of the House and was substantially laid out as a designed landscape in the 1780s. Until 1963 this was privately owned and the estate wall, with associated gamekeepers, generally kept the public out, except for organised events such as gymkhanas and country fairs. In that year the property was acquired by Falkirk Town Council and was immediately opened up and adapted to its new role as a public park. We inherited a rich landscape replete with layers of history. The amount of detail that we have for the park is rather mushroom shaped, with a good firm base in the Iron Age and Roman periods, burgeoning after 1680 and becoming overwhelming in the early 19th century. It is this depth of historic activity that is referred to in stanza 131 of the 1681 poem *Patronus Redux*, which begins “Here is the shade of a well peopled wood”.

Antecedents.

By the late Iron Age, c. 200 BC, there was a large, commanding monovallate hill fort at the top of Callendar Hill, distinguished by a perimeter ditch forming an oval-shaped enclosure 149m by 77. Part of the rampart still stands, unexcavated, at the South East corner. Small areas of cultivation ridges (rigs) may be contemporary. The better-drained gravel of the esker provided better quality soils and a well-developed pre-Roman agricultural soil was found here (Bailey 1995a, 583).

The coming of the Roman army, c. 142 AD, turned the northern strip of the park into a militarized zone, the Antonine Wall, from which native occupants were ejected. The Wall utilised the glacial esker, with ramparts, made of earth dug from the parallel ditch and retained by thin cheeks of turf, occupying the crest of the West to East ridge (Bailey 1995a). Beside the East Burn, just outside the park wall, a bathhouse was built to take advantage of the water supply (Keppie & Murray 1981). The Antonine Wall was occupied for some twenty years but in the 160s AD it was partly demolished and abandoned. The Roman road connected with roads to the East and remained the main land route across the waist of Scotland for centuries. Early churches, castles and towns developed along it. Falkirk continued as a settlement with the church of St. Modan erected on its western fringe.

The chief's dwelling, however, was built on Palace Hill in Callendar Park, sited between the road and the decaying rampart of the Wall. Its date is unknown, though may have been constructed in the early historic period. It was rebuilt in the 10th century as a great hall in a fusion of Pictish and Anglian architectural styles, 25 metres long and seven metres wide (Bailey 2007). The hall was the centre of a small community, with other buildings in the vicinity. The Antonine Wall was probably repaired to form the North side of a defended enclosure, with the Gallow Syke protecting it to the South.

By the early 12th century the area was associated with the powerful Thaness of Callendar and it is probable that by then the hall belonged to them. The Christian names of the family indicate that it was Celtic and had deep roots in the area. The name Callendar, which is associated with the home of the Thaness and not with the adjacent town of Falkirk, has an even earlier origin. It appears in 634 AD as “*Calathros*”, equated with the land “between Haefe and Caere” (the River Avon and the River Carron) mentioned in the Anglo-Saxon Chronicle in 710AD. It was a large swathe of land located at a strategic point in Scotland.

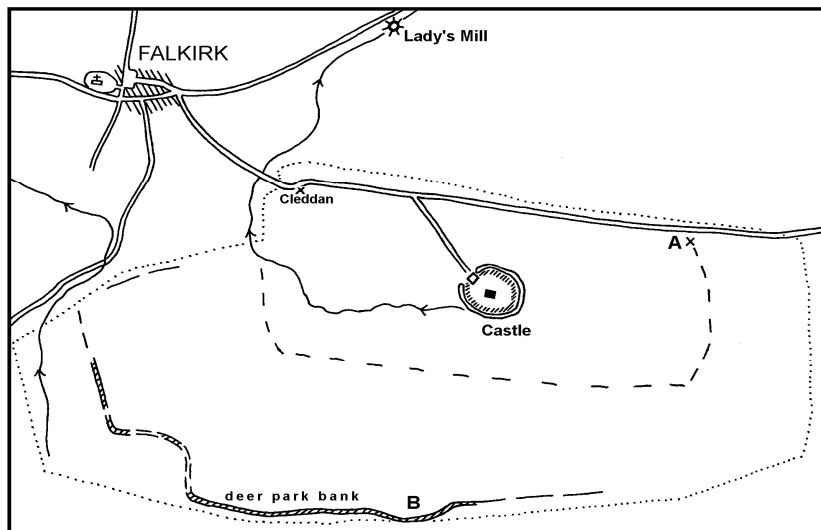
Callendar Park in the Middle Ages.

Sixteen or so inhumations were found just to the East of the “Thane’s Hall” in 1849, but by the medieval period it became customary for leading nobles to be buried in the parish churchyard. The title of thane persisted until c. 1250, at which time the smaller barony of Callendar was created. In the mid-14th century the Callendar family fell from favour due to its support for the Balliol cause and the barony was gifted to the Livingstons. James Livingston promptly and shrewdly married Christian de Calyntar, the daughter of the previous lord and the new coat-of-arms amalgamated those of the two families.

Shortly afterwards the site of the main dwelling was moved and the style of building changed. The new dwelling was a typical tower house of the period with walls 1.8 metres to 2.4 metres thick. The new site was set back from the main road on a small gravel island in a peat-filled hollow adjacent to the East Burn. Although sheltered and having the advantage of the ditch becoming a moat, it must have been damp and midge-infested. Writing in 1878, John Meikle exaggerated the area enclosed:

“Some hundreds of yards distant from the house, and enclosing the lawn, a fortified and curtained stone wall of substantial thickness encircled the mansion and its outer appointments; this was called the Barbican, and was supplied with one gateway only – no doubt fortified with especial care. Inside the Barbican, and separating the lawn from the castle, there was a deep moat with drawbridge. The surface traces of this moat are now obliterated, but only a little digging is required to reveal its presence, and during some recent building alterations, undertaken only within a very few years, most incontestable evidences of its presence were found in digging for the foundation of new wings then being added to the house. Even inside the moat, and before the Castle proper was touched, the garrison was protected by a square projecting outwork of considerable strength. The Castle proper was a square massive structure, possessing none of the elegant outer adornments which have within the last two or three years been worked into, and now make part of the present palatial whole...” [Meikle 1879, p.6-7]

Figure 2. Callendar Castle with the deer park to the South. Cleddan was the place of execution.



The causeway into the defended enclosure was guarded by a substantial stone gateway, strong enough to offer a secure place of refuge. It sheltered Queen Mary in July 1565, not long before her marriage to Darnley. As well as the tower house, the enclosure or 'barnkin' would have contained timber buildings such as stables, stores, kitchens, a brewery, barracks and workshops. The road to the town went North West from the gatehouse (the line of the present road in front of the factor's house) to join the main road from Linlithgow. It descended into the valley of the East Burn by way of the Cleddans Brae, where a cutting, still to be seen North of Belmont Tower, was made to ease the gradient. On the South side, half way down the brae, were two large boulders that traditionally marked the place of execution by hanging of criminals. A site, prominently seen from Falkirk, to display the justice handed out by the baron. Later maps show the flat plateau to the North as the market green, with Marion's Well nearby. This area was the public interface between the town and the park.

The hillside to the South of the tower house was wooded. Twelfth century charters to Newbattle Abbey include references to the use of fuel from Callendar Wood for the saltpans at Grangemouth (RRS vol 1, 176, no 109) and perhaps peat from Callendar Wood was also used. In 1534 "three great oak trees" were taken from Callendar Wood for structural timbers in Linlithgow Palace, and "six dozen great birch trees" for scaffolding (Anderson 1967). There was ample small wood for an annual midsummer bonfire beside Callendar House recorded in 1596. These were beloved by Elenor Hay and

hated by the church of the day (Bailey 1995b, 6). By that date the wood had been there for centuries, providing suitable cover for game and hence hunting. A large earth bank was constructed to create a deer park to preserve the game for the baron. This is best preserved near to Hendry's Hill and is similar to that at Kinneil Park. Typologically these banks appear to date to the 13th or 14th centuries and both are depicted on Timothy Pont's map in the 16th century.

At Callendar Park, the deer park seems to have been wrapped around the castle, with arms projecting northwards at the West and East ends, creating the bipartite division that exists today. This is what is shown on Pont. Blaeu's map of the 1650s misinterprets these enclosure banks and displays them as stream courses. As the deer park centred on the castle and the site of the present house, it is probable that the deer park was created at the same time. Later, though long before 1654, the park was extended westward to include Hendrie's Hill. Wodsyde Aiker at the North West corner of this new extension is first mentioned in 1654 (Reid 2009, 157). The 14th century park also contained a rabbit warren (Anderson 1967, 277).

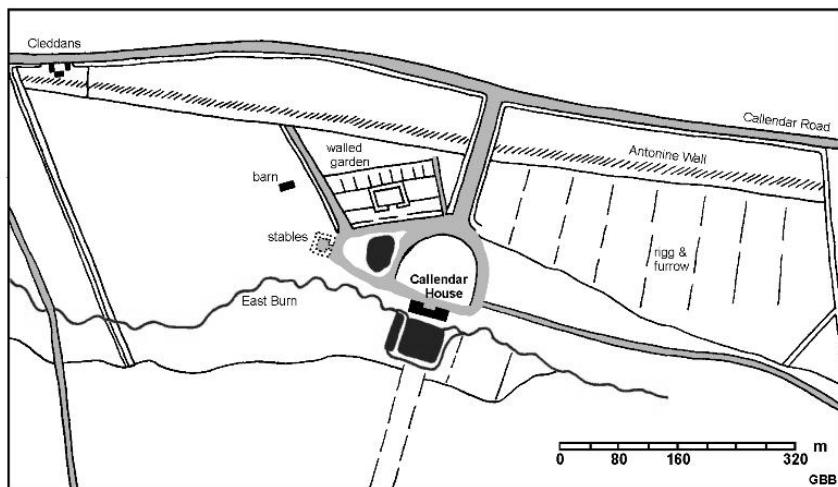
Callendar Park on the 17th Century.

Over succeeding generations the house was greatly enlarged and embellished. In 1651 it still stood within its defensive enclosure and was considered strong enough to be defended against Cromwell's army: his troops reported that "*the House is very strong, with a Moate about it, and a great Wood by it*" (Bailey 1992a, appendix 9; see also appendix 12). It was not strong enough – the outer walls were breached by siege cannon and faggots were used to cross the moat and the castle was successfully stormed by General Monck and badly damaged. For several years it housed English soldiers. By the time the Earl of Callendar returned, it was evident that to resurrect the outer defences was pointless. He had, in any case, agreed not to, and they must have been demolished, particularly the gatehouse, before he retook possession. The house was rebuilt in the grand Continental style in the 1670s and the area around it landscaped. In 1681 a broad avenue was cut through the esker to provide a vista from the front door of this new mansion to the Ochils. A doocot on the far side of the main road lay to one side so that the 'doors' could be glimpsed as they flew in. The cutting also provided a view of the House from the road, acting as a reminder to passers-by that the Earl was an important person. The avenue became the main entrance to the estate, the older road to the West being closed at its northern end. The large amount of gravel removed must have been used to fill in the old moat. At the same time the remnants of the rampart of the Roman frontier were levelled.

On the hill to the North West of the House stood a large barn in which crops and provisions acquired as part of the annual rents of the Earl's tenants were kept. Nearby a stable block was erected around a courtyard. The neighbouring fields continued in cultivation. Sibbald informs us: "*The House of*

Calander is a Noble Seat, with fine Buildings added to the Castle of Calander... The Calander has a large Wood adjacent to it, with Walks cut through it, and Fish Ponds near the House, and Gardens, and large Inclosures to the East and West" (Sibbald 1707, 53-54).

Figure 3. Transcribed plan of Callendar Park, c. 1755.



The fish ponds were substantial structures, with stone dams on their West or downstream sides (Bailey 2012). Roy depicts a large pond 60 metres by 50 metres occupying most of the ground on the South side of the house. There was a narrower one to the West, 13 metres by 50 metres, reached by an overflow and a bypass channel. The vast expanse of water was deliberately placed against the South facade of the mansion to reflect the Dutch taste that the Earl had acquired during his time there in exile. The ponds displaced the usual formal garden on the sunny side of the house. Sibbald's reference to "Gardens" must therefore refer to the walled garden located on the South facing slope to the North West of the house. Between the two was a more natural shaped pond, the last water-filled remnant of the moat.

A schematic plan of the walled garden shows a rectangular structure at its centre with an opening facing the house. The many internal divisions suggest the garden was compartmentalised, allowing formal ornate features to be interspersed with the growing of foodstuffs. It was probably here that two free-standing sundials were placed as centrepieces. One bore the date 1677 and the initials "AN" and "EC": the other sported the Livingstone of Callendar coat-of-arms under an earl's coronet with the initials "E/IL", for James Livingstone who was made the Earl of Linlithgow in 1695 (RCAHMS 1963, 351). The gardens also housed a statue recovered from the demolished gatehouse. It

depicted a woman with a dagger in one hand and her bowels wrapped around her other arm, known locally as “Leddy Alicreech”: “*the terror of the boys, who, if they chanced to stumble upon her, in their nesting or nutting expeditions, were sure to take to their heels for safety*” (Keir 1827, 209).

The “large enclosures to the East and West” would be the water meadows beside the East Burn. Roy (1755) does not show a loch here, though Johnstone of Kirkland mentioned Callendar Loch in 1723, “near the house”, probably that noted to the North West, and a small loch appears on a plan of 1781, probably a substitute for the fishponds that had been in-filled during the intervening years. Further East, in the area now occupied by the Child Support Agency, was a second “pleasant little loch called Lantonloch” (Johnstone 1723, 325). Perch, pike and eels could be caught (Meikle 1879, 89). The Earl is known to have planted specimen trees in and around the enclosures and the lime and elm avenue to the East of the house is attributed to him. On the esker overlooking the business park, a number of sweet chestnuts are old enough to have been contemporary: this tree was popular at the time and other specimens can be seen at Herbertshire and Torwood Castles. A veteran sycamore to the West of the main avenue is also a candidate for this period.

It is notable that the oldest surviving trees occur in the parkland rather than the wood. The large wood was a useful source of timber, which was by then a valuable and scarce commodity. Sibbald (1707) noted “Walks cut through it”, as if these were a relatively recent insertion at the time. Roy’s map of 1755 shows a broad avenue cutting through the wood on the same alignment as that cut through the Antonine Wall in 1681, centred on the house. Smaller avenues would have radiated away from the mansion. Some ‘maiden’ oaks occur on the slopes just below the wood and may represent self-seeded trees. Within the wood few oaks of any age survive, though some of the stunted oaks at the W end may be older than first appearance indicates. The soil here is poor and Peter Quelch (unpublished 2009) noted from tree ring evidence that there were episodic setbacks in growth, probably from heavy utilisation of the timber. This has produced oak ‘scrogg’ pollards. Several 19th century authors refer to coppice, chiefly of oak, allowing branches to be harvested frequently (e.g. Rogers 1853).

Even before Sibbald’s time the West end of the wood at Callendar had been encroached upon by coal mining. One consequence of the Cromwellian occupation in 1651 had been the neglect of these pits, which soon flooded (Bailey 1992a), causing a significant loss of revenue. At this time the indwellers of Falkirk were astricted to the Earl’s mines, meaning that, in the first instance, they had to obtain supplies of coal from him (Reid 2000, 13). In due course the mines were pumped out and Johnstone in 1723 noted “*the water that runs from the level of the coalpits in the wood of Callendar, falls into it [the East Burn]*” (ibid

324). The pits were still productive in the 1740s when the Earl of Kilmarnock was taking on extra colliers (Bailey 2000, 41).

The vista through the Antonine Wall was broad, lined on either side by trees. The high road was also provided with flanking trees, partly to screen the park. A long shelter belt of fine trees ran south eastward from the Cleddans along the western side of the Barnyard Park to the East Burn. A few of its beech trees are still there, in excess of 200 years old. The belt provided an internal park division separating private ground to the East from the more public fields and access roads to the coal pits to the West. The parkland was probably by now under grass. Specimen trees, notably beech, were also planted in the fields to either side of the main avenue to break up the monotony of the parkland (Meikle 1879, 43). By 1797 these scattered trees were in their prime, to be distinguished by the parish minister from those in the wood: "*The numerous fine trees which are in Callendar park and its neighbourhood, together with the wood belonging to the same place, add much to the pleasantness of the town of Falkirk*" (Wilson 1993). The largest trees are beeches on the esker at the East end of the loch, the largest with a girth of 6.2 metres and another of 5.2 metres, suggesting a date for them of around 1680-1730.

Following a prolonged drought in 1681 when the East Burn and the West Burn, of Falkirk, dried up, Alexander Livingston, the town's patron, arranged for wooden pipes to be laid from a copious spring near the SW corner of Callendar Wood to an underground cistern in the town's market place where it could be pumped to the surface at the Cross Well (Bailey 2014). Dispensing with the personal obligation of maintaining the water supply, he established a committee of townsmen to look after it, giving them power to raise a tax or stent within the burgh, from which they took the name of stentmasters. Authority was also given to search for further supplies of water in the wood (Meikle 1879, 71), though in general, people were still forbidden to enter the wood and the Baron Court fined intruders.

18th Century Callendar Park.

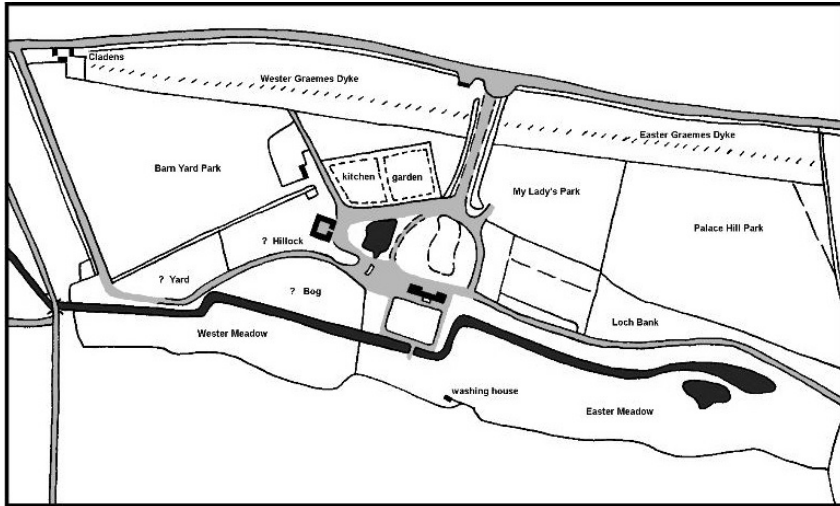
In 1715 the Livingstons of Callendar were attainted for their role in the Battle of Sherrifmuir and their estates were forfeited. Five years later Callendar was purchased by the York Buildings Company and leased to Anne Livingston, the daughter of the departed Earl. As a tenant she had little incentive to carry out any improvements and the estate fell into decline, both in the maintenance of the physical landscape and buildings and also in its ability to maintain law and order. Pilfering in the wood became prolific and the park was used as a shortcut. The road trustees had the right to extract channel or gravel from adjacent land and did so with little constraint, undermining hedges in Piper's Park and leaving a pot-marked landscape (Forbes Papers 172/33). The situation was exacerbated by financial collapse of the York Buildings Company in the 1740s and its eventual drift into liquidation. The

assets of the company were only slowly realised and it was 1781 before agreement was reached for the sale of Callendar. In the meantime Anne and her husband, the Earl of Kilmarnock, and after 1747 their son, the Earl of Errol, exploited their temporary position as acting baron baillies to raise money in order to re-purchase the estate. The Earl of Kilmarnock also tried to maximise coal production (Bailey 2000, 41). It was largely his financial problems that drove him into the arms of Bonnie Prince Charlie in 1745, against the advice of his wife and his own family. Callendar Park saw the comings and goings of both Jacobite and Hanoverian armies. Kilmarnock's knowledge of the area was important in the immediate aftermath of the Battle of Falkirk, but even he could not stop the Argyll Militia from using the park wall at Claddens Brae to cover the retreat of the Hanoverian army. He was executed on Tower Hill later that year. Subsequently, the Earl of Errol spent much time in the house and it was probably he that had the ponds in-filled and the site used as a bowling green. Unnecessary expenditure was cut back further and assets quietly sold off. A few years later it was noted that "*Calr wood is fit for cutting every thirty years but at present there is only a small part at the west end fit to be cut, because Lord E's people having the liberty of cutting, towards the end of their lease sold about £600 worth*" (Forbes Papers 172/16, 27 March 1784). The coal in the wood, however, was practically exhausted.

The presence of Callendar Wood was one determining factor, for its value as charcoal, in the location of the Carron Iron Works in 1759. Wood was also needed for that company's construction projects, as when straightening the River Carron in 1764 when wooden piles to retain the new cut were obtained from Callendar Wood at a cost of £3.16.6 (GD 58/8/10). Wands from Callendar Wood are mentioned in John Christies' correspondence in the Hamilton archives in 1777, and in 1779 cash was paid by Kerse estate for timber and stakes from the wood (GD 173/1/9). Clearly it was a busy place.

George Forbes came to inspect the park before its sale. He wrote to his brother William in September 1782 that: "*The inclosures round the house are very extensive: in them are a multitude of large and venerable trees: I speak here of what we call in this country the policy, and the policy of Callendar is in my opinion excellent*" (Forbes Papers 116/38). The following year William bought the estate for £83,000.

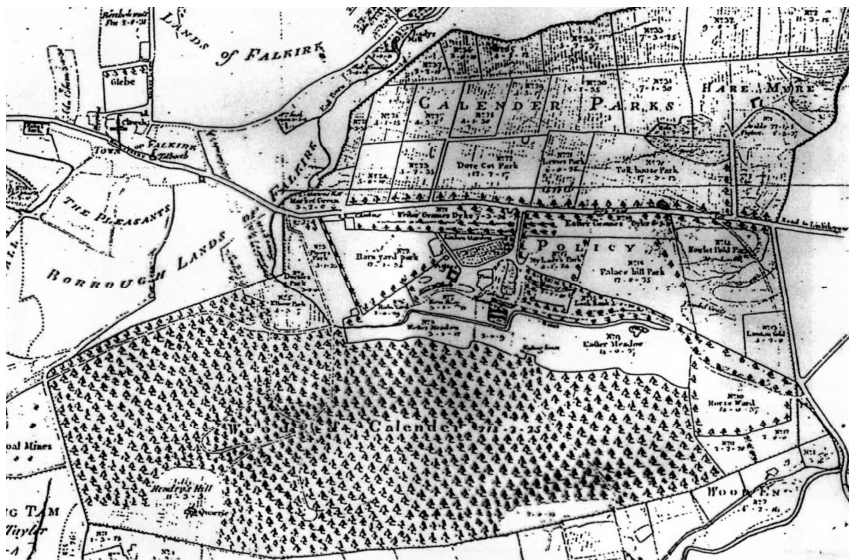
Figure 4. Transcribed plan of Callendar Park c. 1781.



The policy, however, had suffered from lack of attention. Not only had there been little maintenance but the absence of a landlord had seen incursions by the locals using it as a right of way. Boundary walls and fences were in very poor condition and full of “slaps” or gaps where access could easily be gained. James Forbes was the first of the brothers on the ground and in his first weeks encountered many people using the wood as a source of raw material. Initially he demanded that they leave his family’s newly acquired property, but: *“they are not to be easily frightened having been for so long a time winked at. It will not be properly cared for till it has a keeper (who knows all the people in the country) working in it from morning till night. I understand the keeper of such a wood would put a proprietor to little or no expence [sic], because he is often employed in repairing fences, in selling the cuttings and in making wicker work, for coal works and for sale... I understand Lord Kilmarnock used to beat severely with his own hands the offenders”* (172/15). Colliers were accustomed to making their baskets in the wood from the wands that they cut. Others were stealing *“strong trees fit for ploughs and quantities of middling stuff for walking staves, for the Edin: market”*. Murdoch McPherson was also cutting rods or sticks, but being an old man on the parish charity was let off with a caution. John Black, on the other hand was a man of substance. He was an oversman at Shieldhill Colliery who ran a public house there. He was discovered in the wood cutting rods of about 3ins diameter accompanied by a young helper. It was therefore decided to prosecute and make an example of him (Forbes Papers 172/16; 172/17, 172/29, etc). Temporary repairs were made to boundaries, which seem to have comprised low stone dykes and crude wooden fences.

A more widespread abuse of the wood occurred every 4th June – the King’s birthday. The people of the town entered the wood in large numbers, removing leafy boughs to attach to the front of the buildings lining the High Street. Thus adorned there was a day of great celebrations (Forbes Papers 172/32). *“it gives me the greatest pain to see your property here abused in the manner it is - the abuses in the wood of which I have before spoke often have not only increased to a scandalous pitch (upon the fourth of June last a stranger would have supposed that it had walked down to the Town of ffalkirk & neighbouring villages. Every door & window was ornamented with branches of trees. Trees stood in the middle of the streets by bonfires in honour of the day, and every carters horse was trim'd with foliage from Callander Wood)”* (177/29). The wood was a valuable asset and had to be protected. It supplied not only timber for building, but small wood for baskets, wheel spokes, fencing and fuel. Bark too had commercial value: the proximity of the Trysts allowed tanning to be carried on profitably in the town. So valuable was the wood to the estate that it was said that William Forbes often joked that it alone would have bought the whole (Paton 1838, 109).

Figure 5. John Home’s c. 1781 plan of Callendar Park showing the woods.



The fences on the lower ground were in the same condition. *“I am keeping many people from making, as they have done for some time, thorough fares of the Lochbank and pleasure grounds They were grown too common The Lochbank is the admired grass walk with large trees on each side, of about 3/4 of a mile long leading from Cal: house to Sir A Livingstone's”* (Forbes Papers 172/17, 3 April 1784). The

low parks were already leased to tradesmen in the town. *"The fences of several of the parks are broke in some places. When there used to be working people about the house they were always mending them. One Brade, a butcher, who has barnyard park under Peter Waugh, is to put beasts into it in the beginning of the week. He has been asking for some repairs. 2 or 3 days of the man who is at low wages, a sort of under hand at the wood, will put it to rights."* (Forbes Papers 172/21, 24 April 1784). These leases brought in useful cash, but also unwelcome visitors; *"The people who hold the other grounds near the house bring such numbers, droves I may call them, of troublesome children to the milking of their cows that we cannot think of setting the pleasure grounds upon such terms, as the children do a great deal of hurt to the trees & shrubs in the parks already let. The children and indeed grown people would be constantly in the close, about the windows and among the inclosed shrubs breaking and with insolence stealing & destroying."* (172/32, 12 July 1784). Writing some time later, Meikle noted that *"The home park had become a kind of "muir" or "common" to the town, and this was a privilege of which, during the better part of half a century, the bairns freely availed themselves."* (Meikle 1879, 70).

Many of the parks near to the house were under pasture, but the lack of proper leases meant that it had grown rank and produced prolific hay crops. *"There is upon the pleasure grounds an uncommon crop of grass, almost ready for being made into hay. It's thought altogether improper to set them, being the only place at present you can call your own. They surround the house and are close up to it bound in by a sunk fence before the house & broad & deep stanks behind the house."* (172/32). The stanks were in fact overgrown banks of the meandering East Burn; the sunk fence or ha-ha must have bordered the outer side of the horseshoe-shaped drive in front of the house, designed to keep oxen away from the house. The ha-ha was removed in 1785 (236/1, 5 Jan 1786) and further improvements followed.

Barnyard Park was still occasionally ploughed by oxen (236/4 & 8), for barley crops (282/9; 17 Sep 1787). At this time the fields or parks to the North of the main road were considered as integral to Callendar Park (they are depicted as such on Pont's map) and are often referred to as the "front parks" to distinguish them from those "behind the wood" (i.e. Hallglen, eg 282/9; 17 Sep 1787). Meikle refers to the front parks as the outfield, ploughed by horses. Open areas within Callendar Wood were leased as pasture, though animals wandered into neighbouring crops. Hendry's Hill was the largest, and after building of the estate wall was used for the estate's own cattle in the summer months, the cattle being moved to the lower parks in the winter (479/7, 30 Nov 1792).

William Forbes employed a landscape architect from London, William Driver. He drew up plans that included removing the old formal garden, filling in the large valley between the house and the stables, and the ha-ha, enlarging the source of the East Burn to create a loch and canalising the course of the

stream, retaining the water at a high level by means of a weir called the Cascade, laying out new avenues and constructing a new large walled garden to the North East of the house.

“About 100 workmen, gardeners and labourers, are employed within the park or policy, improving and ornamenting the grounds, such as draining some marshy land, making fine walks, avenues, lawns, greens, planting the finest trees and shrubs that can be got, and twenty et ceteras

When the park is completed, which consists of upwards of 500 acres, it will be as fine, I may say finer than any of these fine places we went to see when living at Byfleet. The grounds are naturally beautiful with a number of hills and valleys, and covered with trees of every sort from the largest size down to the smallest that by cutting out trees with taste where they are placed and planting in other places where they are wanting” (246/1; 10 Feb 1786).

The six kilometre long park wall was almost completely rebuilt using stone quarried in the wood. In the first season the North wall, against the public road from Falkirk to Linlithgow, was completed. In 1786 the masons turned to the wall facing Laurieston (282/8; 7 Sep 1787: 282/9; 17 Sep 1787) and a year later to the South wall. The wall on the West, bordering the Glen Brae was in better order, being newer than elsewhere. It was nevertheless raised in height and increased in depth, the gradient of the road improved by removing earth which required underpinning of the wall. This can still be seen by the large rounded boulders about a quarter of the way up the outer face of the wall, which once formed the foundations. The park wall was 14.27 metres tall and was capped with good quality copes (286/13, 18 Oct 1787).

There was an existing lodge with its own forecourt just to the West of the Avenue, plain and run down. It and the dwelling at The Cleddans were soon occupied by men working on the park, who with their families, doubled as watchmen. New entrance lodges were designed by Edward Bardwell Brazier of London. There were three – the Wester or Shieldhill Gate on the Glen Brae, the Easter or Laurieston Gate at the North East of the park, and the principal gate to the North West of the house on the main road. A smaller gate in the East wall known as the Lanton, Lochbank or Howlet Fauld Gate opened only onto a minor road and had no lodge. A small door was also requested in the wall near the North West corner so that the Stentmasters could gain access to their fountain or cistern which supplied water to the town and they offered to pay for the door and its lock (289/11; 25 May 1787). Of these lodges only that on the Glen Brae remains. Its West gable lay against the road and has a chamfered bay evidently designed to project a little beyond the park wall. But that wall was built before the plans arrived in late 1788 because the architect exhibited the drawings at the Royal Academy in London (265/15) instead of sending them promptly to Falkirk. The bay contains a blank window for architectural effect. The facing stone was bought from the quarry at Brightons,

it being of a better quality than could be obtained in the wood and was found to be cheaper (282/7; 4 Sep 1787; 282/12; 9 Oct 1787). To its South a court was formed by setting the North gate pier against the lodge beyond the window bay and providing a re-entrant wall from the South pier to the park wall (what we might now call a visibility splay). A few years later the Slamannan road was re-aligned (the road had run along Station Road) so that the lodge was at the bottom of its descent. Travellers on that route to Falkirk got a distant view of the building, which gradually grew in size as they approached. The main Falkirk gate was more elaborate. It stood at the bottom of the upcast mound of the Antonine Wall on the site of the small steading called Cleddans. Brazier's design showed a symmetrical front onto the main road with a small lodge at either side, a short length of railing with two uprights, and a central gateway flanked by substantial square piers. The park wall was supposed to join the lodges at the centre of their outer gables, but as with the Shieldhill Lodge, the wall had already been built against the road. The architect bemoaned the alteration: "*If the effect of the Lodges was wished to be destroy'd a more effectual Method cou'd not be adopted.*" (320/31; 22 July 1788: 340/3; 14 July 1788). A compromise was reached and the park wall was stepped back a distance of 30ft on either side. The chimney stacks of the lodges here were capped with vases of Coade reformed stone and sphinxes were prominently positioned. A Doric cornice of the same material, had Classic triglyphs. Pine ornaments surmounted the gate piers (340/25, 24 Nov 1788; 340/27, 8 Dec 1788). The elaborate iron gate was executed by Carron Company at 10d per pound weight (315/40, 22 Nov 1788), John Bell of Camelon being unable to execute it (320/39, 10 Nov 1788). The old Avenue or vista was closed off with a semi-circular dwarf wall topped with a stone coping and iron rails (282/12, 9 Oct 1787).

Rather oddly, construction of the lodges and park wall did not stop unwarranted incursions on the North front: "*Many complaints having been made by the former and present Barkeeper at Gallowsyke, of evasions of the Toll duties, by Travellers, with horses and Carriages going by Mr Forbes's gates and Park, and shunning the Bar, while they neither Stopt, nor had any business at Callendar house, And several Trustees conceiving that these Evasions and this loss to the funds, might be prevented, by moving the Bar a little to the eastward of Callendar East Gate, The meeting appoint this subject to be taken into consideration at the next meeting, and to be notified accordingly; - and in the meantime direct and authorise the Barkeeper at Gallowsyke, to demand and levy a Toll from Travellers passing thro' said Park (not having business at Callendar house), and if requisite, to prosecute all evaders, for the penalties of the Statute, Requesting the aid of Mr Forbes in the business.*" (639/23, 10 Sep 1798).

The new landscape design demanded the construction of two new avenues inside the park. The most important was that from the Falkirk lodges to the House, the Wester Avenue. Having passed between the lodges it mounted the crest of the Antonine Wall bank before turning East to follow that ancient

frontier. From here there were magnificent views northward across the Carse and South to the parkland and the venerable old trees. Fleeting and enticing glimpses of the house could be caught between these trees. Just before reaching the old Avenue the carriage road turned to the South and descended the hills to the horseshoe track surrounding the lawn. The Lanton Loch must have been drained to provide the new drive to the Laurieston Lodge. This drive required far more cutting and filling. The esker was breached and the avenue placed in the valley of the Gallow Syke and planted with lime trees. Both drives were completed by the end of 1788 (340/27, 8 Dec 1788). The swampy area at the source of the East Burn was turned into a picturesque loch. *“Chas Clark’s men are still working in the lock in the meadow – you may remember I said it would be a tedious operation but it is producing excellent manure, it is allowed to be better than any we have yet dug anywhere. After taking off the surface, we come into a rich black mud, which is almost inexhaustible; they are making it up in composts with lime which Burnside burns. I think it may save us making any other compost this year”* (282/9, 17 Sep 1787).

From the new loch the East Burn was widened and the banks scarped and stepped so that it could be flooded to create an ornamental feature, achieved by constructing a weir or cascade at the point where the estate road crossed it going to the Shieldhill Lodge. A substantial bridge was built (this is sometimes associated with Robert Adam), the Cascade Bridge. It is this bridge that is referred to in 1787: *“And the coping of the new bridge, which is a job for Ker. A few days after you went from here the bridge was done all but the coping; we left it for two reasons, first, till stones should be got in the course of the operations, and secondly, we preferred building while the weather was fit, and left hewing till the tail of the season”* (282/10, 27 Sep 1787). The balustrades of the parapet were of cast iron (RCAHMS 1963, 351 and Plate 227C), and must have been made at Carron, with five panelled piers on each side. From the bridge the waterfall at the end of the ornamental canal would have delighted the passer by.

Figure 6. The Cascade Bridge looking South East (copyright HES).



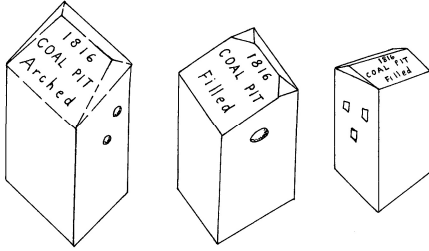
Draining of the old loch to the North West of the house into the canal together with the infilling of the adjacent valley enabled a grand lawn to be placed in front of the house. In levelling the ground, the footings of the demolished barbican gatehouse was grubbed out, revealing remains of some of the defeated garrison (Meikle 1879, 37; Wilson 1797; Keir 1827, 209). The result was an emulation of the mound at Marathon, the Forbes brothers having received a classical education. The mound now supports a fine variegated beech tree. It, like the gatehouse before it, was on line with the old road to Falkirk, now a tree-lined avenue.

The grass parks were kept in trim by introducing sheep, which had the added advantage of providing meat, though not always to those who had a right to it. In 1793 a reward for information was advertised because: "*Several sheep have of late been stollen at different times from Callander park by persons breaking into the park Slaughtering and carrying of the carcasses in the night time*" (501/37; 3 Nov 1793). Grazing rights were still let under the condition that the animals were removed at the beginning of November each year (405/8, 26 Oct 1790). Cattle remained a feature: "*There are three milk cows for the use of the house. Seventy highland oxen were bought to feed on the ground and to be killed for our own use. Sixteen of the strongest of them worked in the plough.*" (246/1, 10 Feb 1786).

The lawn was designed to impress visitors to the house, which fronted onto it. The stables too presented the main facade in its direction. On the opposite side the pedimented ice-house faces West into this arena, constructed on the edge of an earlier gravel pit in 1787 (Bailey 1992b, 40-41). Some distance behind the ice-house was the all-important kitchen garden. "*A large kitchen garden is making which contains about 7 Scotch acres, it is to be surrounded with a brick wall 14 feet high and to have hothouses, hot walls and green houses all in the first stile* (246/1, 10 Feb 1786). Like the other garden structures it was designed by Driver (246/2). The foundation was laid using stone rooted from the front parks (282/10, 27 Sep 1787). The walls took a huge quantity of bricks, whose manufacture had to be commissioned for the purpose. The massive gate piers and two ornate seats were of stone (282/12, 9 Oct 1787) embellished by Coade vases (340/25, 24 Nov 1788; 340/27, 8 Dec 1788), placed in pedimented alcoves framed by Doric pilasters. The sundials do not seem to have been transferred to the new garden but were placed on the South side of the house. An experienced gardener was hired in 1788. That same year a new range of hothouses of 58 metres in length was begun, overseen by Lady Glasgow's gardener (282/13, 18 Oct 1787). A variety of fruiting pines were sent in pots In September by Driver on board the Carron Company ship 'Paisley' (340/13, 8 Sep 1788). The stable block was upgraded using plans by Brazier (254/13, 18 Sep 1786), gutted, new floors put in and the roof replaced. The back and side walls were harled and whitewashed. It is probable that the fine sandstone facade facing the house was also whitened as it now looked "*black and old beside*

the other” (282/9; 7 Sep 1787). Earth from behind the stables was used to fill the valley to the East, and this created a useful yard for storage and composting (429/5, 5 Dec 1791). Surplus coal was also dumped there, prior to being used to burn limestone (479/6, 24 Nov 1792).

Figure 7. Pit markers in Callendar Wood.



William Cadell opened new coal pits at Pirleyhill and those in the wood closed down, and in 1816 the first pits were arched over (Figure 7). On the night of 23rd August 1797 a great band of disgruntled colliers and some of the youth of Falkirk burst into the park and paraded round

Callendar House, beating a drum and shouting, protesting against the new Militia Act. This so alarmed William Forbes and his brothers that they fled the house by a back door into the wood. Looking from among the trees they beheld the flickering blaze of Carron Works and believed that the mob had set the house on fire. Once safe in Edinburgh they arranged for the Lancashire Dragoons to be dispatched to Falkirk, whence the truth was discovered (Bailey and Young 2013). William Forbes ever after felt an attachment to the Volunteer forces, and for almost a decade from 1806 the Linlithgow and Stirlingshire Volunteers had permission to hold their annual parades in the grounds of Callendar House (Forbes Papers 847/1).

Perhaps spurred by the Stentmasters request for a gate in the park wall, William Forbes negotiated to buy the water rights from the town. The original water supply, it would seem, came from a copious spring to the North of Hendry’s Hill, from where it was presumably led by an open ditch to the foot of the wood, conveyed then to the Cross Well by way of the Cow Wynd in hollowed out tree trunks joined by iron collars. Over the following century the water supply was augmented by water collecting in abandoned coal workings just above the Slamannan road to the West of Callendar Park. As coal extraction proceeded uphill to the South, the catchment area for the water increased and this new source became more important than its predecessor. From the flooded mine workings the water now flowed along the Muir Burn to the town with a series of reservoirs or “fountains” that acted as settling tanks on the route. Some tanks lay in the North West corner of Callendar Wood, utilising earlier installations. The Stentmasters therefore no longer needed the original supply and by selling the rights were able to use the money to establish a more direct route for the more westerly source. Some of the traditionalists in the town were incensed by this break with the past and the Earl’s gift. Robert Keir in 1827 wrote scathingly: “*The right to the well-fountains*

which were situated in Callendar wood, was lately sold by the stent-masters to the Callendar family, for a paltry sum, which, it is said, scarcely covered the expense of conveyancing” (Keir 1827, 206).

In 1791 William Forbes erected a vaulted chamber over the old spring which consequently became known as the Barrel Well: the date is prominent on the lintel. From here an underground pipe led to a series of reservoirs at the foot of the woods, then conveyed to the house. A large culvert also led from the lower reservoir to the town, presumably to augment the supply there. For part of its course it runs almost parallel to the East Burn, but at a higher level, and still carries water to this day. The lower reservoir was certainly in place before 1825, for correspondence in May that year states: *“To lead the pipes by the stables and over the cascade bridge is about 80 yards longer than over the bridge south of the house, but I am inclined to think that at some time after the stables may possibly consume more water than they have done for some time past” (Forbes Papers 1155/14).*

Figure 8. Callendar Park looking South West towards the Cascade Bridge. The iron fence took the place of a stone boundary wall. Sheep crop the grass.

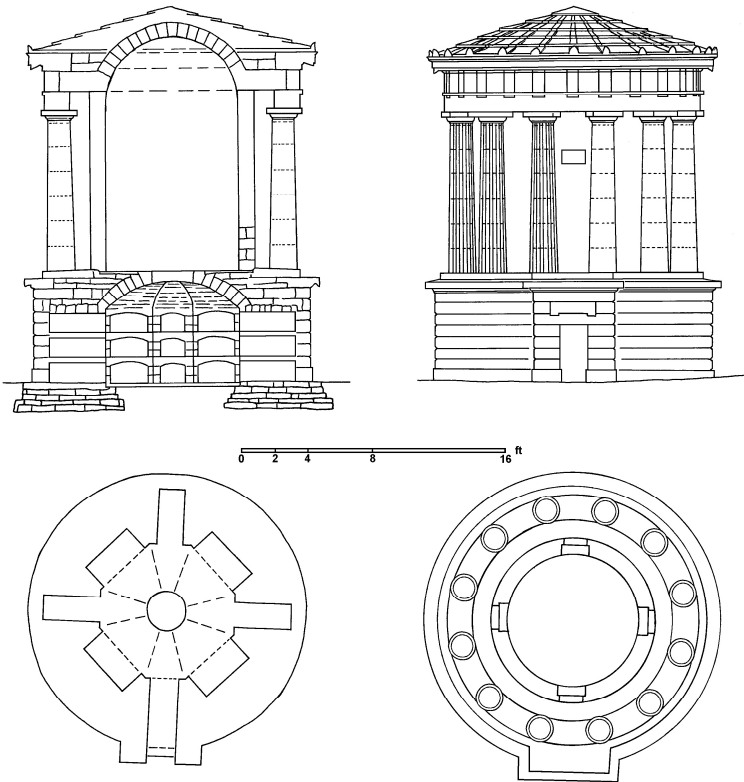


The following month it was noted that a cistern was needed to allow the water to be drawn from the house and the stables at the same time (ibid 155/22). So the horses at Callendar stables had running water long before the people in Slamannan, who got their supply only in 1911. Eventually there were three vaulted cisterns at the lower reservoir in Callendar Park, and an even larger one in the woods.

The Park in the 19th Century.

The first William Forbes died in 1815. His trustees commissioned the London-based Scottish architect, Archibald Elliot (1760-1823) to design a mausoleum. Of the three designs submitted, the one chosen took the form of a circular Doric temple 14.6m tall. It was constructed in the wood about half a mile from the house and can be seen in a print of 1818 towering above the trees at the far end of the loch. The heavily rusticated podium supports a cella and a peristyle of twelve columns under a ribbed stone-paved roof.

Figure 9. William Forbe's Mausoleum.



The building is set within a circular enclosure 96m in diameter surrounded by a thick stone wall capped by huge dressed copes: trees now obscure it. The estimated cost was £2,370: ironically it is unlikely that William Forbes himself would have approved of such profligacy. At about the same time, small groves of yew trees were planted throughout the wood, though slightly more on approaches to the tomb.

The period around 1820 was one of general unrest in the country: weavers were thrown out of work by mechanisation. It seems that, like many landowners, the Forbes family tried to alleviate this situation by providing temporary unskilled employment in construction of additional gravel paths in the woods. These paths – something between 16 and 32 kilometers of them – were partly to aid harvesting of wood and partly for the leisure of the family. The eastern part of the wood was replanted with Scots pine. In 1827 the Falkirk Monthly Magazine published a poem about Callendar Wood, which suggests that many bairns still saw it as a public space:

“Callendar Wood, during the life of the late proprietor, was the favourite retreat of lovers. Under the oak or birken tree, concealed from every eye, they breathed their tender tales of love”.

The new configuration of water made the loch suitable for curling matches in the winter. For several years the Falkirk curlers were given free access for that purpose, until purpose-made ponds at the old washing green became available (Meikle 1879, 89). The first recorded curling match was between Grahamston Curling Club and Falkirk Curling Club in 1837 (Falkirk Archives a746.1). Thereafter it seems to have become an annual match.

The ornamental canal within the park was extended around 1830 to the West by moving the weir to the West end of the park. The weir is a curved structure, braced against the pressure of the water, of substantial sandstone blocks with a sluice at the centre, ponding a small loch. By 1870 this had been drained and its bank grassed (Meikle 1879, 89). It was probably in the 1830s that Callendar Loch was also enlarged to the West. The extension contained four islands, reflecting the more naturalistic landscaping movement of the time. Marriage in 1832 of William Forbes, son of the coppersmith, to Louisa Antoneta Charteris was commemorated by a tapering sandstone pillar, placed beside the new serpentine pond. On top, rather weathered now, are the incised letters “W.F./ L.A.F./ 11 NOV --”. This became a family tradition for the next 150 years and more as other faces became covered with initials, one of the latest for Charles William Forbes on 7th March 1889.

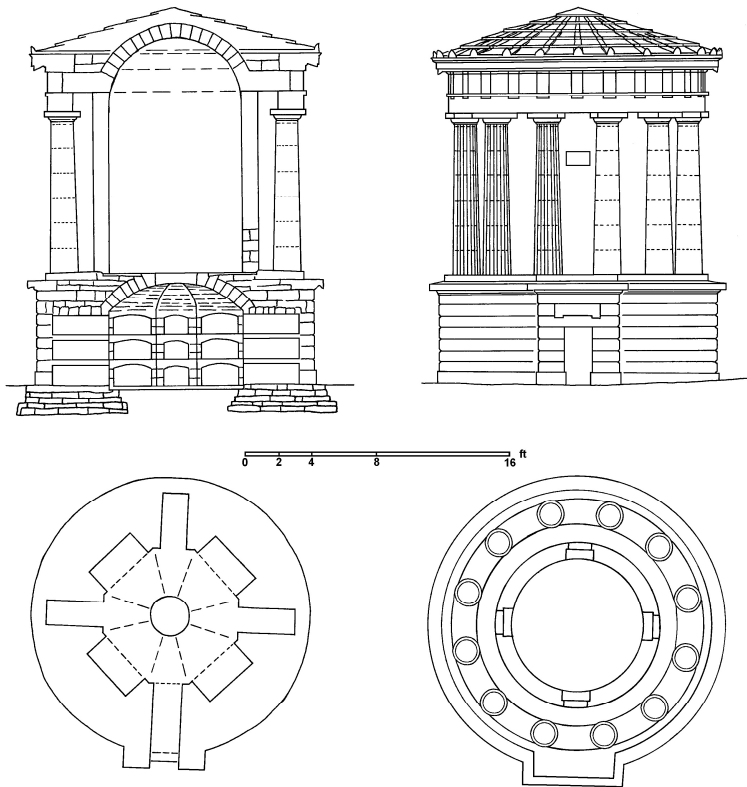
In the second decade of the 19th century plans for the construction of a contour canal from the Forth and Clyde Canal, at Lock 16, to Edinburgh, known as the Glasgow and Edinburgh Union Canal, were slowly formulated and a parliamentary bill was sought. The Company’s preferred route would have taken the canal through Callendar Wood, taking an open curving line along the contour to near the South East corner of the park. William Forbes, and after his death the Trustees, vehemently opposed the Bill’s passage. The Forbes Trustees commissioned Alexander Naysmith in 1818 to produce two water colours of the park, one showing the existing scene, the other the aspect it would bear if the canal took the deviation. The case for this design was rejected: a tunnel was dug under Prospect Hill.

Figure 10. Naysmith's (1818) painting of Callendar Park with the Union Canal in the background.



Soon after, in 1835, the Road Trustees decided to improve the road into Falkirk by replacing the section East of the East Burn, removing the tortuous ascent at the Claddans Brae, an act prompted by the overturning of a mail coach here (Eyre-Todd 1934, 5). The road was realigned from a point North of Callendar House, gradually diverging northward from the previous route which can still be seen as a distinct tree-lined terrace within the park. The new route eased the descent into the valley of the East Burn, where earth was used to form a large culverted embankment near Marion's Well, 100 metres North East of the East Burn Bridge, joining the High Street at the top of East Bridge Street (Meikle 1879, 74). The expanse of land between the old and new road was then incorporated into the park. The alteration left the main lodges stranded. They were demolished and a new one built to the North West. A new avenue was then constructed, thrusting South from the lodge until it met the avenue to the Shieldhill Lodge near the Cascade Bridge, allowing it to utilise an existing belt of beech trees for shade. Then, when the Edinburgh and Glasgow Railway was projected in 1840, part of the route struck through the extreme South West corner of the park, but no protest was made as it was to be contained in a tunnel. In 1842 the railway opened and thousands of passengers now daily pass through the park.

Figure 11. North elevation and plan of the summerhouse in the arboretum. The steps and the surrounding parapet walls are still visible.



1842 also saw the visit of Queen Victoria to Callendar Park (Bailey 1993). The *Stirling Journal and Advertiser* provides a good feel of the atmosphere on the day: “shortly after two o’ clock the cortege entered the grounds. At this moment the crowds who had followed her Majesty through the town rushed into the western gate with a fury which no force could have opposed, every one running at the top of his speed towards the lawn before the house to get a second glimpse of the Queen. In this they were not disappointed, as the avenue is circuitous, and the pressure of the crowd on the Royal carriage such as baffled all the attempts of the yeomanry and the soldiers to keep back. The cheering from 15,000 voices was absolutely deafening. Mr. Forbes and the Earl of Zetland accompanied the Royal party; the former in the uniform of a Deputy-Lieutenant, the latter at the head of a large body of his tenantry. Her Majesty entered into conversation with her host, during the four minutes the carriages were

drawn up for the purpose of changing horses and was graciously pleased to express to Mr. Forbes her acknowledgements for his attention."

Again improvements encroached, with the Midland Junction Railway passing through the North East corner of the park in 1847 on a curving embankment, carrying it over the main road by the Skew Bridge. This isolated the Laurieston Lodge from the park and the following year a new lodge was constructed 200 metres to the West.

Around 1855 an arboretum was inserted into open ground between the wood and the ornamental canal to the South of the house, believed to be the work of the third William Forbes. It incorporated some of the oak trees that formerly stood within the wood, and there are also specimen conifers, mostly Scots pine, and several Western Red Cedars, the latter 3.5 - 4.5 metres in girth). The perimeter of the arboretum was defined by a curving iron fence and an avenue again ran on the central axis of the house to a new summerhouse of rustic wood construction set on an octagonal plinth, surrounded by stone dwarf walls and accessed by steps. The old sundials were placed on this avenue. Near the canal the trees and bushes were kept neatly trimmed. North of the canal, more yews were planted along with topiary shrubs. Hollies provided a quilt of evergreen near the house unifying the two. Lime trees were planted along the East side of the estate road, perhaps in around 1880. Elsewhere the trees were allowed to mature. The Ordnance Survey Gazetteer noted "*Five splendid limes are in front of the mansion, a magnificent avenue of planes on the east leads to a lochlet full of aquatic vegetation.*" Some trees were given extra significance and there is still a tradition amongst local people that a group of four represented the Four Marys of the Queen of Scots. Various locations have been put forward for these personalised trees, including the West end of the House and the great lawn: however, no reference can be found to them in the literature. The woodland remained valuable and in 1880 the Agricultural Society noted that the total income from the entire estate, including minerals, was estimated at £19,811 a year (Transactions of the Highland & Agricultural Society of Scotland 1880).

It was probably at this time that the lawn to the South of the House was created and laid out with paths and lozenge-shaped flower beds. Stone flights of stairs from a first floor balcony now led from the principal rooms to a raised platform with a new terrace wall. The paths formed four plots, the easternmost of which contained a shallow oval depression, possibly a curling pond. A sundial was placed in the centre of the lawn, replaced around 1920 by a three-tiered fountain. Two detached elevated octagonal wooden game ladders were erected on the edge of the wooded area at the East end of the House, near the larder extension design by David Hamilton. During the Second World War the trees in Callendar Wood were needed for the war effort and required extensive

replanting afterwards. Much of this new planting was spruce and was ready for commercial logging in the 1980s.

A Private Park Made Public.

Throughout the 1950s the park was periodically thrown open to the public for horse trials and garden fetes, the latter usually in connection with the Unionist parliamentary campaigns, which were supported by the Forbes family. Falkirk was by now bursting at the seams and Falkirk Town Council sought means of expanding the housing capacity. In 1958 it approached Colonel Forbes but received a refusal to sell piecemeal. Partly as a consequence the park, excluding the wood, was acquired through compulsory purchase in 1963. The following year 14 storey tall high-rise flats, were proposed and built from 1965 to 1969.

Figure 12. Callendar Park high rise flats.



Most, except the westernmost two blocks of flats (Eastburn and Belmont) were named after local councillors: Leishman, Marshall, Maxwell, Paterson and Symon. The bold straight lines, inclement balconies, wide grass verges and paths in the parkland setting provided a modernist townscape.

A college of education was constructed in 1964 in the interior of the walled garden at the opposite end of the park. The life of the college was curtailed and in 1989 it was re-developed by Central Regional Council as a business park. As part of this the Laurieston Lodge was demolished in 1990. After 1963 Falkirk Council opened the park to the public. Over a number of years the height of the North wall of the park was reduced to 0.9 metres. Birch trees in a triangular plot at the northern end of the main avenue, now called Queen's Avenue, echoed the park's new role as a public space, as did flower beds along the Callendar Road frontage. Beech hedges along the southern side of the South avenue and along the edge of Kemper Avenue were accompanied in 1972 by the addition of native and exotic species of trees to the arboretum. The Loch was extended for use as a boating pond in the 1970s, complete with jetty and booking office. A timber palisaded 'fort' soon followed just to the North, on the West side of the house swings and slides and attracted the younger children. Here too a miniature railway was put in place. About 1970 the fountain on the South lawn collapsed when a large number of children stood in the elevated basins. The rustic summerhouse could not be expected to survive and the ice-house was filled in and used to keep goats.

In the 1970s the lawn in front of the house was frequently used for events. In 1975 there was a children's cavalcade, sports days, the Forth Valley Music show and a five nation folk dance. There were performances by Maori dancers, a Venezuelan orchestra, the Delaware Youth Jazz band, the Red Deer Royals, the Warren Junior Military Band, the Hertfordshire Youth band and the Falkirk Fiddlers' Tryst. In 1972 it attracted the rock band, Slade. Local talent was often displayed and in 1987 a historic pageant called Marie R was performed on the South lawn by the Falkirk Arts and Civic Society. There were also annual Spring Flings and Family Shows. The park continues to change as the seasons and the years pass.

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THE KING'S KNOT: SCOTLAND'S FINEST LOST GARDEN

Marilyn Brown

Introduction

Lying below and to the South-West of Stirling Castle is the most remarkable garden in Scotland to survive as an earthwork, the King's Knot. It has no close parallels remaining elsewhere in Europe and, while the date of its creation is not known, consideration of the remaining documentation and its stylistic affinities would suggest a date in the earlier seventeenth century, in the reigns of James VI and I or Charles I.

At the present day the King's Knot takes the form of a grass-covered octagonal stepped mount. Although not very high, at some 3m, it would allow surrounding decorative parterres and flower beds to be viewed from above. It would also be visible from high above from the West side of the palace of James V, the residence actual and theoretical of the kings of Scotland (Plate 4).

The mount lies within a double-ditched, almost square enclosure, measuring some 129m by 127m. The South-West angle of the feature was destroyed by the building of the turnpike road to Dumbarton about 1813. The two stepped platforms are eight-sided, surmounted by a sunken octagonal compartment with a circular flat-topped mound at its centre. To its North-West was a garden of similar size, with a double quadrilateral design of raised parterres, defined by paths, around a central circular bed. The Knot would have been marked out with low growing plants and hedging, perhaps with a fountain intended for the centre of the mount.

The history of the King's Knot

The present garden is not the earliest at Stirling Castle. There were gardens within the castle walls documented from the later fifteenth century, but probably going back to the earlier Middle Ages when such an amenity would be an expected feature of a royal castle. Records from the volumes of the *Exchequer Rolls of Scotland*, *Accounts of the Lord High Treasurer of Scotland* and *Accounts of the Masters of Works for Building and repairing Royal Palaces and Castles* detail the gardeners and the expenses involved in the creation and maintenance of the gardens. There were earlier gardens and orchards near and on the site of the King's Knot and the Knot was part of a more extensive landscape of gardens and orchards and park (Brown 2012, 62–9; 77–9).

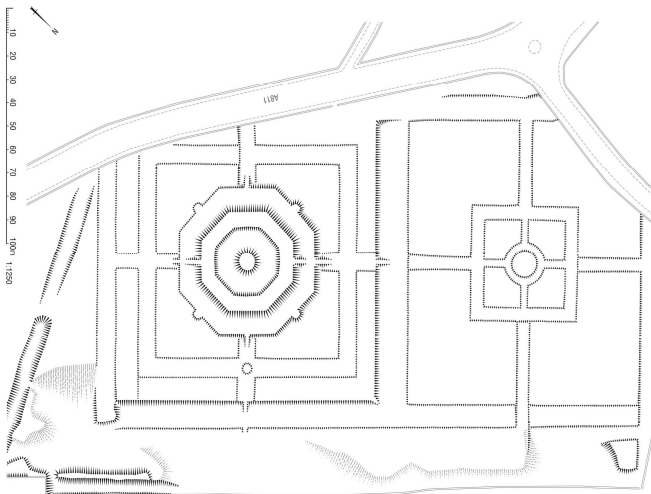
Unfortunately, the *Masters of Works Accounts* for 1617 for the Castle and Park of Stirling are incomplete and frequently indecipherable so that relatively little is known about activity there at this time. The editors of the

volume record that, 'This account has been greatly damaged by water impregnated with lime, and only a few pages here and there are decipherable.' (MW, 24). These are the accounts for the period immediately before James VI and I returned 'salmon-like' to Scotland when a great deal of preparation was undertaken to present both James and his English courtiers with a positive view of Scotland. Before he left Edinburgh to take up the throne of England in April 1603, James had made a speech after the sermon in St Giles, declaring that he would return to Scotland at least every three years (Stewart 2003, 167). However, it was not until 1617 that he was to make his only visit to Scotland (McNeill and McNeill 1996).

What survives in the Master of Works Accounts for this period is a payment of £3-0-0 for six days work to the gardener, Richie Buckam and a payment of £5-16-8 for seventy loads of green turf to the alleys in the garden (MW, 2, 25, 27). This probably relates to the area of the King's Knot, but it is difficult to quantify what coverage this would provide. Flowers for the garden were also paid for (MW, 2, 444) and Alexander Quhitbrow, a gardener, presumably at Stirling, was paid for ferns, thyme and lavender for the King's chamber 'at the first coming' (MW, 2, 445). James arrived at Stirling on 30 June and left for Perth on 5 July, having heard a speech on the Roman antecedents of that ancient town.

On stylistic grounds the King's Knot could have been designed at this time, but the surviving documentary evidence also indicates extensive works in the area of the garden in the mid-sixteen twenties after Charles I came to the throne.

Figure 1. Plan of the King's Knot below Stirling Castle. ©HES GV004973.



Although there is no proof for the case, and the argument to some degree is based on an absence of evidence, the creation of the King's Knot has most reasonably been associated with a payment for the planning and establishing of a new orchard and garden under the direction of William Watts, (RCAHMS 1963, 219). William Watts had been recruited as a result of a warrant from Charles I to the Earl of Mar as Royal Treasurer, to choose a '*skilfull and well experimented*' gardener in England to go and reside at Stirling for reparation of '*the orchard adjoining his Majestys Park of Stirlin*', which the king is informed has '*for lack of attendance become wild and overgrown with bushes and brambles*' and which state of matters '*being an imputatioun to that whole kingdome*' he thinks should be remedied. The gardener should receive £30 sterling yearly and should provide advice on other royal gardens and orchards (*Hist MSS Comm* 1904, 131). William Watts, described as '*William Watts, Englishman*', was in post in 1625. Watts is a name common in both Scotland and England and it is possible, despite the emphasis on his English nationality, that the Stirling gardener had Scottish origins. However, a William Watts was gardener of Wroxton Abbey in Oxfordshire and died there in 1610, and Stirling William may have been a relation.

The next set of Master of Works accounts for Stirling date from 1625, shortly after Charles I succeeded to the throne, and are similarly damaged by damp. They record that stanks or fishponds were dug out between 16 May and 22 August and that Richie Buckham was paid for supervising the work, as well as receiving drink on the occasion of an inspection visit by the Master of Works, James Murray of Kilbaberton (*MW* 2, 165). The clearance of the stanks required '*coal rakes*', perhaps for removing coal or stones, which had been used to make decorative patterns, and also axes to cut the roots of bushes, which may have been ornamental. Fifteen workmen are mentioned in the accounts, which over some four months, amounts to a very considerable amount of clearance. The cost for labour was in the region of £500-0-0, based on the detailed list of 6 June 1625 (*MW* 2, 165), which suggests a large undertaking. This might seem excessive for just clearing fish ponds and could indicate the construction of new and elaborate designs, possibly involving earth and other material removed from the stanks.

The Masters of Works accounts for 1628-9 survive in better order. They include sums for the planning and contriving of a new orchard and garden in Stirling, with reference back to garden work in 1627. William Watts, His Majesty's Master Gardener at Stirling, was repaid £375-12-0 for the wages of workmen for 22 weeks and for various materials used (*MW* 2, 230). He received a further £478-3-6 for workmen's wages and other provisions for 26 weeks disbursed between May and November 1628, and between January and August 1629, for the '*plattng and contriving his majesties gairdein warkis at the park of Stirling*' (*MW* 2, 242, 243, 257). In a rental of 1642 there is a reference to the orchard of the King known as '*lie gairdine*', next to the garden of the

great edifice known as the Newark (Mar's Wark) in Stirling *ad pomarium regis lie gairdine, contiguam ad hortum magni edificii lie Newark in Stirling* (RMS 9, 403 no 1072).

The gardens below the castle were first specifically mentioned in 1499 (ER 12, 76) when, in the reign of James IV, there was considerable expenditure but there may have been another and earlier feature there. Aerial surveys in 1975 and subsequent years revealed the cropmarks of up to three lines of ditches, suggesting an oval enclosure beneath the Knot. This might be of prehistoric date, although any periods preceding the construction of the Knot are possible. Recent geophysical investigation has extended the known area of this earlier feature (Digney and Jones 2013).

Medieval tradition associated Stirling with the Arthurian city of Snowdon or Snawdon (Loomis 1956, 17). This reference first appeared in Froissart's *Chronicles*, and in his *The Bruce*, written in the later fourteenth century, Barbour describes how, after the Battle of Bannockburn, the defeated Edward II escaped around the Park of Stirling, 'close by the Round Table' (Barbour 1996, 226). In the mid-sixteenth century David Lindsay referred to the '*Tabyll Round*' at Snawdon (Stirling) in his *Complaint of the Papingo* (Lindsay 1879, 75). The conclusion is that there was some feature close to but below the castle, which was identified with the Arthurian Round Table.

Throughout Britain, various monuments were associated with King Arthur, one of which, 'King Arthurs Round Table', near Penrith, is a prehistoric hengiform earthwork with a passing resemblance to the King's Knot. It would be a well-known sight to anyone travelling to Scotland from England by a western route. 'Arthur's O'on' near Falkirk, which was probably of Roman date, was another monument attached to Arthur's name. What the site near Stirling was is unknown. There is no indication of a particular feature on Pont's map of Stirling, which clearly shows the Park beside the Castle. The Arthurian Legend was invoked by Scottish and English kings in their entertainments and in their patronage of writers. In James VI's reign there were Arthurian references in masques, in particular that written by Ben Jonson for Prince Henry, the *Barriers*, of Twelfth Night 1610. King Arthur's Round Table was specifically suggested as a device or emblem for Prince Henry (Strong 1986, 141-5).

It is not known how the gardens at Stirling were planted or otherwise decorated, but low evergreen hedges delineating beds marked out in different colours, whether derived from plants or from brick or coal or gravel, would be usual at this time. The projecting lobes on the middle terrace may have been intended to carry arbours and seats. It is now approached up turf ramps, but steps may have been planned and there may have been other architectural features in stone, such as balustrades. A sundial might have been intended, as at Holyrood in 1633, where William Watts also worked. A fountain was the

choice at Ravelston in 1630 for George Foulis, who served both James VI and Charles I. Such a garden might be expected to boast elaborate fountains and a collection of statuary, as at Heidelberg, but nothing is known of any work or purchases to support this presumption.

Scottish Parallels for the King's Knot

There are few surviving parallels for the King's Knot. Gardens are fragile creations, changing constantly in minor ways as trees and other plants increase in size or fail to thrive, in major ways as fashions change and gardens are seen as out of date and cease to present the kind of image that its owner believed to be desirable or destroyed by war. By these means even elaborate gardens can disappear.

A garden which has only recently been recognised and has some affinities to the King's Knot is that at another royal palace, Linlithgow (Brown forthcoming). The remains of this garden are situated to the South-West of the palace. Because of its position it does not appear on the well-known depiction of Linlithgow in *Theatrum Scotiae* by Slezer, which probably recorded the palace sometime in the 1680s and then published in 1693. This shows that two large terraces had been created in the area around the Palace. These may belong to the earlier seventeenth century, possibly at the same time as the more elaborate terraced gardens to the south.

Figure 2. Aerial view of Linlithgow Palace.
©HES SPWO 17716.



This rectilinear garden was constructed on five levels extending from the palace courtyard on the North down to the former line of the Watergate with Kirkgate to its East. Its form emerges most clearly on the First Edition of the Ordnance Survey 25" map of Linlithgow surveyed in 1855 (OS 1:2500 Linlithgowshire Sheet v.3 (1856)). An aerial photograph taken in the winter of 1927, when the trees which now obscure the site were much smaller, shows the terraced garden before the car parks were constructed over it.

Unlike the gardens at the King's Knot in Stirling or that at Lincluden College, it is not centrally planned. Its situation near the summit of the hill on which the palace and parish church stand allowed a fall to the South and West and full advantage was taken of the natural topography. The uppermost

platform is approached up a ramp and the other terraces are spread out below. It measured at its greatest extent about 100m by 100m, although it was not symmetrical in layout. There is no documentary evidence to which the terraced gardens can be linked, their dating depending on a combination of stylistic features and historical events with which their construction might be associated.

It is possible that this garden might belong to the later years of James VI's and Anne of Denmark's residence in Scotland; for James' Homecoming in 1617; for Charles I's expected visit in 1628, or actual visit in 1633; in 1639, when seven thousand turfs were laid in the outer close (*MW* 2, 345-6) or even that the Keeper of the Palace, Lord Livingston, laid them out for his own benefit. These gardens would be most visible from the upper rooms of the South-West tower and from the upper chambers of the western part of the South range. The latter part of James VI's residence in Scotland, and the presence of his daughters at Linlithgow from 1596, are likely to indicate the earliest period at which this recently recognised terraced garden may have been planned and constructed. Its design is unlikely to date from after the 1630s. The site of this garden is now occupied by the garden and house of the ministers of Linlithgow and by the extensive car parks of the 1960s and 1970s which reflect to some degree the lines of the original terraces.

Some elements of the King's Knot, in a much humbler context, can be seen in the surviving terraced garden mount at Lochwood Castle in Dumfriesshire, the property of the Johnstone family (Brown 2012, 194-5).

Here a medieval earthwork motte, in part of natural origin, was reworked to form a mount from which the wider gardens could be viewed. It stands to the North of a long range of buildings of seventeenth century date and their associated courts and the earlier tower which received additions in 1603. In 1912 a second mount standing about 10 feet (2.76m) high with a diameter at the summit of 10 feet (3.07m) stood at the centre of a walled garden. Around its base was a shallow trench with a width of twelve feet (3.7m), perhaps suggesting a water feature (RCAHMS 1920, 114-17).

Figure 3. The medieval motte at Lochwood Castle, Dumfriesshire, ©HES SC381741



Perhaps the closest parallel to the King's Knot in Scotland is at Lincluden College near Dumfries. This was a medieval nunnery which was suppressed in 1389 and replaced by a college of secular canons. The surviving buildings are those associated with the collegiate church and the house of the provost, which was built into them and overlooks the garden. This feature is enclosed by a raised walk and decorated with a low grass-covered mound on two levels. The lower part has twenty sides and the higher

Figure 4. Aerial view of Lincluden College, Dumfriesshire, ©HES SC1020630.



mount at its centre has eight (Brown 2012, 179–81). The garden here was first clearly noted when Thomas Pennant visited in 1769: '*Behind the house are vestiges of a flower garden, with parterres and scrolls very visible; and near that a great artificial mount with a spiral walk to the top, which is hollowed, and has a turf seat around to command the beautiful views.*' (Pennant 1776, 105). He presumed that the garden was the creation of the provost and bedesmen before the Reformation. It is, however, more likely that it was laid for the lay provost of the college in the earlier seventeenth century. The last clerical provost, Robert Douglas, celebrated mass there until at least 1585, held his office into the 1590s and may have lived until about 1609 (M'Dowall 1886, 153–4). His nephew and successor, William Douglas of Drumlanrig, held the property up to 1617 when it was granted to Sir Robert Gordon of Lochinvar, the owner of Kenmure Castle and probably the creator of a garden there (Brown 2012, 173–4) and to John Murray of Lochmaben, later Earl of Annandale, who was a groom of the bedchamber to James VI. James is reputed to have visited Lincluden on his visit to Scotland in 1617, after his stay at Drumlanrig on his way to Dumfries (M'Dowall 1886, 157; Mc Neill 1996, 45) The remains of the garden emerged when the site was in the process of being put in order by the Office of Works after it came into state care in 1922.

A workman on the motte looked down on to bare earth covered in frost and noticed a pattern was visible. A subsequent excavation revealed the features beneath (Reid 1931, 9). It was put into repair on the instructions of Sir Charles Peers, the Chief Inspector. The garden is overlooked by a motte of Anglo-Norman date based on a natural ridge. This has been transformed into

a terraced garden mount which survived at least until the later eighteenth century,

Parallels for the King's Knot outwith Scotland

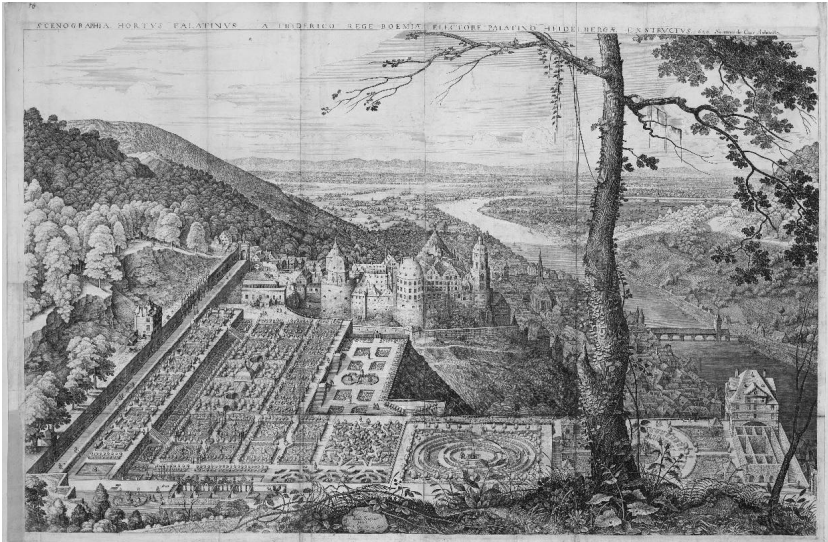
Octagonal designs, as at the King's Knot, appear in garden settings in Androuet du Cerceau's sixteenth century volumes *Les Plus Excellents Bastiments de France*, but more usually as architectural or sculptural features, such as the pavilion at Gaillon and the fountain at Blois (Androuet du Cerceau 1998, not paginated). There is a plan dated 1609 in the Royal Institute of British Architects Drawings Collection for Ham House, near London, by Robert Smythson. This shows an octagonal, stepped, sunken garden measuring about 85m by 66m centred on an oval parterre which could be viewed from the raised gravel paths around it (RIBA 12941).

Perhaps the closest parallel in England appears on a plan (RIBA 29111) by Simon Basil, drawn by Robert Smythson, showing the gardens at Somerset House on the Strand in London. This depicts the changes considered by James' Queen, Anne of Denmark. This private garden was designed to be adjacent to the proposed extension of Somerset House, then renamed Denmark House. It consisted of two shallow terraces linked by short flights of steps. Below, towards the River Thames, there was a square garden with paths around the perimeter paved with black and white stone linked to a circular walk. Within this was an octagonal setting designed for a mount, in this case intended to represent Mount Parnassus, the home of Apollo and the Nine Muses.

The plan of the King's Knot, if not the elevation, provides a parallel. This was a popular Renaissance subject for sculpture: representing poetry, music and all the arts. The account of King James' return to Scotland plays on this theme (Adamson 1618). In 1613 the Parnassus Mount at Somerset House was described by a foreign visitor as surmounted by a Pegasus; a gilded horse with wings, accompanied by various statues, including one of black marble representing the Thames. The Parnassus Mount was the work of Salomon de Caus, a French Huguenot engineer, who had visited various gardens in Italy, including Pratolino, before working in Brussels for the Archdukes Albert and Isabella. A hundred years later the gardens at Somerset House had been flattened.

Perhaps the most famous gardens Saloman de Caus worked on were those at Heidelberg which survived for only a few years before they were destroyed during the Thirty Years War. They were created for Elizabeth of Bohemia, the daughter of James VI who married the Elector Palatine of the Rhine.

Figure 5. The gardens of Heidelberg Castle, as laid out in 1620 by Salomon de Caus. 1620. ©The Trustees of the British Museum.



Later modifications to the appearance of the King's Knot

There has been some discussion about the authenticity of the current state of the garden below Stirling Castle. Earthworks appear on a painting of the 'Burgh and Castle of Stirling' by Vorsterman and on a plan of Stirling dated 1725 (RCAHMS 1963, Plates 120, 121). Vorsterman's picture of the Castle, late in the seventeenth century, shows trees in a garden which resemble the smaller quadrilateral garden, rather than the Knot itself, and its details do not greatly resemble the present appearance of the site. This has led to the suggestion that the King's Knot might have been considerably altered, perhaps originally having been on a different alignment (RCAHMS 1963, Plates 120, 121).

This change was supposed to have taken place about 1867 following Queen Victoria's and Prince Albert's remarks on the neglected appearance of the King's Knot during a visit to Stirling. After some time had elapsed, a 'thorough restoration and renewal was accomplished under the care and supervision of the late Provoost Rankin and Mr Mathieson of Her Majesty's Office of Works, the original well-defined plan scrupulously adhered to and the main part of the work consisted in repairing the ravages effected by frost and rain during centuries of neglect and having the whole surface re-sown with grass and re-turfed where necessary' (Shirra 1889, 34). Comparison between the Ordnance Survey large scale plan of Stirling, surveyed in 1858, with a digital plan of 2011 by RCAHMS (GV004973), reveals that there has been little change over the last

century and a half. Less detailed plans from earlier in the nineteenth century, such as that by Loudon in the *Gardeners' Magazine* of 1842, show an earthwork of essentially the same form. The lower area of the garden was referred to as the Queen's Knot and part of it was included by Loudon on his plan (Loudon 1842, 596–606).

During the eighteenth century various historians and travellers mention the gardens. Sibbald, writing in 1707, refers to '*an Orchard and the vestiges of a large and spacious Garden*' (Sibbald 1892, 46). Defoe refers to the gardens as '*very old fashion'd*' but adds that the '*Figure of the Walks and Grass-Plats remains plain to be seen*' (Defoe 1727, 753–4). Pennant refers to the King's Knot '*where according to the taste of the times, the flowers had been disposed in beds and curious knots, at this time very easily to be traced in the fantastic form of the turf*' (Pennant 1776, 225).

Nimmo, who composed his *History* prior to 1777, says that '*in the garden is a mound of earth in the form of a table known as 'The Knot' where, according to tradition, the court sometimes held fêtes champêtres*'. His editor continues '*Around the garden in Mr Nimmo's day were the vestiges of a canal on which the royal family and the court arrived in barges,*' which was destroyed by the construction of a public road (Nimmo 1880, 1, 82). This story was continued by later writers, but there is now no surviving evidence for such a structure, although the creation of a canal would be entirely in keeping with seventeenth century garden in Scotland at this period. There is also no trace of the fish ponds which, according to the many references in the Master of Works Accounts, undoubtedly existed during the sixteenth and the earlier seventeenth centuries. The considerable amount of paid work on the '*casting of the stanks*' in 1616 (*MW* 2, 163–72) may actually relate to a water garden of which there is no surviving evidence other than late and romantic tradition.

The earthworks of the gardens at Stirling survived because of a provision written into the later rentals for the area of the King's Knot that the land should be used only for grazing and must not be ploughed (NRS, SC67/49/17, p.439). It is to the care of the Keepers of Stirling Castle and the desire of the citizens of Stirling that this remarkable monument should be preserved, that Scotland may boast of this example of a major early seventeenth century formal garden.

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STIRLING'S OBSERVATORY: THE HIGH SCHOOL TELESCOPE

Alan Cayless

An Observatory for Stirling: Nestled among the historical buildings in Stirling's old town is a hidden treasure of Victorian engineering and ingenuity. Spittal street winds its steep way from Stirling Castle, first past the Church of the Holy Rood and then the Old Town Jail, before coming to the building that until 1962 was the High School of Stirling. At the south-eastern corner stands the observatory tower. Best viewed from lower down Spittal Street and looking back up the hill, the characteristic green colour of the weathered copper observatory dome stands out against the masonry, making it a distinctive feature of Stirling's Old Town skyline.

Figure 1. Observatory tower, 1951.



Photograph by James Atterson. Frontispiece to *From Castle Rock to Torbrex* (Thomson and Strachan 1962)

The observatory dome houses a 12.5 inch Newtonian reflecting telescope, housed in an oak barrel nine feet in length. It is mounted on a cast-iron German equatorial mount which allows it to be directed towards any part of the sky and to follow the apparent motion of celestial objects across the sky as the Earth rotates on its axis. Installed in 1889, the mount, telescope and dome are splendid examples of Victorian engineering and part of Stirling's heritage.

Originally installed for the use of science classes at the High School, today the telescope is in full working order and in regular use for night classes and astronomical observations. Maintained and operated by Stirling Astronomical Society, the observatory receives over one

thousand visitors a year from all over the world. The location on Castle Hill is well-placed for astronomical observations, with wonderful panoramic views of the night sky to the west, south and east. The view to the north also provides dramatic night time views of the historical skyline of Stirling's Old

Town. Although the building is now a hotel, the observatory is used on specific occasions during the year and is open to the public by arrangement.

The telescope continues to be used for the purpose for which it was originally intended and through regular use, the Astronomical Society aims to preserve it in as close as possible to its 1889 condition for future generations as a part of Stirling's history.

The School on the Hill: A.F. Hutchison (1866-96) was the first rector of the High School of Stirling and author of the definitive history of the School, published in 1904 (Thomson and Strachan, 1962). Records of a Grammar School on castle hill go back as far as the Reformation in 1560, although Hutchison is confident that there was a pre-reformation school in Stirling as far back as the middle of the twelfth century (Hutchison 1904, p5). The history of the High School itself begins in 1854 with the laying of the foundation stone for the school buildings in Spittal Street on the site of the old monastery of Greyfriars and opened as a school for the first time in 1856. Originally based around a quadrangle, the buildings were later extended in 1889 with the addition of the tower that was to house the observatory and telescope.

By April 1887, with the aid of a Government Building Grant from the Department of Science and Art (Hutchison 1904, p213), the construction of the extension began, with the laying of a foundation stone taking place on the 14th October in a ceremony attended by many local dignitaries, former scholars and benefactors including Sir Henry Campbell-Bannerman, then MP for the Burghs. The extension, designed by architect James Maclaren F.R.I.B.A., himself a former pupil, was originally intended to house a public baths in addition to the observatory tower. Prompted by the formation in 1886 of a governing body known as the Governors of the Stirling Educational Trust, and a government act empowering this body with the administration of various local endowments so that it: "*... became possible to provide the splendid building and equipment for science and art study, which supplies the wants alike of the High School and the Evening Classes*". (Hutchison 1904, p 212).

The original estimate for the construction, as provided by the architects, was £7000. The swimming baths were eventually left out in order to save money (£711), but the construction of the extension and the observatory tower were completed with the help of the borrowing powers of the Educational Trust and the installation of the observatory equipment was facilitated by donations from MP Sir Henry Campbell-Bannerman, who paid for the observatory dome, and local businessman Laurence Pullar, who provided funds for the telescope. The telescope was designed and constructed by Sir William Peck, an Edinburgh instrument maker and first City Astronomer of Edinburgh (Astronomical Society of Edinburgh, 2017).

Thomson and Strachan remark: *"The Spittal Street wing of the School was added in 1889, to the design of a former pupil, Mr J. Marjoribanks MacLaren, F.R.I.B.A. Its dominating observatory tower, whose revolving dome was the gift of Sir Henry Campbell-Bannerman, is unique among schools"*

At this time the school had approximately 700 pupils. From 1878, the teaching of science at the High School had flourished with the appointment of Mr Alexander Croall as teacher of Botany and Natural History. Mr Croall, who also held the office of Curator of the Smith Institute, is described by Hutchison as *"... a man of rare acquirements and singular modesty, whose enthusiasm for natural science was most stimulating to his pupils."* (Hutchison 1904, p206). From 1889 to 1901 the headmaster of the science department was Mr Wilson, former headmaster of the Falkirk Science School, who was succeeded in 1901 by A.S. Third, previously science master in Arbroath. Hutchison describes the science facilities in the new extension in the following terms: *"The portion set apart for Science comprises a large theatre or lecture room, preparation room, physics laboratory, and private laboratory or still room. Immediately above, in the tower, is the chemical laboratory, communicating with the preparation room by a hoist, the balance room, and a dark room for photographic purposes. On the summit of the tower are the observatory buildings, consisting of a telescope house, with revolving dome, and a house for transit instrument and astronomical clocks. These observatory buildings were the generous gift of the Right Hon. Sir Henry Campbell-Bannerman, M.P., while the astronomical instruments were provided, with unstinted liberality, by Mr. Laurence Pullar, Bridge of Allan."* (Hutchison 1904, p216) (Plate 5/a).

Figure 2. The new extension with observatory tower and dome.

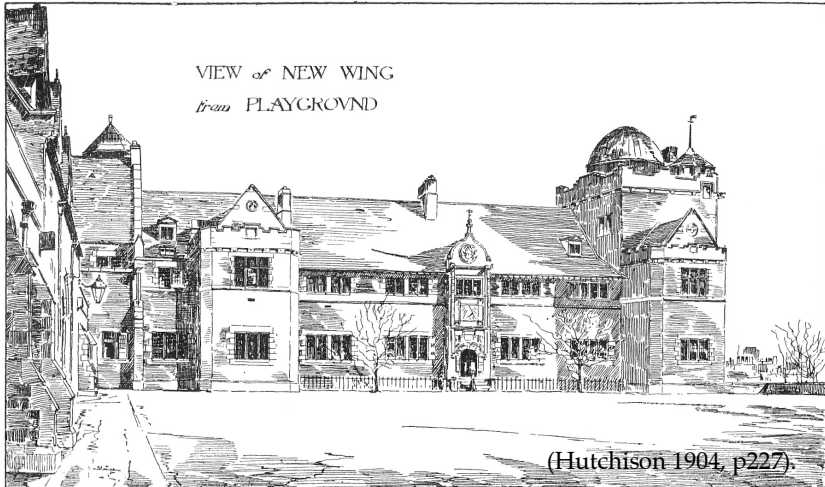
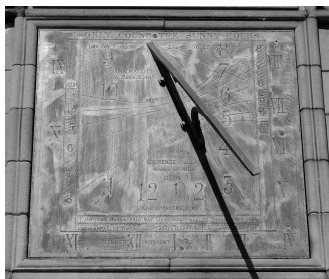


Figure 3. School Sundial.

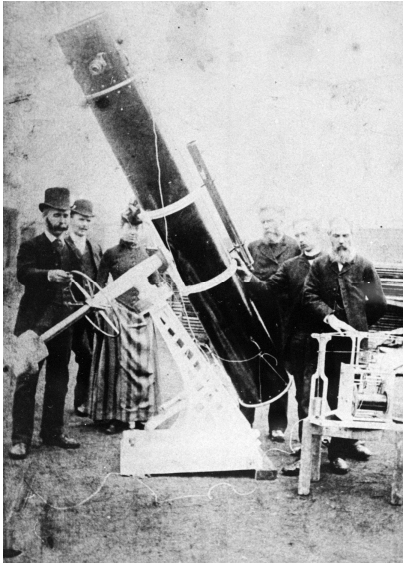


In addition to the observatory, a sundial also designed by William Peck can be seen above the entrance door. In 1903 a further new wing was added to the south-west side of the school, adjacent to the observatory tower on the right hand side as seen in this image, completing the quadrangle. With the additional facilities provided by the extension, classes at the school were reorganised, with four courses for pupils at the Upper School, including Scientific or Technical. The science classes were taken by Mr Andrew Wilson, F.I.C., who was himself an experimenter and inventor whose accomplishments include a patent for stabilisation of ships, taken out in 1890. The science classes made use of science laboratories housed in the new extension, and of the observatory itself. A.F. Hutchison, who had held the office of Rector since 1866, retired in 1895 and was followed as rector first by James Cruickshanks Smith, and then in 1899 by John William Critchley. In 1902 George Lawson, head of the mathematical department at the school for over twenty years, was promoted to Rector, taking up the appointment on the 27th September.

In 1962 the High School was relocated to a new site approximately one mile to the south of the city centre. The 25th April 1962 marked the last day at the site in Spittal Street and by the 17th May 1962 the School had transferred to new buildings in Torbrex (Thomson and Strachan, 1962).

William Peck – genius and inventor: In order to equip the observatory with the finest astronomical instrument, the governors turned to William Peck, F.R.S.E. and F.R.A.S. (1862-1925), an Edinburgh astronomer, inventor and instrument maker. Peck was also a prolific author and in 1887 had published *The constellations and how to find them*, a collection of 13 celestial maps showing the positions of the constellations in the sky during each month of the year – described by Peck as “*A popular and simple guide to a knowledge of the starry heavens*”. Peck later published patents on improvements in astronomical indicating instruments, and also on improvements in internal combustion engines and in military periscopes. In 1889 Peck was elected a Fellow of the Royal Society of Edinburgh (3rd June 1889) and at only 27 years of age, designed, constructed and installed the Newtonian reflector, with a 12.5 inch primary (concave) mirror of 9 feet focal length, in the rooftop observatory of the High School of Stirling.

Figure 4: William Peck.



Photograph courtesy of Dr David Gavine and a Mr Stuart in Kent (Mackay 1976).

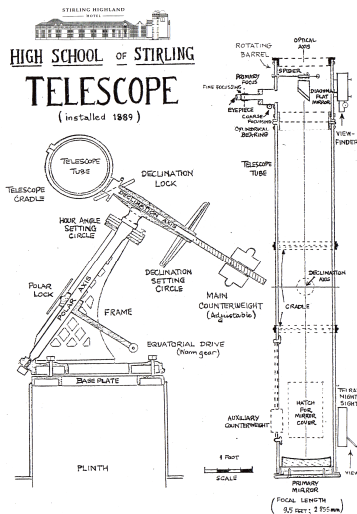
In this photograph, believed to have been taken at Edinburgh Haymarket station, William Peck is the middle of the three gentlemen on the right, with his hand resting proudly on the telescope he constructed. The clockwork drive mechanism, now lost, can also be seen in the foreground. Sometime between 1886 and 1896 (sources vary regarding the exact date) Peck was appointed as the first Edinburgh City Astronomer and Director of the Edinburgh City Observatory at Calton Hill, which was re-equipped following the relocation of the Royal Observatory to Blackford Hill. Peck was knighted in 1917 and ran the City Observatory with his assistant John McDougal Field until his death in 1925. Peck was buried in Warriston Cemetery in Edinburgh together with his wife Christina (d. 1922) and their

grave, marked by a granite obelisk bearing hieroglyphic markings, can still be seen there today.

Design and construction of the telescope: The High School Telescope is an example of a Newtonian reflecting telescope, working on the principle of mirrors, rather than lenses, to capture light from distant astronomical objects and focus it to form an image. Invented in 1668 by Isaac Newton (1642-1727), the reflecting telescope was intended to overcome the problem of chromatic aberration common to traditional refracting telescopes based on lenses. As light passes through the glass of a lens it is split into the rainbow colours – this is a particular problem for astronomical telescopes, in which a bright object such as a star or planet, seen against the dark background of the sky, would appear surrounded by coloured fringes or haloes, reducing the contrast and resolution of the image. Based on his extensive studies of the properties of light, and of the phenomena of refraction and reflection (Newton, 1730), Newton realised that when reflected by a mirror rather than passing through glass, rays of the different colours were all reflected at the same angle, avoiding the problem of chromatic aberration.

In 1668, then just 25 years of age, Newton constructed his first reflecting telescope, using a concave mirror of just two inches in diameter (stopped down to an aperture of 1.3 inches) made of polished speculum metal in a barrel less than seven inches in length (Hall and Simpson, 1996). A later, slightly larger model was presented to the Royal Society in 1671 (Royal Society, 2017, Peck 1891 p98). In total, Newton is believed to have made three such telescopes, with the original from 1671 still in the possession of the Royal Society.

Figure 5. Design and construction of the Stirling High School Telescope.



From the archives of Stirling Astronomical Society.

form an image back near the top end of the tube. A small secondary mirror, mounted at a 45 degree angle in the centre of the upper end of the tube, deflects the light sideways into an eyepiece. As a consequence of this design, the eyepiece sits on the side of the tube near the open upper end of the barrel. With a focal length of 9 feet, this means that when directed towards a celestial object high in the sky, the eyepiece can be far above heads of the observers. The observatory is therefore equipped with stepladders enabling observers to view in comfort. Peck also ingeniously made the upper section of the oak barrel rotatable in order to present the eyepiece at a convenient angle as the telescope turned on its equatorial mounting (Plate 5/b).

221 years later, William Peck built the telescope for the observatory at the High School of Stirling on the same principles as Newton – a single large mirror to collect the light is mounted at the bottom end of a hollow oak tube [Figure 5]. Perfected by Herschel and others, about the only change (apart from size) from Newton’s original design being the use of a parabolic, rather than spherical, profile to the mirror in order to correct for spherical aberration. Light from a distant object such as the Moon enters the open upper end of the tube, travels all the way to the concave primary mirror at the bottom and is reflected by the parabolic surface of the mirror to

Figure 6. Peck telescope and mounting.

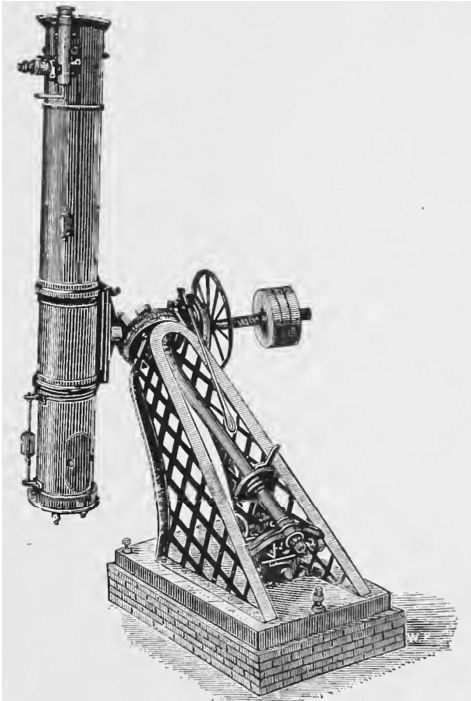


FIG. 36. A MODERN REFLECTOR EQUATORIALLY MOUNTED,
CONSTRUCTED BY THE AUTHOR.

(Peck 1891, p105).

the light is reflected from the front surface of the mirror, only one optical surface needs to be figured and polished and the mirror can be supported from behind, whereas lenses can only be supported around the edge. Lenses must be made of optically perfect glass to allow the light to pass, and are often made of multiple elements requiring several surfaces to be accurately shaped and polished – all adding to the cost and complexity.

All large observatory telescopes today (and indeed, space telescopes such as the Hubble Space Telescope) are based on Newton's principle of using mirrors rather than lenses. The layout and configuration of these modern instruments is slightly different, with the secondary mirror generally directing the light along the axis and through a hole in the main mirror where it is to cameras, spectrometers and other scientific instruments, but the basic principle of using a large curved mirror

In his *Popular Handbook and Atlas of Astronomy*, Peck presents an engraving depicting the Stirling telescope, on its cast iron equatorial mount. The main shaft of the mount is angled upwards at 56 degrees and is aligned with the north celestial pole (the observatory is located at $56^{\circ} 07' 08'' \text{N } 3^{\circ} 56' 27'' \text{W}$, as shown on the wall sundial. Once aligned with a particular celestial object, it is only necessary to rotate the telescope about this axis in order to follow the apparent motion of the object across the sky as the Earth turns on its axis. Originally driven by a clockwork drive mechanism, the entire assembly is finely counterbalanced and can easily be moved with one finger.

Mirrors offer considerable advantages over lenses in addition to the absence of chromatic aberration. Because

Furthermore, Newtonian reflecting telescopes of exactly the same design as those of Peck and of Newton are still in use by and available to amateur astronomers today, offering arguably the best combination of aperture, image quality and price compared to other telescope designs. Other than fire and the wheel, there can be few other inventions that have stood the test of time and changed so little in almost 350 years as the Newtonian telescope.

Early use of the telescope: Following the installation of the telescope, Hutchison notes that: *"All the instruments were designed and the construction and erection conducted under the superintendence of Mr. William Peck, the City Astronomer of Edinburgh. Mr. Peck also designed the sun-dial over the quadrangle doorway; and he further added to the obligation under which he laid the school by delivering a peculiarly interesting course of lectures to inaugurate the study of astronomy."*

However, there is little further account of the use of the telescope in Hutchison's history of the school. It is known from the notes of Ken Mackay that the observatory was initially in the charge of Mr Lowson, and that by 1891 a series of evening classes were being given in the winter months (Mackay 1976). Other masters, including Andrew Wilson, head of the science department, were also involved, but Mackay notes that among former pupils of the High School there are no details or recollections of the use of the telescope after about 1906. An edition of School magazine *The School on The Rock* from 1928 makes no mention of the telescope or observatory (Various 1982).

In a recent development, a document handed in to the Highland Hotel by a member of the public and passed on to the Astronomical Society details eight numbered "Rules and Regulations" for the Stirling Observatory (Stirling Astronomical Society 2017). The document details a Society and a Committee and outlines the provision of regular evening classes and evenings on which the observatory would be open to the public. The rules detail season ticket charges of 2/- for teachers and of 1/- for "Pupil-teachers", giving access to the telescope on Friday evenings .

Rule 7 notes that: *"... in the case of such events as Eclipses, Transits of Planets, Occultations or other phenomena of short duration, which it may be desirable to observe with special care, the Committee shall have power temporarily to suspend the above Rules, as to hours and conditions of admission, and to make such arrangements as may be necessary for scientific observation."* In addition, Rule 8 states: *"In the case of such phenomena as the appearance of Comets or remarkable Sun spots, the Committee shall have power to afford the Members or the public larger opportunity for viewing them."*

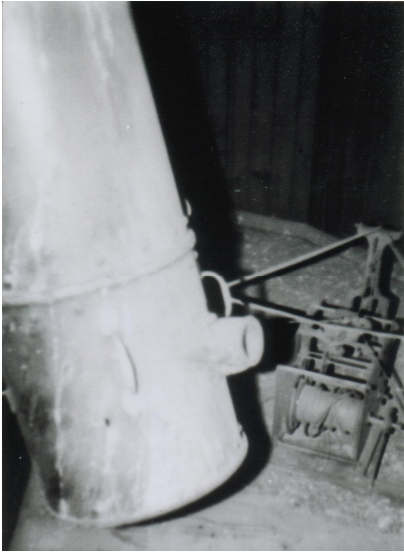
The date of the document is indistinct, but appears to be from 02 Feb 1913. The initials "AW" on the document are possibly those of Andrew Wilson, the science master. These Rules and Regulations form the latest documented use of the telescope in this period and it is believed that at some time shortly after this, possibly partly as a result of the First World War, that the telescope fell into disuse and remained so until the High School closed its Spittal Street doors for the last time in 1962.

Restoration: The following description of the restoration of the telescope is based on an account written in 1976 by Dr. Ken Mackay (1931-2014) and reproduced in a leaflet of the Astronomical Society. Dr. Mackay was at the time a physics teacher at the High School in Torbrex and following the successful restoration of the telescope, founder member and President of the Stirling Astronomical Society. Dr. Mackay relates: *"Attempts have been made over the years to rehabilitate the observatory. In the mid-1950s, a prominent professional astronomer estimated [that] it would take £1500 to restore. When the High School moved to the building at Torbrex in 1962, the observatory was not completely abandoned, as the mirrors were kept in safe custody.*

In 1973, a request for information for an Open University project [from Dr David Gavine, President of Dundee Astronomical Society (Gavine, 1981)] led to a photographic survey of the condition of the observatory. At the same time, growing interest in Comet Kohoutek [C/1973 E1] stimulated a new member of the Physics staff, with some experience of astronomy, to enquire about the state of the School Telescope [this member of staff was Dr. Mackay himself]. January and February 1974 saw weekly restoration sessions taking place, with some 10 keen pupils and a number of specialist advisers. A report of 17th Jan summarised the situation regarding both the dome and telescope, and proposed that £30 - £40 be spent, once the derusting and repainting was finished, on restoring the observatory to basic working condition. Optical parts to replace missing components were purchased from Franks, in Glasgow, while technical help was provided by Mr Littlefair of the High School and Mr Harrison of Stirling University. Re-aluminising of the main mirror was done (free!) by Paisley College of Technology. The telescope was restored to functional operation towards the end of April, 1974." (Mackay 1976) Patrick Moore visited the project and viewed the telescope, shortly after restoration (Plate 5/c).

As can be expected after up to sixty years of disuse, the telescope was in a state of considerable disrepair. Additional work carried out at this time included cleaning and re-varnishing of the oak telescope barrel, repainting of the cast iron equatorial mounting and renovation of the system of wheels, cogs and gears operated by a large hand-cranked wheel for rotating the copper dome. Over the intervening years a number of the smaller detachable items such as eyepieces and the fine brass finder scope mounted on top of the main barrel had gone missing.

Figure 7. The telescope prior to repair.



(Photograph: Ken Mackay).

The clockwork drive mechanism which can also be seen in the foreground of the photograph in Fig 7 was not in a repairable condition and the drive is now hand-operated. The end result, however, was a fully working telescope and observatory that is still in regular use today.

Stirling Astronomical Society: In 1986, Dr. Mackay, together with other interested local astronomers, founded the Stirling Astronomical Society. The Objects of the Society were originally stated as “. . . to foster interest in Astronomy and Space Science and to promote and encourage Amateur Astronomical Observation”. These Objects were later expanded as follows. *“In furtherance thereof, the Society shall seek to:*

- a) *hold regular public lectures;*
- b) *organise observation evenings;*
- c) *conduct public evening classes;*
- d) *co-operate with local Schools and other groups in studying Astronomical subjects;*
- e) *maintain the historic telescope in the Observatory at Stirling Highland Hotel, and demonstrate it to the public.”*

(Stirling Astronomical Society 1986, 2001).

The Astronomical Society continues in the pursuit of these aims with regular public lectures at the Smith Institute on the second Friday of every month from September to May, and with evening classes in the Highland Hotel. The Society continues to maintain close links with the High School, and in keeping with these objects (and indeed, Rules 7 and 8 of the 1913 Rules and Regulations) has facilitated public viewings of recent astronomical events including the solar eclipse of 20 March 2015 in an event at the High School, viewed by up to 900 pupils and teachers, the transit of Mercury on 09 May 2016 viewed from the observatory tower, and comet C/2011 L4 (PANSTARRS) in March 2013, again photographed from the observatory tower.

Figure 8 – The Moon, photographed through the High School Telescope.



(Photograph: Alan Cayless).

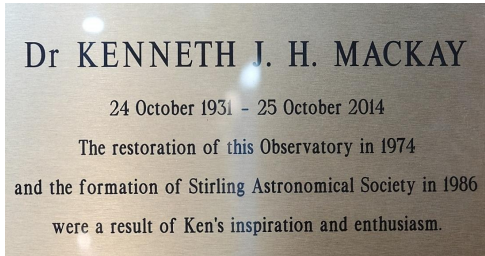
The telescope in use today: The main mirror of the telescope was recoated again in 2004 by Orion Optics of Crewe. This process involves chemically removing the old aluminium coating and depositing a new reflective coating on the polished glass surface of the mirror. In doing so, only the thin aluminium coating is replaced: the original hand-polished parabolic curved surface from 1889 is retained.

A test report carried out at the time shows the mirror to have been polished to an accuracy of one wavelength of light and confirms the focal length as 2.903 m (Orion Optics 2004). With this recoated, but original, mirror together with other ongoing maintenance the telescope continues to give high quality views of the night sky, with frequent observations of the Moon, planets including Jupiter and Saturn, and of the brighter star clusters and nebulae.

Visitors to the observatory and participants in evening classes can learn about the age of the lunar surface and the processes by which the craters and other features on the Moon were formed. The rings of Saturn are clearly visible, as are the four main moons of Jupiter, just as they were observed by Galileo in 1610. In viewing the Great Orion Nebula (M42) the telescope can show regions in which new stars, planets and eventually solar systems are being formed. All of these celestial objects and phenomena are visible clearly from the High School Observatory in the centre of Stirling.

An Observatory for the future: In 2017 a plaque commemorating Ken's role in restoring the telescope and forming the Astronomical Society was attached to the plinth of the telescope.

Figure 9. Commemoration plaque.



(Photograph: Alan Cayless).

One hundred and twenty eight years after it was originally installed, and forty-three years after its restoration, the High School Telescope continues to be used for its original purpose, as well as being of engineering and historical interest to thousands of visitors from all over the

world. The High School Observatory is a proud part of Stirling's heritage that will continue to provide access to the wonders of the night skies for generations to come.

Acknowledgements: The Society is indebted to the family of Ken Mackay, and in particular to Murray Dickie, for access to the papers and archives of Dr. Mackay. The Society would also like to express our thanks to the management and staff of the Highland Hotel, Stirling for their continued support in maintaining the building and access to the observatory and for their generous provision of teaching rooms and facilities for evening classes. Additional thanks to Stirling Astronomical Society members Brian Byrne, for scanning and collating documents from the archives of Ken Mackay, to Bert Mackenzie for unearthing several interesting documents, and to Sandi Cayless for additional research into William Peck.

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THE LOST SETTLEMENTS OF THE THREE FIELDS

Murray Dickie

The Clackmannanshire Field Studies Society obtained a National Lottery grant through the Heritage Lottery Fund in partnership with the Inner Forth Landscape Initiative to undertake a four year research project on aspects of the development of the Two Estates of Alloa and Clackmannan, with particular emphasis on the 18th and 19th centuries. The grant enabled local volunteers to be trained and supported to research a number of topics. Fourteen local volunteers were involved in undertaking the desk and field-based research into this topic from May 2014 to October 2015. During the desk-based research for our first project, Clackmannanshire Colliery Waggonways, we came across evidence of the small mining village of Westfield. The village is shown as a substantial settlement of forty three dwellings on the Ordnance Survey (OS) First Edition, 25 Inch Map, which was surveyed in 1861. We were intrigued to discover during our field research that this village had completely disappeared.

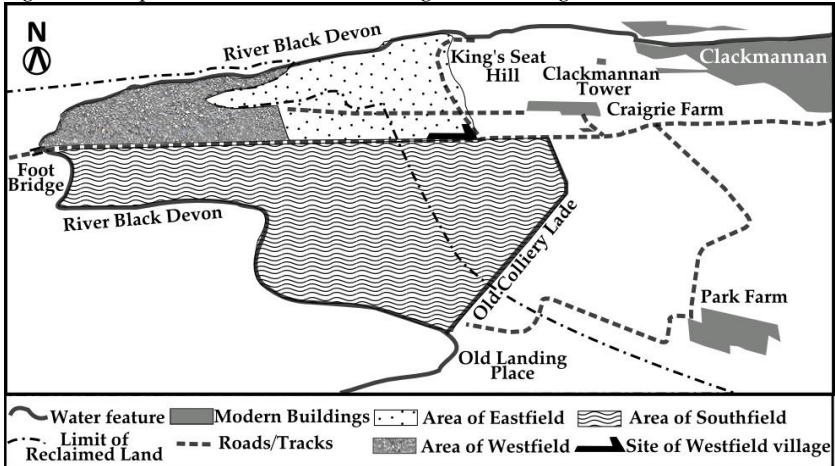
Figure 1. Site of Westfield Village, 2015.



Having collected a considerable amount of material on this village and the surrounding area, we came to realise that the village of Westfield represented the culmination of centuries of settlement in the wider area and that these settlements had all disappeared.

Research into old maps revealed that the area was once divided into three "fields"; Eastfield, Westfield and Southfield (*Russell, B., 2003 and Horn, J., 1814*). The area lies on the Carse lands of the River Forth mostly on land reclaimed from the sea. It is located in a loop of the River Black Devon, bounded to the East by the King's Seat Hill and the line of an old colliery lade.

Figure 2. Oblique view from the Old Landing Place, looking North.



Based on information from Old Ordnance Survey Maps and Google Earth, 2016.

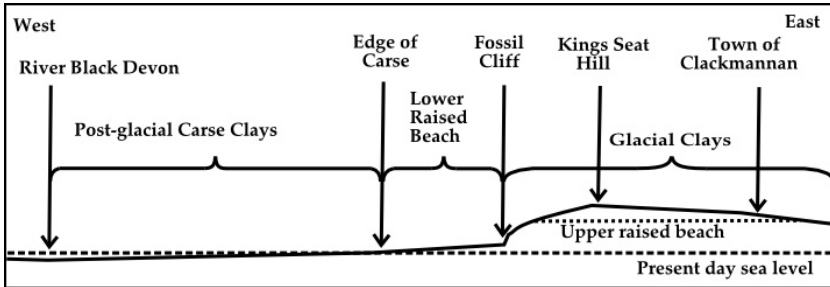
Landscape Elements

The three fields of Clackmannan lay in a low lying area of the Carse of the river Forth which is underlain by post-glacial deposits, mainly estuarine clays. This area is bounded to the East by a glacial clay mound, which was laid down and moulded into a ridge running West to East by the last ice sheet to cover this area (Francis, E., 1970). The ridge is called King's Seat Hill and Clackmannan Tower sits on its summit. The church and medieval town of Clackmannan are sited lower down on the spine of the ridge.

The weight of the ice sheet pushed down the land surface in this area by about 40 metres. When the ice finally melted, some 10,000 years ago, the sea flooded into this depression, drowning much of the area of the Inner Forth. An extensive raised beach was developed at about 127 feet (40 metres) above present sea level. As the land surface slowly rose back up again, a further series of raised beaches and cliff lines were created (Francis, E., 1970).

The base of the King's Seat hill has a well-developed cliff line around it, carved when the sea was still at a slightly higher level than today. This higher sea level deposited a raised beach at the base of the cliff line. As the land rose up further, the cliff line and beach were left as fossil remains. During the lengthy period when the post-glacial sea covered much of the area of the Inner Forth, the extensive deposits of Carse clays were laid down, forming a very level area stretching from Bo'ness in the East to Aberfoyle in the West.

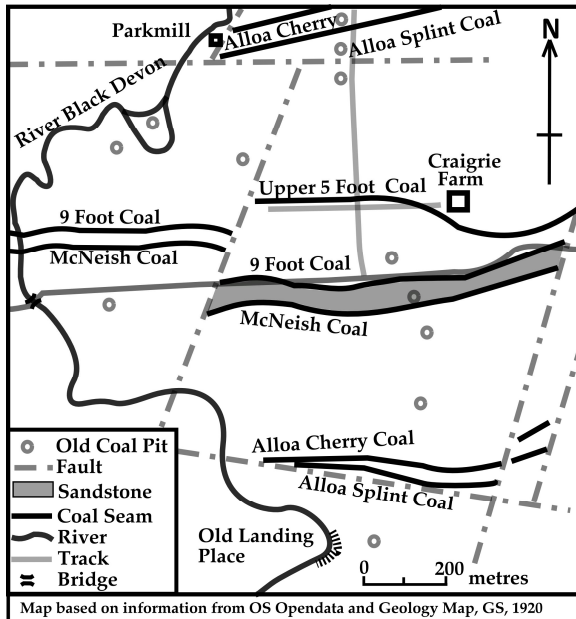
Figure 3. A cross section through the Three Fields and Kings Seat Hill.



Based on information from Old Ordnance Survey, OpenData and Google Earth, 2015.

The river Black Devon comes down through the raised beach deposits and then meanders across the clays of the Carse to join the River Forth. Over time, the river Black Devon has often changed its course (*Lens, B., c 1710*).

Figure 4. Geology of the Three Fields.



The area is underlain by rocks formed during the Carboniferous period. There were many seams of workable coal and ironstone and a band of high quality sandstone (*The British Geological Survey, 2008*). The coal seams are inclined at an angle of 1 in 6 towards the north (*Bald, R., 1812*). The rocks are broken up into small blocks by a number of fault lines. Once a pit had worked out the coal seam in a block it would be abandoned and another pit opened in the next block. Older pits were often re-opened at a later date to work a deeper seam below (*Williamson, J., 1877*).

As the rise of the flooded land slowed, much of it still lay between low and high tides. The rivers are rich in silts, constantly depositing new layers of mud. The rise and fall of the tides created mud flats at the edge of the river and salt marshes slightly further inland. This view of the river Black Devon at low tide shows the mudflats and the edge of saltmarsh on each bank.

Figure 5. Mudflats on the river Black Devon.



Figure 6. Area of Saltmarsh.



At the landward edge of the mudflats the land is out of the water long enough for salt tolerant vegetation to grow. These salt marshes are regularly flooded and networks of small channels have developed where the waters flow out at low tide. From the mid-17th century a series of embankments have been built to reclaim extensive areas of the saltmarsh and some of the mudflats (*Moodie, R., 1791-99*).

The Clackmannan Estate

In 1147, King David II granted the church of Clackmannan, its chapels and forty acres of land, to the Abbey of Cambuskenneth. King Malcolm gave the Mill and lands to this monastery, excepting the multures of the King, which he might require when visiting. In 1231, Clackmannan was the residence of King William the Lion as a charter was signed there. King Robert the Bruce issued many of his charters from the Tower (*Bruce, W., circa 1868*). The present Tower was started by Sir Robert Bruce shortly after he was granted the barony of Clackmannan in 1359. This grant was made by his kinsman, David II, son of King Robert Bruce (*Historic Scotland, 2016*). There had evidently been

a royal castle on the site and the prominent hill on which the tower stands is known as King's Seat Hill. Subsequently the Bruce family of Clackmannan altered and added to their ancestor's tower. In the 1600s they built a new mansion to the West. The Bruce family of Clackmannan had been mining coal from the 16th century and exporting it from a landing place at Clackmannan Pow, which is located about a kilometre up the river Black Devon from its junction with the river Forth (*Gordon, T., 1926*). There was also a salt panning industry along the north shore of the river Forth, with pans at Kennetpans, Clackmannan and Alloa providing a market for coal (*Moodie, R, 1791-99*).

In the mid-17th century Sir Henry Bruce supported Charles I and suffered following his defeat. Although his titles and estates were later restored by Charles II (*Bruce, W., circa 1868*), Sir Henry had accumulated large debts. When David Bruce inherited the estate from his father in 1673 he acquired 3,500 chalders (5,250 tons) of coal, £8,000 free money and a great deal of debt. He went on to spend a considerable amount of money improving his collieries in Clackmannan and Sauchie. In 1693 he applied to Parliament for a trust deed on behalf of his creditors and in 1704 he applied again to Parliament for further protection (*Wallace, J., 1890*). William Dalrymple and Alexander Inglis purchased all of the debts of the estate, becoming the principal creditors (*Wallace, J., 1890 and Morrison, W., 1803*). It would appear that they originally intended to sell the estate by public roup, with Sir John Schaw of Greenock as a possible purchaser (*Lauder, J., 1756*). The roup was not successful and William Dalrymple managed the estate and developed the coal mines until his death in 1744.

The nature and date of the transfer of the ownership of the estate to the Dundas family is unclear, but may have come through marriage or by land grant. In 1738 Sir Lawrence Dundas of Kerse married Margaret Bruce, daughter of Alexander Bruce of Kennet and received several grants during the 1760s and 1770s, including Clackmannan in 1763 (*The Peerage, 2014*). The Zetland family continued to manage the Clackmannan Estate into the 20th century.

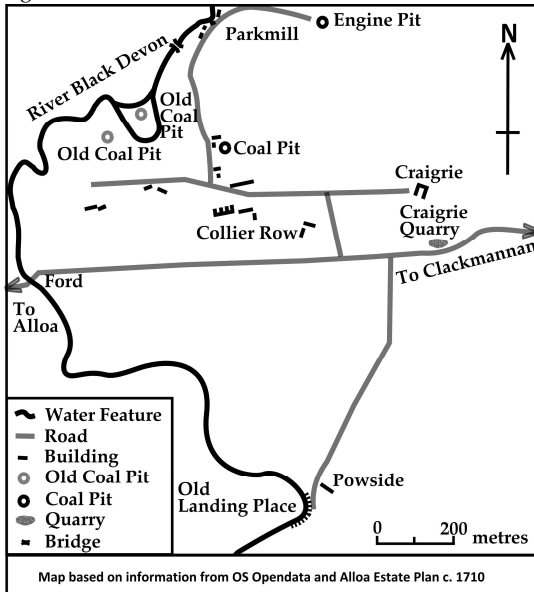
The Three Fields in the 17th Century

Much of the area of the Three Fields has been reclaimed from the sea. The earliest embankment in the Clackmannan area of the Carse was constructed in the mid-17th Century by the 5th Earl of Mar to reclaim lands around his farm of Ferryton (*Moodie, R., 1791-99*). The line of this embankment is shown on Roy's map of 1747-55 (*Roy, W., 1747-55*). The embankment was not substantial and was regularly swamped by the highest tides. As the River Forth is very silty, this flooding built up the level of the land behind the embankment. This process was described in the Humber estuary in 1829, where it was used deliberately to raise the level of land in an inter-tidal area (*Creyke, R., 1829*). It was reported there that an increase in the height of land of one to three feet

(0.31 to 0.93 metres) could be obtained in a single season, using all tides. In the case of the embankment constructed by the Earl of Mar, the flooding by only some tides each year would have meant that this increase in height would have been spread over many years.

The Ferryton embankment would have had an impact on the three fields by allowing at least some areas of pasture if not cultivation. The Bruce family of Clackmannan were working coal in the area as early as 1599 (*Gordon, T., 1936*) and the embankment would have allowed access to parts of the Eastfield and the Westfield to work the coal seams under them.

Figure 7. The Three Fields c. 1710.



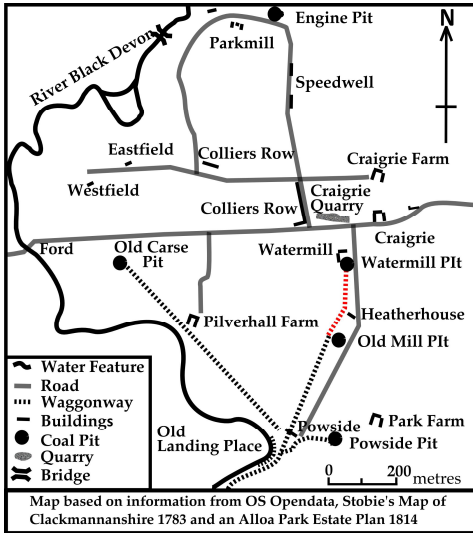
An estate map drawn for the 6th Earl of Mar circa 1710 shows a mix of farm buildings, cottages and colliers' rows on the Eastfield and the Westfield (*Lens, B. circa 1710*). It also shows there were two abandoned coal pits on the Westfield and an active coal pit and a water-powered "Engine Pit" on the Eastfield. There are references to the Craigrigie Quarry in the Erskine family papers of 1711, where the 6th Earl of Mar noted that he had agreed access to stone from the

Craigrigie quarry for improvements to his estate (*National Records of Scotland, 1712*). Apart from the landing place on the river Black Devon at Powside, there are no settlements shown at this time in the Southfield.

Roy's map of 1745-47 shows Eastfield and Westfield as areas of cultivation with some saltmarsh and the Southfield as mainly saltmarsh. By this time the mines in the Westfield had been abandoned and in 1765 the Alloa Cherry and Alloa Splint coals were being worked in Eastfield and Southfield (*Moodie, R., 1791-99*). In 1776 a horse drawn, wooden waggonway connected these pits to the landing place at Powside. The waggonway took advantage of a new embankment which had been constructed to help reclaim land on the Park farm and two new piers were built further down the river Black Devon (*Moodie, R., 1791-99*). By this time the first, long, L-shaped row had been built

at what was to become Westfield village. The Ordnance Survey Name Book of 1861 notes that this row had originally been built to house workers at Craigrig quarry. When the quarry closed, it had been taken over as housing for colliers (*Ordnance Survey Name Book, 1861*).

Figure 8. The Three Fields, 1783-1814.



By 1796 it was reported that 7,000 tons of coal were being exported from Clackmannan to Leith, Dunbar, Perth, Montrose and other places. These were taken to the harbour in waggons of a ton and a half, the mean distance from the pits being about three quarters of a mile (*Moodie, R., 1791-99*). During this period more houses were built at the colliers' row next to the Craigrig Quarry, forming a small village of 43 houses in three rows, now named Westfield (*Census Returns of Scotland, 1841*) In 1800, the

Zetland Estate leased the coal and ironstone pits, the colliery waggonyway and harbour facilities to the newly formed Clackmannan Coal Company (*Carvel, J., 1944*).

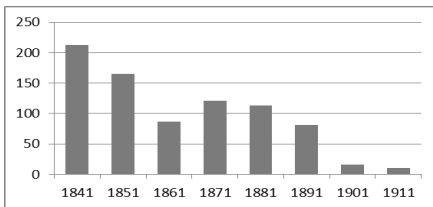
By the beginning of the 19th century the number of buildings on the three fields had decreased. There were small farm settlements at Eastfield and Westfield and four colliers' rows; one at Eastfield, one next to the Craigrig quarry and two at Speedwell. Three farms are shown; Craigrig, Pilverhall and Park together with small miners' settlements at Craigrig, Watermill, Heatherhouse and Powside (*Stobie, J., 1783 and Horn, J., 1814*). There were now four pits on the Southfield and an active quarry at the Craigrig. There are traces of two older quarries to the east of the main quarry on later Ordnance Survey maps. By the end of this period, changes in the pattern of farming meant that the scattering of small settlements had been replaced by a much smaller number of larger farms surrounded by enclosed fields. Similarly, the pattern of mining had changed, with extended water-powered drainage permitting deeper workings. These changes had major consequences for the distribution of population in the three fields. In addition, the Craigrig quarry had worked intermittently, eventually being extended to the West.

Westfield Village in the 19th Century

Mining continued to develop in the 19th century. In 1793 the Devon Iron Works had been established near the present village of Fishcross (*Court of Session, 1829*), creating a considerable demand for coal and ironstone (*Carvel, J., 1944*). By 1831 the Clackmannan waggonway had been extended northwards, at least as far as Hillend pit (*National Records of Scotland, 1831*). In 1832 the Clackmannan waggonway had been extended southwards again along another new embankment to the banks of the river Forth where a substantial pier had been built to accommodate larger ships (*National Records of Scotland, 1832*). By 1839 the Clackmannan waggonway had been connected to a private waggonway built by the Devon Iron Company to link their iron works to the Clackmannan coal and ironstone pits and the harbour at Clackmannan Pier (*National Records of Scotland, 1838*).

The 1841 census returns for the village of Westfield (*Census Returns, 1841*) shows that there were 43 houses accommodating 213 people. There were 120 adults and 93 children under 13 years of age. 45 adults were shown as being in employment, only one of whom was a woman (a farm labourer). Of the 56 men, 44 were in employment (35 worked in the coal pits, five worked in the stone quarry, two were general labourers, and there was a stock dealer and a schoolmaster). Of the 64 adult women, only one was shown as being in employment and one of independent means. Two boys, one aged 10 and the other 12 years old, were listed as “*coal miners*” The Second Statistical Account of Clackmannan in 1841 (*Balfour, P., 1841*) notes that the population of the parish had increased substantially in the period 1755 -1841 (1755 = 1,913, 1791 = 2,528, 1831 = 4266 and 1841 = 5,159) and that most of the increase has been due to the extension of coal working. By then more than three fourths of the population in the parish derived a living from the collieries and industries associated with them. Coal was the fuel used by all classes of people, priced at about 6s (£0.30) per ton and collier families had a free supply. The Account also noted that “*There is an extensive quarry about half a mile south west of the village of Clackmannan, owned by the Earl of Zeland producing light-coloured, hard and durable sandstone.*”

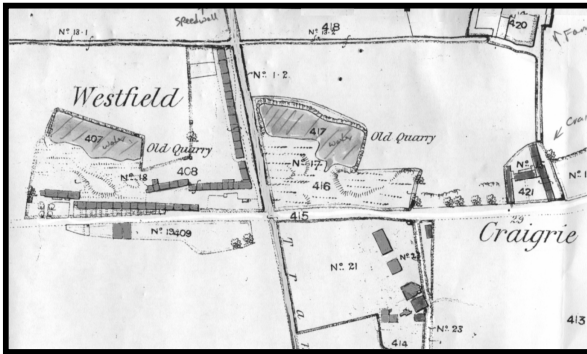
Figure 9. Population of Westfield, 1841-1911.



Data from ScotlandsPeople, 2015.

The census returns for the area from 1841 to 1911 show that the only sites occupied in the three fields were Westfield, Speedwell and Powside. The village of Westfield was at its height in 1841 and then declined, with a small recovery in 1871.

Figure 10. The Village of Westfield, c. 1845.



© Unattributed Source, Russell Website, 2003.

We are fortunate to have a very detailed map of Westfield in the mid-19th Century from the website of the Russell Family. This map is not attributed as to its authorship, but appears to be an earlier and more detailed version of the first edition of

the 25 inch Ordnance Survey map of the area. It shows the village at its maximum development with 43 houses in several rows or “tenements”. From a description in a report on housing (*Glasgow Herald*, 1875), it would appear that these were in three main groups, known as the Long Row (nearest Clackmannan village and the first to be built), the Middle Row and the Low Row (last to be built). The map shows both the Craigrie quarry and the later Westfield quarry as being disused and filled with water.

The period 1840 to 1900 is one of the best documented times. As well as very detailed maps from the Ordnance Survey; there were census returns for each decade; the Second Statistical Account; reports from Commissions on working conditions, housing, education and health and numerous references from national and local papers.

Lifelong Servitude

Coal miners and salters (workers in the salt pans) in Scotland had for centuries been slave labour. In 1605 the Scottish parliament passed an Act which bound them to land owners (*Acts of the Scottish Parliament*, 1605). It also enabled owners to claim anyone who was declared a “vagabond or sturdy beggar” (a person who was not gainfully employed but considered fit to work). A further Act of 1641 extended servitude to include other workers in the mines and forced the colliers to work six days a week. Even the 1701 “Habeas Corpus Act” of Scotland was not extended to them (*Acts of Scottish Parliament*, 1701). Servitude was eased in 1775 when Parliament passed an act to offer some freedom to colliers, coal bearers and salters (those under 21 immediately, those aged between 21 and 34 after 10 years, those aged between 35 and 45 after seven years and those over 45 after three years) (*Acts of the Scottish Parliament*, 1775).

However, it was not until 1799 that this servitude was finally ended (*Journals of the House of Commons*, 1799). Even after that date, colliers and their families were often tied by contract to a particular pit. As a result, mining families were often bound to a particular mine owner and lived in tied housing. The colliers were provided with a supply of coal. The importance of this for heating and cooking is underlined by a letter which was sent to a mine manager close to Clackmannan: *Saturday 30th May, 1840* - "Sir, all my three children is working in the work, and a have no fire to mak their meat, and, Sir, you must give me some Fire Coal to mak their meat or else a must stel them, but this is to let you know before a doso." (*Derbyshire Courier*, 1840)

Housing

Colliers' houses were located close to the pits where they worked as, until 1841, men and women and young children all worked together underground in the pit (*Bald*, R. 1812). These houses were meant to be temporary and were very basic, small dwellings, usually in a row. The rows were built directly on top of the soil and sometimes, below the level of it. The primitive housing had no damp course and the houses were always damp, as the following account records (*Glasgow Herald*, 1875). "Leaving the Pottery, I proceeded next to Westfield, where there are three rows – the Long Row, the Middle Row, and the Low Row, consisting of between thirty and forty in all. Taking them in this order, we go into the first house in the Long Row, a room and kitchen. Fires are lighted in both apartments, and on the hearth-stone of the room the woman of the house has placed two trunks with the lids thrown open in order to dry the clothes which they contain. This she requires to do every other day; and the contents of the boxes are often quite moist. The room beds are placed against the back walls, and as the ground outside is above the level of the floor it is not surprising that the sleeping places are damp. In the next house the kitchen is very damp, and the room altogether deserted. The neighbours have pretty much the same story to tell, and at the end of the row several of the tenements are unoccupied.

The middle row houses are a shade better than those we have left. They are on a better level and therefore less liable to damp. The low row is, however, the worst of the three, the houses being all unhealthy during wet weather, and more or less so even when the sky is bright. In one of them the tenant found it necessary to remove her room furniture to prevent it from being destroyed, and in another a piece of sacking laid in front of the room fire is quite black with damp. Here there are no fewer than ten persons living in a small room and kitchen. There is no regular water supply for the village, but Mr Allan, a neighbouring farmer, kindly allows the people to help themselves from his well. In summer this permission is often necessarily withdrawn, and then the villagers go to Wellmyre, fully half a mile away, where good spring water is obtained."

Given the difficulty of obtaining fresh water, residents of Westfield often went to great lengths to obtain a supply, sometimes with awful results. "Thursday 05 May 1870 - On Sunday afternoon a little girl named Fife living at Westfield Clackmannan, was drowned in a quarry hole there. She had gone to the place to get a pitcher of water and fell in, and no one being at hand to help her, she perished" (*Southern Reporter*, 1870). The lack of fresh water and any form of proper sanitation was a major problem and there were many outbreaks of disease associated with it. In May 1832 there was an extremely serious outbreak of cholera in Clackmannan Parish, with 43 individuals affected, of whom 14 died. The number of people affected in Clackmannan Parish accounted for some 40% of the total cases in Scotland at that time (*Public Ledger and Daily Advertiser*, 1832). In February of 1849 there was another outbreak of cholera in Clackmannanshire and five deaths in Clackmannan and Westfield (*Stirling Journal & Advertiser*, 1849).

The miner's single room cottages were generally overcrowded. Census returns show that the average occupancy over the period 1841 to 1911 was consistently around five, other than in 1861 where the availability of more empty houses reduced this (*Census Returns, 1841 to 1911*). Poverty and excessive drinking often went hand in hand. "Saturday 24 May 1862, Shameful Conduct - On Monday last a woman from Westfield, who had been deputed to receive the respective weekly allowances from the Inspector of the Poor, of a number of the paupers living in that locality, having received the money, amounting to some 22 shillings, went and made herself drunk and lost or squandered the whole of it." (*Dunfermline Saturday Press*, 1862).

Agricultural workers were not bound by the same legislative process as colliers, coal bearers and salters. However, the agricultural improvements which transformed the farming landscape in the late 18th and early 19th centuries impacted on them. There were forty fewer farms in the Parish of Clackmannan in 1794 than there had been twenty years previously. The replacement of small scattered farms by larger farms displaced many families from their homes (*Moodie, R., 1791-99*).

Working Conditions

Working in a coal mine in Scotland has never been easy, but in the 17th, 18th and early 19th centuries, it could only be described as dire. In the Inner Forth coal pits, coal was cut as "Great or Sea Coal" into large slabs for export (*Bald, R., 1812*). Mining families worked as a team. Men and older boys worked as "coal hewers", cutting the coal at the working face. Younger boys worked as drawers, moving the slabs of coal from the face to a roadway going to the shaft bottom. Young girls and boys worked as "putters", dragging wooden sledges and, later, hutches to the bottom of the shaft with several slabs of coal. When wheeled hutches were introduced they were easier to move and the task of hauling them was given to even younger children than

had moved the sledges. As the seams in the Clackmannan coalfield slope at a gradient of one in six, hauling coals in sledges or in a hutch was a very arduous task (*Brodie, W, 1834-45*). Women bearers were responsible for carrying the coal to the surface in baskets on their backs. In addition, many of the seams were less than five feet in height, making working conditions cramped.

In 1812 Robert Bald, a mining engineer who campaigned for the emancipation of women and children, described the work of colliers and the bearers still employed in carrying coals in the Alloa Colliery. He stated that the colliers (men and older boys) would leave home at 11.00 pm and start hewing coal into large pieces (great or sea coal) weighing about two cwts (102 kg). Women and younger children would leave about three hours later. The coals were carried up shafts to the surface by women bearers. Two men would help place a basket on their backs and then they would climb a series of six foot ladders up to the surface, carry the coal to the coal hill and stack it there. At that time colliers worked five days a week and 10 – 12 hours a day (*Bald, R. 1812*).

A Commission of Enquiry was set up in 1842 in response to concerns about working conditions in the coal mines (*Franks, R.H., 1842*). Below are some of the statements from young employees of the Devon Iron Company, who worked the Clackmannan pits in partnership with the Clackmannan Coal Company.

No. 307 - *Joseph Sharp, 12 years old, hewer:- Wrought three years in the mines; usual hours three in morning till two and three in the day; works with one brother and sister; all work on father's account; he is a reddsmen [road-maker]; brother Adam is 16 years old and wrought eight years below; sister Agnes is 18 past and been more than eight years in the pit; we take 30s. in the 11 days for our own work; can all read and father gives us a lesson at the writing when we home early. [Reads well and can shape a few letters; scarcely write his own name.]*

No. 308 - *Robert Hunter, 17 years old, hewer:- Been five years below; works 12 hours daily, sometimes less; is wrought on father's account; has done nothing at school since down; can read. [Reads, cannot write; dull.]*

No. 310 - *Ann P. Francis, 14 years old, putter:- Began to work when eight and a half years of age; not been to school much since; can only read. as have never been wrought at the writing; I wheel the carts, which hold 7cwt. to 8cwt. coal it is very ill sort of work, as we have to put four pins in the wheels, to lessen the rapidity of the movement, as the brae is very steep and the carts often peel my legs [take the skin off]; never very long laid idle. [Reads very well; knows the English Catechism well; attends the Episcopal Church, Alloa, regularly.]* (Reproduced by kind permission of Ian Winstanley and Picks Publishing, 1999 and the Coal Mining History Resource Centre.)

Life for a collier's family was extremely hard. The 1841 census of Westfield shows that of a total population of 213 only two men and two women were over 60 years of age. In 1851 there were no men and only one woman over the age of 60 and in 1861 there no men and four women over the age of 60.

The Mines and Collieries Bill was hastily passed by Parliament in 1842 (*Act of the GB Parliament, 1842*). The Act prohibited all underground work for women and girls and for boys under 10. In the Clackmannan Coal Company's mines the law was regularly ignored by colliery managers and workers. A trial was heard in Alloa Sherriff Court where "*In a trial under Lord Ashley's Act - In the coal mines of Clackmannanshire, the women wrought as wheelers to the workmen, who, it appears, both employed and paid them, and the defendant in this case was charged with having employed a female in the month of June last, underground, and in violation of the 13th Section of the Act....*". The manager of the Clackmannan Coal Company had been charged previously under the Act, but successfully argued that it was the workmen who employed the women and he did not know about it. The collier was found guilty, and sentenced to pay £5 with £3.2s costs or be imprisoned for a calendar month (*The Royal Leamington Spa Courier and Warwickshire Standard, 1844*).

The removal of women and children from underground working was not without its difficulties. There was debate in Parliament regarding petitions to amend the Mine and Colliery Act, which was passed in 1842 with a start date of 1st March 1843 (eight months later) to allow proprietors time to make alternative arrangements for drawing coals and women to find alternative employment (*London Evening Standard, 1844*). "*There has been in Scotland another class of proprietors who, on the passing of the Act formed themselves into a confederacy to obstruct its operation in every possible way*".

It was reported in the press that the sum of £100 was donated by a lady in England for the relief of women in Scotland who were still suffering from being excluded from working in the pits. Lord Ashley added money of his own and it was disbursed to four parishes in Scotland, one of which was Clackmannan. It was noted that "*The minister of the fourth parish, Clackmannan, very properly is retaining the sum sent, until he is satisfied that the females for whom it is meant have ceased to work below ground*" (*Morning Post, 1845*).

There was also a considerable degree of unrest amongst miners, fuelled by poor pay and restrictive conditions. In 1843 severe conditions were being proposed. In terms of tonnage – owners were looking for a volume of coal, for which they paid as a "ton". This could be from 25% to 50% on top of the weight, so miners were being paid a ton rate for mining 24 cwts up to 30 cwts. Miners were to be charged 9d a day for oftakes – purchasing goods from the colliery owner. A four and a half day week was to be imposed and wages would be about 18s a week which represented a reduction of about 20% (*Stirling Observer, 1856*). The Coal Mines Regulation Act of 1860 improved

safety rules and raised the age limit for boys working underground to age 12 (*Act of the GB Parliament, 1842*). However, there were still many serious and fatal accidents in the collieries at Clackmannan. The most common accidents were caused by workers falling into shafts, being caught up in machinery or equipment, flooding from old workings and roof falls.

Thursday 10 February 1842: *“Daniell McAinsh, who was employed in one of the coal pits in the neighbourhood, was assisting some of the workmen at the engine when he was struck by a wheel which precipitated him against a wall. He had his skull fractured and other parts of his body so mangled that he died instantaneously.”*

Thursday 22 April 1852: *“An accident occurred at one of the pits of the Craigrig colliery, by which a man named Thomas King, a miner near Clackmannan, lost his life. The pit in which the accident happened is newly sunk and for the last week or two the deceased, along with two other men, had been engaged in driving a mine from the pit bottom. A large quantity of water burst in upon the men from, as is supposed, an old waste which was not known, and the pit was immediately filled to a depth of six or seven fathoms. The three men, however, after considerable struggling in the water, managed to lay hold of a bell rope suspended from the top of the pit for the purpose of giving signals. The noise of rushing water being heard at the pit head, a bucket was immediately sent down. The bucket struck King on the head, and he lost his hold on the rope. He was never seen alive again.”* Thomas King was listed in the 1851 census of Westfield, living with his wife Jean and daughter, Elizabeth. Amazingly, despite the bucket plunging to the bottom of the shaft, the other two men managed to climb into the bucket as it was raised and were rescued.

12th January 1876: *“Francis Love, 17 years of age, killed in a Clackmannan Pit when a stone weighing 30 cwts fell on top of him.”* Data from the Scottish Mining Website, 2014.

Migration

The first detailed indication of where people living in Westfield village had been born comes with the census records in 1841. In that year there were 213 people living in Westfield of whom all but six indicated that they had been born in Clackmannanshire. The records for subsequent census returns are more detailed. Comparing the records for 1851 and 1871, they are remarkably similar, with still less than one in five having been born outside of Clackmannanshire. Despite the ability of colliers to move about since the 1799 Act, most of the families living in Westfield village were born very locally. This is reflected in the prevalence in the census returns of names such as Hunter, Russell, Sharpe, White and Fife.

Figure 11. Percentage Birth Places for Westfield Residents.

	1851	1871
Clackmannan	50	58
Westfield	24	19
Other Parishes in Clackmannanshire	7	7
Outside Clackmannanshire	19	16

Data from ScotlandsPeople, 2015.

Emigration

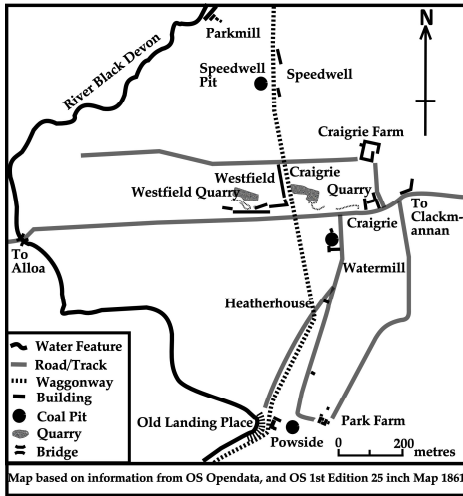
Many collier families emigrated from Westfield in the mid-19th century. Some went to Canada. Jane Hunter was born and brought up in Westfield and married William Drummond Gordon, from Saline. William became a grocer, coal griever and finally harbour master at Clackmannan Pow. Their children, Thomas Drummond Gordon, Helen Sharp Gordon, Margaret Hunter, Drummond Gordon and William Drummond Gordon all went to British Columbia (*Kith and Kin Website, 2016*).

A letter sent from Canada in 1821 was printed in the Stirling Observer and the editor observed that *"None, it will be seen, need leave this country to better their situation, unless they are prepared to labour diligently, and to combat hardships and difficulties."* In the opinion of the writer and the newspaper editor, emigrating was a means to self-improvement, but not an easy option (*Stirling Observer, 1821*).

However, by far the largest number of emigrants from Westfield moved to America, mainly Salt Lake City. This movement was associated with missions sent from there in 1839 by the Church of the Latter Day Saints (LDS), known as Mormons. The arrival of LDS missionaries caused great consternation amongst Scottish churchgoers. In 1842 a Clackmannan mob burned an effigy of LDS founder Joseph Smith Junior (*Szasz, F., 2000*).

The Mormon Missionary, Elder William Gibson, came to Clackmannan in 1848 and learned that *"the Town Crier had gone through the town with a proclamation to the people telling them to burn the tracts they had got from the Latter-day Saints, for they contained soul ruining heresy."* (*Aird, P., 2015*). Howard Bennion who visited Clackmannan in 1919 stated that although the great majority of those who joined the Mormon Church in Scotland were lowly esteemed colliers, the anger of the clergy was stirred and mob action aroused. A Parish Clerk (in Clackmannan) told him this story, *"This is the verra hoose where the Mormons were holdin' a meetin' when the mob came and rapped on the door and demanded entrance."* He went to say that *"Thomas Condie held them talking while the Mormons slid out the back windows and through the fields to Sauchie."* (*Baker, R, 2010*). The descendants of several families who emigrated to Salt Lake City in Utah have placed details of their journeys and later life on the internet.

Figure 12. Westfield 1861.

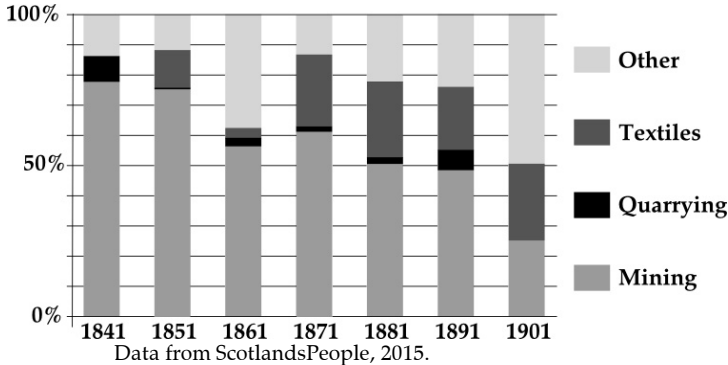


By 1861, settlement in the three fields had been reduced to the agricultural sites at Parkmill and Craigrie, the village of Westfield and Speedwell cottages (*Census Returns, 1861*) There were also small mining hamlets at Craigrie, Powside, Watermill, and Heatherhouse.

Employment: The census records of Westfield provide an insight into the employment patterns in the village. They show a slow change in occupations over time. The chart below shows the

percentage of people employed in mining, quarrying, textiles and other industries from 1841 to 1901 (There were too few people in 1911 to be significant).

Figure 13. Employment at Westfield village through the period 1841 to 1901.



The chart reveals the slow decline of mining, apart from a brief resurgence in 1871; the intermittent employment in quarrying; the growth of textiles and the changes in the percentage of "other"; reflecting the availability of alternative employment in place of quarrying, mining and textiles. The statistics on male employment and unemployment during the period 1841 to 1911 show that, with the exception of 1841 the vast majority or all males of working age in Westfield village were in employment during this period. A

blip of male unemployment in 1841 may reflect the closure of a number of coal seams in 1831, when the Five Feet, Nine Feet, Alloa Cherry and Alloa Splint coals were abandoned at Westfield (*Catalogue of Abandoned Mine Plans, 1931*). The slight upsurge in mining jobs in 1851 could reflect the new contract agreed between the Zetland estates and the Clackmannan Coal Company and the Devon Iron Company to mine coal and ironstone in the Clackmannan coalfield (*National Records of Scotland, 1841*). Similarly, the dip in employment in the mines between 1851 and 1861 may be related to the closure of the Devon Iron Works in 1858 (*Aris's Birmingham Gazette, 1858*).

This picture of male employment contrasts starkly with that of women, where the number of unemployed women who always exceeds that of those in employment (*Census Returns, 1841-1911*). It is likely that this is related to the Act banning the employment of women underground in 1842. The fact that only one woman indicated that she was working in 1841 may be related to this. The range of occupations of residents at Westfield village from 1841 to 1901 shows a dependence on employment in mining, textile working and quarrying. Although quarrying and mason work is at a very low level, up to 1900 there was always at least one present in every census. There are a scattering of other employments, almost on a random basis.

Figure 14. Occupations at Westfield village, 1841 to 1901.

Occupation	1841	1851	1861	1871	1881	1891	1901
Coal Worker	33	52	19	32	22	9	1
Woollen Factory Worker		9	1	14	12	6	1
Quarryman/Mason	4	1	1	1	1	2	
Other	5	7	6	9	14	10	2

Data from ScotlandsPeople, 2015.

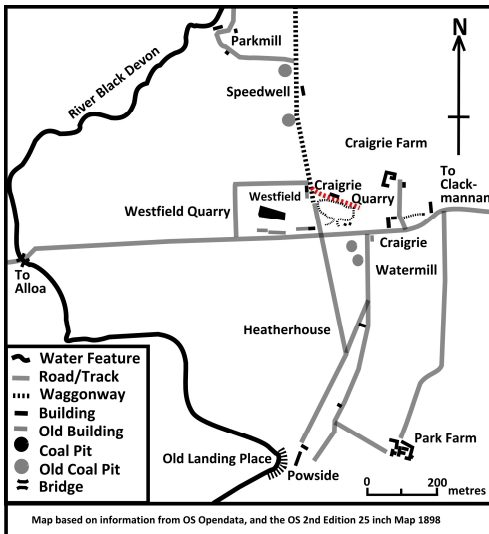
The availability of work in the Clackmannan woollen mill definitely helped to overcome the decline of work in the pits, especially as it afforded employment to women. Many of the other jobs would have required people to travel some distance to their place of work.

Education

In 1841 the village of Westfield had a school and the school master's house, garden and coal and the pupils' school fees were guaranteed by the proprietor (*Balfour, P., 1841*). Another teacher is recorded as living in Westfield village in 1851 (*Census Returns, 1851*). Throughout the period covered by the census returns, except 1841, all young people of 12 and under were listed as scholars. Recently, a note was uncovered in the 19th century Dawson Family Records of the Clackmannan Coal Company of a transaction "To land Sales, Colliery School" on the 19th of November, 1863 for £0.16.03p (*Dawson Family Archives, 1863*). It is not known when the Westfield colliery school finally closed.

Several schools had been built in the town of Clackmannan. In 1823 there was a parochial school (*Stirling Journal & Advertiser*, 1823) and it was noted in 1859 that "...A few years ago, a female school was opened in this village, chiefly through the exertions and instrumentality of the Rev. P. Balfour, minister of the parish, who not only contributed from his own substance, but, by his own money ..." (*Dunfermline Press*, 1859). In 1859 it was also reported that "On Wednesday forenoon last, committee of the Presbytery of Stirling, consisting of Messrs Balfour, Brown, Irvine, Smith, and Murray, examined the Parochial School there, taught by Mr Smeaton." (*Falkirk Herald*, 1859). In 1877 it was recorded that "The Female School is taught by Miss Leask, and is supported by Lady Zetland, who gives an annual salary of £20, with the Government grant and the fees. This is a most useful school, and is attended by from 90 to 100 pupils, who, in addition to the ordinary branches are taught sewing, knitting, &c. The Clackmannan and Zetland Schools have now been amalgamated under the joint mastership of Messrs Munro and Masterton." (*Lothian*, J., 1877). By this time it is likely that pupils from Westfield were attending the parochial or 'Zetland' school.

Figure 15. The Three Fields, 1898.



It is likely that the waggonway was finally abandoned circa 1900 following a series of Boards of Enquiry when ships loading coal at Clackmannan harbour foundered at sea (*The Dundee Advertiser*, 1890). Following this, several Clackmannan pits were abandoned (*Catalogue of Abandoned Mine Plans*, 1931).

The re-use of part of the old waggonway as a mineral line connecting a re-opened Craigrie Quarry to the mainline railway at Clackmannan kept a few houses going at Westfield (*Ordnance Survey*, 1898). There was still one family living in one of the Speedwell cottages and a small number of occupied buildings on the Parkmill site (*Census Returns*, 1901). The two quarries of Westfield and Craigrie were abandoned and are shown as being filled with water (*Ordnance Survey*, 1898). Speedwell cottages had gone but there are still buildings on the Parkmill and Powside sites.

Decline

The number of houses in Westfield peaked at 43 in 1841 and then steadily reduced until 1901. The RAF aerial photographs of 1945 show only two small remnants of the Front Row left (*Google Earth, 1945*). By then, Westfield quarry had been filled in and the Craigrie quarry is shown as abandoned, but still an open hole. The Craigrie pit is still working, with a large spoil heap being developed. There are still two small buildings shown at Westfield and some at Parkmill and Powside.

Today, there is hardly any trace of the former habitation on the three fields. Apart from the Craigrie farm, the only buildings left are the settlement of Parkmill, Craigrie Cottage and ruined cottages at Powside. All of the land is now worked by the Craigrie Farm. The Craigrie Quarry was finally filled in with domestic rubbish from the town and the surrounding area after the Second World War (*Graham, W., 2105*). Ploughing and land clearance has removed all trace of the other settlements and many of the waggonways and tracks which once crossed the fields have disappeared (*Google Earth, 2013*).

Conclusion

The Three Fields of Clackmannan; the Eastfield, Westfield and Southfield, have had a long, complex and fascinating history of development, redevelopment and decline. Much of the area was tidal saltings and wetlands in the 17th century and it was not until the mid-18th century that the first large scale land reclamation project began to release much of the Eastfield and some of the Westfield for agricultural and industrial activity. Small communal farming communities developed across the two fields, one of which was entitled Eastfield and another Westfield. Small coal pits were sunk and abandoned when seams were worked out. Historical records suggest that the quarry workings at the Craigrie were already established in the 18th century. It is possible that the smaller quarry face still visible to the East of the present Craigrie Cottage is the oldest working.

Further land reclamation in the 19th century released most of the Southfield for agriculture and the construction of the present line of embankment released the rest of it. Changing agricultural techniques and the development of larger farms saw the smaller scatter of settlements slowly disappear and two large peripheral farms replace them; Craigrie, and Pilverhall. Changing mining techniques saw the move of mining into the whole area, again with pits opening, being abandoned and re-opened as old seams were worked out and new ones accessed. The construction of a series of new embankments for land reclamation enabled piers to be placed ever closer to the River Forth and this, together with horse-drawn waggonway which connected the harbour to the coal pits, encouraged coal mining and the development of associated industries.

In the mid-19th century the emergence of OS maps, census returns, reports of Commissions of Enquiry and local and national newspapers provide much detailed information about the people who lived and worked in Westfield village. At the same time, many families were encouraged to emigrate to Australia, Canada and, especially, to the United States of America. The genealogical records of their descendants have provided a great insight into the life and times of these intrepid emigrants. By the late 19th century, the advent of railways and larger, deeper coalmines in other parts of the parish was prompting families engaged in mining to move away. The developing facilities in the town of Clackmannan, particularly the provision of a town water supply and drainage system, encouraged this trend.

By the mid-20th century, the abandonment of pits, settlements, waggonways and tracks, together with modern ploughing, began to take their toll on the historic landscape. Today, you could easily walk through the Three Fields without realising that anyone had ever lived there.

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