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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 Journal 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.

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.

FNH publications are listed on the internet British Library (BLPC) and by booksellers e.g. Amazon, Bol, Barnes and Noble. Offers of papers/notes for publication and of presentations for conference are ever welcome. Visit the website for instructions to authors.

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Report on the Forth Naturalist and Historian Conference, 2018

The Ochils – A Special Place

Richard Tipping

2018 marked the 25th Anniversary of the founding of the Friends of the Ochils (FotO) in 1993 by Rennie McOwan. This year's conference was an opportune collaboration with the Forth Naturalist and Historian (FNH) to celebrate this anniversary and to remember Rennie, who sadly passed away the month before after a long illness. **Stuart Dean** (Chair, FotO) introduced the meeting. FotO has campaigned to protect the Ochils from developments felt to be damaging to the landscape and the enjoyment of it by visitors, but the conference was more about developing an understanding of the many different aspects of the Ochils, their natural history and historical and contemporary changes. It also looked at how impacts might be lessened and how future planning and management might serve the region best for the benefit of all who live and work in and near to the hills and those who regularly enjoy their wide horizons and secret places.

Drew Jamieson, a founder member of FotO, is a geographer who grew up within sight of the Ochils. He took us to the more than 10km of elevated plateaux and ridges around the 10 summits >600m high and the deep glens that cleave the south-facing scarp, leading to the more intimate landscapes within them. Drew evoked how they have inspired others, such as Burns, Scott and RL Stevenson, how 'deep time' can be traced from their origin as lavas 400 million years ago to the historic period and reviewed some of the issues that confront us - of the unitary nature of the hills but, paradoxically, the three local authorities, 17 community councils and multiple stakeholders responsible for them and their protection. Designations can seem comprehensive, from the three Local Landscape Areas, the nine sites of Special Scientific Interest and the two European Union Special Areas of Conservation. However, visitor pressures on 'honeypots' like Dumyat (*c.* 36,000 people visited Dumyat alone in one year, 2004), Ben Cleuch, Dunning Glen and Glen Devon come from the large urban populations near at hand with attendant problems of casual car parking, footpath erosion, dog control, ugly sign-posting and anti-social behaviour. The hills also provide work, in hill farming, forestry, water supply, renewable energy and tourism. Drew argued that current changes in society, climate and land use demand changes in planning policy and the challenge for the near

future is in balancing these demands. We should see these as opportunities to sensitively share the past, enhance rare habitats as we create new woodlands and forests, support hill-farming, conserve peatlands, reduce flood damage, plan for visitors and re-vision the landscape (Jamieson 2016, 2018).

Murray Cook, Stirling Council Archaeologist, evaluated evidence for the period the Ochils first have historic significance, in the early-mid 1st millennium AD, with an identified people in Roman sources from around AD 200, the Maeatae, a contemporary tribe of the Votadini in East Lothian. Later, the Maeatae appear to have become the Miathi and the Votadnini became the Goddodin. The Maeatae's territory included Manau, which covered Clackmannan/Slamannan. A portion of Manau was conquered by the Goddodin around AD 400. Around AD 700 the rump of the Miathi were in conflict with Scots from Dalriada, led by Aedan, Prince of the Forth, whose son was called Arthur. In turn the area came under pressure first from the Angles and then from the Picts from the North, with a larger polity (Fortriu) formed around AD 850, centred on Foreteviot on the north-eastern flank of the Ochils, which became known as Alba around AD 900. Finally, the area was ravaged by the Vikings around AD 900. Somewhere in this narrative stands Dumyat, which with Abbey Craig and Mote Hill, controlled the only crossing point of the Forth at Stirling. Was Dumyat a Roman-age or Early Medieval hillfort, or both? Murray argued that Dumyat is Dun Maeatae, named for the tribe who ruled this area and traded with the Romans, but which in the 2nd century AD when they were the Miathi incorporated a broch-like structure, perhaps after the hillfort was abandoned. But the Miathi may not have seen themselves as Picts, but an independent British Kingdom under pressure from all sides and conquered by successive waves of invaders: other Britons, Scots, Angles and ultimately Picts when Fortriu expanded under Kenneth MacAlpin.

John Harrison is a historian who has worked for over 30 years on many aspects of Scotland's past, including the Stirling Castle Palace project. He worked closely with the Royal Commission on Ancient & Historical Monuments on a brilliant analysis of the historic landscape in Menstrie Glen, North of Dumyat (RCAHMS 2001) and also in Glen Devon. His exploration of the post-Medieval uplands began with the point that the Ochils are so varied, and past land uses so contrasting that generalisations are dangerous. However, three broad divisions of time can be recognised. The first, from the Middle Ages to *c.* AD 1500, was a time of Royal and monastic estates, with land and flocks owned centrally and tended by 'native, kindly tenants'. The early modern period, *c.* AD 1500-

1760, was characterised by extensive settlement of mixed arable and pastoral farms, Many were owned by lords in the lowlands but farmed by tenants while other, small scale units were farmed by owner-occupiers (feuars) This was a dynamic, integrated economy, with all resources used: limestone was quarried to improve arable soils and winter-hardy 'Southland' sheep breeds were introduced to Glen Devon as early as the 17th century. Pressures from agricultural 'improvement' increased through the 17th century, with disputes over pasture occurring in the Back Hills above Tillicoultry in the later 17th century. In Glen Devon the period was characterised by wealthy, well-capitalised feuars with large numbers of livestock and more substantial houses. Lowland coal replaced upland peat as a domestic fuel and pasture was described as "oppressed", declining in quality. From *c.* AD 1760 the landscape of Menstrie Glen was rapidly developed; crops were replaced by sheep walks and the land was enclosed and de-populated.

Susan Mills, Clackmannanshire Council's Museum and Heritage Officer from 1999 to 2017, a Director of Clackmannanshire Heritage Trust and a Trustee of Dollar Museum, considered the extraordinary industrialisation of the Hillfoot villages in the late 18th and 19th centuries. Stobie's 1783 map shows the uplands quite bare of trees, apart from area above and below Alva House, which had been well planted in the 1720s by Sir John Erskine and his successors. Wool-spinning and weaving had long been a domestic industry, with wool preparation and waulking of the finished cloth done by women and the wooden hand-looms located in homes and operated by men. By the late 18th century the force of the swift-flowing burns flowing out of the Ochils began to be harnessed to power the wheels to drive large numbers of looms in new mill buildings and the roles of men and women were reversed. The successive inventions of the textile revolution in England spread widely and rapidly and members of the Archibald, Paton and Drysdale families were successful in establishing increasingly large mills in Menstrie, Alva and, especially, Tillicoultry. The latter two villages developed so rapidly during the 19th century that their populations increased faster than the infrastructure to support them and led, particularly in the case of Tillicoultry, to the need for major improvements in living conditions. This led in turn to the formation of burgh councils, enabling the communities to be responsible for these matters themselves. The volumes of water from the small catchments of Hillfoot glens were powerful and, after prolonged heavy rain, could be dangerous. A dramatic flood in Tillicoultry in August 1877 damaged the dam and lade system, at least one of the mills, several houses and streets, as well as causing the death of a mill owner and one of his workers. However, the

burns were always limited in flow and almost ceased in droughts, so the availability of local coal made the switch to steam-power inevitable. In the mid 19th century, as the other villages grew into industrial towns, Dollar, which had only one small woollen mill (now Dollar Museum), developed in quite a different way. Those responsible for the foundation and growth of what is now Dollar Academy ensured that industry was curtailed. The steady increase in population was the result of the arrival of new residents eager to qualify to send their offspring to the new school.

Moving to the current landscape, plant habitats in the Ochils (vice-counties 85-88) were reviewed by **Alistair Godfrey** who is the Botanical Society of Britain and Ireland (BSBI) joint recorder for Mid-Perthshire. Covering some 3,470km^2 above the 100m Ordnance Datum contour, the 968 taxa on the BSBI data-base comprise species, subspecies, hybrids and aggregates include six nationally rare, 11 nationally scarce and 87 'notable' native species. This variety reflects the importance of the range within Britain and reflects the effects of the geology, geomorphology, soils and climate of the Ochils. Among these important varieties are the Common Rockrose (*Helianthemum nummularium*), an example measured using GPS and confined to just two stations on base-rich lava on the south-facing scarp and Parsley Fern (*Cryptogramma crispa*) on more acid substrates.

Blanket peat contains Star Sedge (*Carex echinata*), *Polytrichum* moss, Blaeberry (*Vaccinium myrtillus*), Heath Bedstraw (*Galium saxatile*) and grasses typify drier, acidic soils. Springs and flushes release nutrients to support the dwarf form of Marsh Marigold (*Caltha palustris* var. *radicans*), Creeping Forget-me-not (*Myosotis secunda*) and the nationally scarce Hairy Stonecrop (*Sedum villosum*). The Ochils are a core area for Chickweed Willowherb (*Epilobium alsinifolium*). Many plants are rare because of grazing pressures, of course, and exclusion of sheep allows species like the nationally scarce Spignel (*Meum athamanticum*) to thrive once more. True upland species, such as Mossy Saxifrage (*Saxifraga hypnoides*) and Starry Saxifrage (*Saxifraga stellaris*), cluster on the rock outcrops of the highest summits. Ben Cleuch, for example, is the only current station between the Southern Uplands and the Highlands for Dwarf Willow (*Salix herbacea*). Habitat change and bird life was the concern of **David Jarrett**, a researcher at the British Trust for Ornithology's Scottish office in Stirling. David is particularly interested in understanding the effect of large-scale environmental change on upland birds. For example, bird surveys on the 1400 ha of Alva and Menstrie Mosses on the plateau in 1987 (Calladine *et al* 1990) recorded 11 pairs of curlew and seven pairs of Golden Plover. By 2007 Golden Plover was absent and Curlew was found only

"here and there", a reduction in line with UK trends, due to a mix of afforestation, improved drainage and increased numbers of generalist predators, particularly those predating on ground-nests. Forest cover in Scotland has increased from 5% in 1900 to 19% in 2018. This is driving increases in northern Britain of species like Willow Warbler, Tree Pipit and Whinchat, studied locally by Calladine (2016). A progressive increase in the mean altitude of Whinchat territories from 311m OD in 2010 to 338m OD in 2014, was confirmed to 354m OD in 2017, due to the cessation of grazing and increased scrub generation. New work has included micro-climate and habitat monitoring in Glen Sherup, Glan Quey and Menstrie Glen. Whinchat is constrained at lower altitudes by denser canopy covers of newly planted woodland and at higher altitudes by climate/exposure. In contrast, Willow Warbler persists in dense vegetation/mature woodland and is less constrained at higher altitudes by climate/exposure. Understanding the relationship between habitat, climate and bird abundance permits conservation actions within appropriate climatic zones which could allow declining open country species such as Whinchats to persist, as their marginal upland habitats are afforested.

Afforestation of the Ochils might be seen as potentially damaging to rare or scarce plants and birds, but **Andrew Vaughan**, Central Scotland District Manager of Tilhill Forestry Ltd (and a member of the local Forestry Commission Scotland Regional Forestry Forum) reminded the audience that the Scottish Government had identified pressing societal and statutory climate change commitments to reduce carbon emission. In seeking to increase sequestration of existing carbon and limit global temperature increases it was promoting woodland planting. placing pressures on areas of rough-grazing (70% of Scotland) that is likely to be preferred for forestry use. The current Scottish Government target for woodland creation is 15,000 hectares/year. In the Ochils as elsewhere, tensions between competing land uses and different types of woodland must be managed. Currently there are 47,500 ha of woodland on the Ochils, of which roughly 34% is broad-leaved and 66% is conifer. The new woodland at Jerah, one of the largest sites planted in Britain in recent years, consists of 1.3 million trees and 16 species (68% of the area either planted with native species or retained as open land). Plantings are embedded in the landscape with regard to local landscape character, soils, hydrology and stream networks (including reducing flood risk and pollution), ecology (changes in open ground habitats; bird populations; deer), archaeology and public access.

Concern with the near-future reduction of flood risk in the Scottish uplands drives the work of **Heather Forbes**, Senior Policy

Officer for Flood Risk Management in the Scottish Environment Protection Agency (SEPA) and lead author of SEPA's *Natural Flood Management Handbook*. The 2009 Flood Risk Management Act stipulated 'natural' flood management; including measures like tree -planting to intercept rainfall, improve soils, increase infiltration and slow stream flows; blocking upland drains to reduce connectivity with the main river network; re-wetting of drained wetlands to reduce and slow down runoff; land management in cross-contour hedgerows and cover crops (over-wintering with grass to reduce soil erosion).

These measures contrast with traditional 'hard' defences such as levees and can help such defences deal with climate change or help reduce flood risk where the cost of hard defences cannot be justified. Better mapping has enabled reduced flood risk and flood prevention studies; as in Dunblane, Bridge of Allan, Tillicoultry, Menstrie and Alva; combine analysis of opportunity for restoration or enhancement of natural features with detailed understanding of the mechanisms of flood generation. Along the Allan Water measures have included peatland and river bank restoration and moorland grazing management. In Menstrie Glen, work with Heriot-Watt University and Tilhill Forestry Ltd is focusing on the effectiveness of tree-planting practice in reducing stream flow and soil/sediment erosion. Practical measures are matched with research in social sciences on the attitudes of stake-holders.

The Ochils as sources of recreation and inspiration was the theme of a series of personal reflections by **Bob Aitken,** born and raised in Grangemouth, schooled at Dollar Academy, a geographer by training and conviction and a recreation and conservation consultant. Bob argued that the Ochils were now "not adequately cherished" and ignored by the rush of people northward to the Highlands, ironically given their proximity to large urban populations. The changing landscape (more trees, dams, vehicles, and people and fewer sheep;) had a dynamism to it, revealing, rather than increasing reactions to barely controllable external forces. These forces are not necessarily the ones we expect, like wind-farms and power-lines. They are often the quixotic urges of people urged on by social media, with 'stone-stacking' masquerades as public art disfiguring the environment or kilometres of mostly un-sanctioned mountain-biking routes. The outdoors generally is more consumerist, more performance oriented and less engaged with the natural environment – much like the rest of British society. The future is unpredictable: the need is to gain the vision and values to respond wisely to change.

Paul Roberts is an Operations Manager at Scottish Natural Heritage (SNH), based in Stirling, and is a member of the Chartered Institute of Ecology and Environmental Management. He addressed the land management issues raised by Drew Jamieson regarding the fragmentation of responsibilities for planning and management of the Ochils which leads to a disconnection between national and local management strategies. Paul argued that, in general, differing organisational responsibilities and boundaries don't make things easier. The Ochils provide a range of ecosystem services; ranging from food production to the economic benefits of tourism, from flooding attenuation and carbon sequestration to the benefits of an accessible recreation resource as well as an inspiring landscape. Integrated land and water management is therefore important to secure a long-term, sustainable future for Ochils as a precious resource. Since 2008 there have been a series of encouraging Scottish Government initiatives, including Scotland's Land Use Strategy; the regional land use partnerships encouraged in the Community Empowerment (Scotland) Act 2015; "Getting the Best from our Land" (2011, 2016-21); the SNH "Scoping a strategic vision for the uplands" (2017); the Scottish Government's post-Brexit consultation, "Stability and Simplicity" (2018) and the discussion paper "Developing an Environment Strategy for Scotland" (2018), with its emphasis on the agri-environment. The direction of travel is positive but public sector resources are reducing so for landscape conservation and protection, we will also need be more imaginative and look to mechanisms such as the Heritage Lottery Fund to help fund landscape-scale conservation and deliver a more holistic approach.

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THE VEGETATION ON STIRLING'S CASTLE ROCK: THREE CENTURIES OF CHANGE. PART I: THE SLOPES AND FIELDS AROUND THE CASTLE ROCK

Roy Sexton (Scottish Wildlife Trust)

Botanical Recorders: Pam Murdoch, Sue Sexton, Jan Harbidge, John Harrison, Dr Brian Ballinger, Prof. John Grace. Norman Still, Jacky Robinson. Editor Dr Neville Dix .

Background

At the 1930 meeting of the Stirling Natural History and Archaeological Society (SNHAS) it was agreed that, in view of the rapidity of changes taking place in Stirling, it was desirable to record the plants on the Castle Rock to serve as a basis for future comparisons. James Chisholm undertook the task and with the help of his fellow botanists published a 22 page report in the 1931-32 SNHAS Transactions. As result of similar concerns about the growth of scrub and woodland over the open ground around the castle, the local Branch of the Scottish Wildlife Trust started a comparative survey in 2007. Last year we were prompted to complete this project by the Botanical Society of Scotland, who offered to help as part of their Urban Flora programme. Changes in urban plant communities are of particular interest because they are more exposed to factors like atmospheric pollution and the release of non-native species. They can also provide unexpected refuges for past plant populations. For instance, during this survey Scarlet Pimpernel was re-discovered in a neglected tenement garden having been thought to be locally extinct since 1890.

During the last 12 years eleven botanists have carried out 18 surveying trips and recorded 286 species in the same area in which Chisholm reported a little over 200 species in 1931. As a result of the volume of information we have gathered we have divided the report into Part 1: The slopes and fields immediately around the Castle Rock and Part 2: Gowan Hill and Cemeteries which will include an index of the complete list of plants.

Early Castle Hill Botanical Records

Chisholm's paper is not the only record of the Castle Hill's flora. The earliest that we are aware of is a *List of Rare and Interesting Plants Collected in the Vicinity of Stirling* compiled by Dr William

Hutton Forest in 1831 and published in an information booklet produced for guests at the Airthrey Mineral Springs in Bridge of Allan (Forest, 1831; Morris, 1908). We tend to think of trees as being the only members of the flora to persist for any time but Forest's list draws attention to the many colonies of small perennial species which have survived in the same spots on Castle Hill where he recorded them 190 years ago.

Figure 1. Stirling Castle Rock from the King's Knot 1871 showing the absence of woodland on the castle slopes. Photographed by pioneering photographer George Washington Wilson. Courtesy of Aberdeen University.

A good example is the wonderful display of hundreds of Aquilegia or Columbine plants which are still flourishing on the cliffs along the Back Walk between Ballengeich Road and the Beheading Stone (plate 1) . He also mentions Pellitory of the Wall a rather unusual member of the stinging nettle family which grows on the lime mortar of old walls (plate 2). It is still growing in a number of places where it was reported centuries ago including what has become Ballengeich Cemetery Wall. Both the castle walls and the exposed rocks that support them have always been famous for their Wall-flowers (figure 2, plate 3). Mabey (1996) suggests they were planted in castle walls so their scent would waft through the

windows of bed chambers. We counted 240 plants in 2011, a good population but one which no longer matches McDougall's description in 1882 of *Wall-flowers adorning the weather-beaten rocks of the Castle in a mantle of gold.*

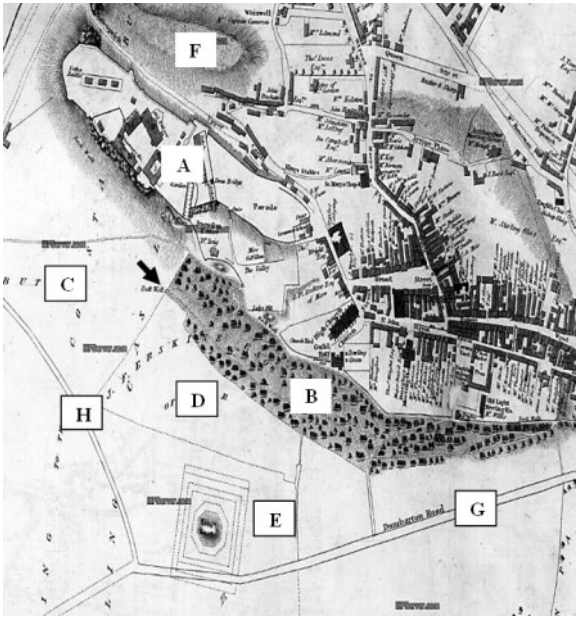
Figure 2 Wall-flowers photographed on the upper Castle slopes by Arthur Macpherson in the late 1950s. Stirling Smith collection.

Not all plants in these old lists have survived of course. In 1880 Deadly Nightshade was removed from the upper scree slope on the south side of the castle after a child died from eating its very attractive but extremely poisonous berries (plate 4, Croall, 1882). I have been told that one of these bushes was moved to the garden of the Stirling Smith where it remained until a decade ago. Henbane, another taxonomically related poisonous plant was also originally found nearby on the west cliffs (Croall, 1882). The close proximity of the two species suggests they may have both been cultivated there for medical use. Bridge of Allan Pharmacy,which was built in 1851, has labelled apothecary drawers dedicated to samples of both species. Henbane seeds were used in medieval anaesthetic concoctions (Lee, 2015) and were discovered during the excavations of Stirling Tolbooth in 2002. This led to speculation that they were employed to subdue prisoners or sedate them before a hanging (Lee, 2015). Derivatives of atropine and hyoscine which can be extracted from these species are still in use in modern medicine. Another recent loss was Alexanders which was recorded until 1930 growing along the Back Walk near the old High School. The plants had spread from adjacent gardens where they were cultivated as an early spring pot herb. According to Croal (1879) *its flavour was too pungent to be agreeable to the more fastidious tastes of the 1870's* and it was replaced by celery its close relative.

Another early list of plants on the Castle Rock was discovered at Kew. It was compiled by the well-known botanist H. C. Watson who visited the town for the day in 1841. Of the 87 plants he found all except five are still present. Picked out on his list was White Mullein (*Verbascum lychnitis),* a Stirling Castle rarity that was exhibited at a number of botanical meetings. Sadly it is now locally extinct. However there have been several two metre high specimens of its near relative Great Mullein (*Verbascum thapsis)* on the Back Walk below the Highland Hotel. The long dried woolly flower stems of Great Mullein were thought to have been dipped in oil and used as torches by the Romans (Cambell-Culver 2001). Another extinct wall specialist and Stirling rarity was the Greater Snapdragon *Antirrhinum majus* the wild relative of the garden annual (McDougall, 1882).

The Back Walk Woodland below the Southwest Castle and Town Walls

Figure 3. John Wood's Map of Stirling Castle Area 1821, Reproduced with permission of The National Library of Scotland.



A The Castle
B Back Walk Woods
C Butts Fields
D The Haining
E The King's Knot
F Gowan Hill
G Dumbarton Road
H Raploch Road

To the North of Dumbarton Road between the Town Walls and the rear of The Stirling Smith, Albert Hall etc. the slopes are covered with a strip of woodland which I will refer to as the 'Back Walk Woods' (figure 3). Early 18th century pictures and maps show very few trees on either the steeper slopes below the town walls or the flatter ground below them.

This area was probably kept clear of cover for security reasons. Ronald (1890) states: *In the early days no trees were allowed on the Back Walk and the brae was let to tenants and laboured. By the end of the 16 C a tenant was allowed to plant a row of trees along the marches and a fine row of beeches was planted at the west boundary of the Haining in 1592*. These trees would not have survived the intervening 400 years though one very large beech at the north end of Royal Gardens was recently felled and formed into a large wood carving. John Harrison has written an interesting account of the early cultivation of this area in his article *The Gardens and Gardeners in Early–Modern Stirling (*Harrison, 2013).

The Back Walk Woods start to appear on maps around 1780 and a dense woodland was well established by 1821 when John Wood drew his Town Plan (figure 3). This was before the construction along Dumbarton Road of the public halls, churches and villas between 1873 and 1896 (Ballantine, 1927). The presence of native trees like Oak, Sycamore, Ash, Elm, Mountain Ash and Beech mixed with exotics like Maples, Horse Chestnut and Walnut suggest that a combination of natural regeneration and planting was responsible for the woodland's origins. In 1902 James Murdoch gave a talk to the SNHAS entitled *Improvements in Our Belts of Trees and Shrubberies*. It appears his advice to enliven the woodlands by planting Red Maple, Yew and Horse Chestnut were taken. The Conker or Horse Chestnut had Albanian origins and was first recorded in the UK in 1616. With its beautiful spires of white flowers it soon became very fashionable throughout the country (Cambell-Culver,2001). Chisholm points out that some native woodland trees like Hazel and Holly were missing in 1930.

Over the intervening 90 years Holly seed has been brought in by birds and there are now about 40 plants together with two young Hazel bushes. Botanists have lists of ground flora species which help them recognise pre-1500 woodlands (Crawford, 2009). As might be anticipated many of these are rare or entirely missing from the Back Walk Woods confirming their relatively recent origin. Besides Hazel we might expect quite large numbers of Primroses, native Bluebells, Wood Anemones, Wild Garlic (Ransom), Red Campion, Sweet Woodruff etc. all of which were noted as absent by Chisolm. Some effort has been made to introduce them since 1930 and the Bluebells particularly are spreading but Ransom, Sweet Woodruff, and Wood Anemones are still virtually absent. There is an attractive clump of recently planted Primroses with Winter Aconites, and Snowdrops behind the Albert Hall car park. Sweet Scented Violets which were considered *well nigh extinct around the castle* by McDougall in 1882

have also been re-established by the statue of Rob Roy. Unfortunately there are some large colonies of Spanish Bluebells behind the Albert Halls. These hybridise with our native species and produce pink and white hybrids. Many more characteristic ancient woodland species are present in good numbers in the woodland along the north edge of King's Park Golf Couse (Pox Wood) only 450 yards away (Sexton, 2014). Although the earliest map showing the King's Farm woodland is 1858 the flora suggests it is much older.

Figure 4. A Sycamore on the Lower Back Walk in the early 1900s and the same tree a century later. Stirling Smith Collection.

In the past the Back Walk woodlands have been extensively managed, fallen and moribund trees have been removed and replanted and the ground flora tidied. A plate photograph taken in the early 1900s shows a scene which is very similar to the same view today (figure 4). One plant that has spread prolifically is Green Alkanet with its brilliant blue flowers and hairy leaves and stems (plate 5). This is surprising since in 1882 it was feared that it had been exterminated by the blasting undertaken to widen the Back Walk (McDougal, 1882), indeed Morris considered it lost in 1908. Another spectacular plant of these woods is the white flowered Tuberous Comfrey or 'Knit-bone' which still covers *the whole bank between the Smith Institute and the jail* as described by Croall in 1879 (plate 6). As its name suggests it was widely used as

a healing poultice and contains allantoin which promotes the healing of connective tissue (Mabey,1996). During a survey in April 2007 we found a single plant of the rare Yellow Figwort in the woods beneath Cowane's Hospice. We considered this a spurious unaccountable find but our research since has revealed that it was recorded by Forest 190 years previously. Perhaps it is one of those plants whose seeds can remain dormant for long periods.

A guided walk for visiting botanists describing the location of interesting species was written by Johnstone Shearer in 1919. He suggested starting near the war memorial in Dumbarton Road and climbing up the Castle Rock along the outside of the town and castle walls using the Upper and Lower Back Walks. The construction of the upper Back Walk was originally proposed by William Edmonstone in 1723 about a century before the public parks movement secured green spaces in other cities (King, 2009). Initially it ran from Academy Road (by the Highland Hotel) up to the Lady's Rock viewing point in the cemetery behind the Church of the Holy Rude and part of the cost was contributed by the town council. In 1791 one end was continued down to Port Street while in 1798 the other was extended up and round the steeply banked west face of the Castle Rock to Ballengeich Road (Mair, 1990).

Following Shearer's route summer visitors would have found the cliffs and walls between Dumbarton Road and the Corn Exchange decorated by Red Valerian, Yellow Corydalis and purple Ivy Leaved Toadflax, all naturalised non-native species. As the Back Walk ascends to the Highland Hotel most of the native plants except Ivy were stripped away when the walls were re-pointed. An unexpected find was Hare's-foot Clover on rocks next to the gun bastion (plate 3). At the time we thought it was a new record since it did not occur in the Botanical Society of Britain and Ireland's database but our subsequent research has revealed that both Forest in 1831 and Shearer in 1919 had spotted it on the cliffs below the castle centuries earlier. This is normally a plant of sandy places and may have become established on these cliffs because of the granular soil produced from the readily eroded quartz Dolerite rock. Feverfew a cure for headaches and Shining Crane's-bill have also survived there since 1831.

At the top of the climb is the Lady's Rock with its viewing platform which has been visited by many botanists. A number of species on it have been present for at least 160 years. These include both the White and Red Campion and their pink hybrid (Watson 1845), the very attractive Star-of -Bethlehem, (Forest, 1831) and both white and yellow flowered Stonecrops (McDougall, 1882). Primroses and Snowdrops are more recent additions. Star of

Bethlehem is thought to have been brought from the near east by the Crusaders (plate 3, Campbell-Culver, 2001). It was also recorded by Shearer (1919) in the wood above The Stirling Smith but Morris could not find it there in 1930. We discovered a colony struggling to survive in the road verge of Royal Gardens.

Figure 5. A Mauchline ware page marker made of sycamore with Stirling Castle illustration. Stirling Smith collection.

At the side of the Upper Back Walk as it curves NW round the Cemetery from the Lady's Rock there is a colony of Hemlock (plate 4). This 1.5m tall poisonous plant can be found scattered all over the Castle Mound. It is a member of the carrot family and shares the characteristic white umbels of flowers with Hogweed, Hedge-parsley and Sweet Cicely also found in the area. It is distinguished from its less harmful relatives by the purple blotches on its stems. Hemlock is not found in the King's Park Woods across Dumbarton road suggesting it was planted on the Castle Rock. It has been used medically to treat cancers and is still used in a highly diluted state in homeopathic remedies.

As can be seen on John Wood's map (Figure 3) the Back Walk woodland ends abruptly on the line of a wall which runs down from the castle and past the Butt Well to the Raploch Road. A late 18 C Ordnance Board plan in The Stirling Smith Museum shows this is the boundary separating the lands directly below the Castle administered by Castle Governor (and later by the Office of Woods and Forests) and that of John Erskine Earl of Mar (Kew Archives 1806). According to Elspeth King (2009) from about 1700 until the departure of the castle garrison in 1964 the taller vegetation on the slopes directly beneath the Castle was kept to a minimum for security purposes. This would have been partially achieved by grazing the area with sheep and the Ordnance Board map describes it as a 'pasture bank'. From the turn of the 18 C a livestock proof kissing gate can be seen in old postcards where the Upper Back Walk passes through the boundary wall (figure 6). On the high resolution OS maps of 1858 the four posts of this barrier are marked. The 'Greasy Gate' as it was known by locals was still

there until the 1970s when vandalism took its toll. Three hundred metres further along the Upper Back Walk it crosses another older 'Park Wall' which runs down from the Nether Bailie and along behind the houses in Ballengeich Road. A third wall which completes the enclosure of the slopes appears on maps about 1860 and runs along the base of the cliffs from Ballengeich Road to the Butt Well. Elspeth King makes the interesting observation that some trees must have been allowed to grow to feed the Mauchline wooden souvenir industry. These beautifully crafted miniature objects (snuff boxes etc.) made of pale grained Sycamore wood often carried an image of Stirling Castle with the legend *made from wood grown on the slopes of Stirling Castle* (figure 5) (King, 2009).

The view of the Castle towering over these steep slopes initially attracted artists and then from the late 1850s onwards pioneering professional postcard photographers affording us an unparalleled record of changes in the vegetation. The work of both George Washington Wilson and James Valentine from the 1860s onwards can be viewed on line in collections at St Andrew's and Aberdeen Universities. In the early photographs from 1870 to 1911 the lack of trees on the Castle slopes is a striking feature (figure 1). The view from the upper Back Walk must have been stunning providing a 360^{O} panorama completely unrestricted by trees. Pictures of people on the path show the vegetation was a mosaic of bare and Ivy covered rocks, areas of tussocky grasses and scrub with a few saplings. The latter would have been made up of Brambles, Gorse, Blackthorn , Hawthorn and Elder which would have looked very attractive when they were all flowering in spring. Roughly from 1910 to 1930 trees started to grow up provoking Chisholm's survey. He correctly predicted that in the absence of a management programme the slopes would be overwhelmed by Ash, Sycamore, Birch and Elm all species whose seeds were dispersed by wind. Throughout the 1950s -1980s the trees grew up apparently unchecked and their canopies closed over the slopes. Although the majority of the current trees are of no great age there are a few which could be a century old. Some of the bigger trees nearer the bottom of the slope look as though they might have been felled early in life and then regrown multiple trunks from the stumps. The only Hazel of any age is found here. Plants that could not tolerate the lack of light were lost and they are still gradually being replaced by woodland floor species like Ivy, Dog's Mercury, Wood Avens, Great Wood-rush, Enchanter's-nightshade and Bluebells. There are some interesting plants in this area. Although Deadly Nightshade was supposed to have been removed in 1880 Shearer spotted one or two bushes in 1919 together with scattered Henbane plants. Half way along the Upper Back Walk between the

bisecting walls is a seat surrounded by Wild Cabbage plants. These are now the only remains of much larger colonies of yellow flowered brassicas which used to cover the slopes and were noted by virtually all recorders. Old Brassica cultivars are difficult to classify but our group agreed with Forest that this clump was a form of early Rape (*Brassica napus*). When we started the survey there was another wild cabbage patch on the side of Ballengeich Pass. These plants had purple stems characteristics of 'ruta baga' and we agreed with Shearer they were cultivars of Wild Cabbage (*Brassica oleracea).* John Harrison's article describes how cabbage was widely cultivated in local gardens so it is not surprising to find escaped Brassicas. He also relates how children pulled up cabbage plants at Halloween and used the roots to foretell one's fate in marriage (Harrison 2013).

Figure 6. A livestock-proof gate in the boundary wall as it crosses the Upper Back Walk J. Valentine 1890. Note the lack of vegetation on the slope below the Castle Wall.

Such is the gradient of these slopes that we had to survey the Castle Walls above them with binoculars, which is not ideal. Much of the vegetation would have been stripped when the cliffs were stabilised in the late 1970s to early 1980s however hundreds of Wall-flowers survived. Counting them at a distance was made difficult by the presence of large numbers of Spotted Hawkweed which also has yellow flowers. From May onwards most of the Castle and Town walls become covered in tufts of the delicate pink Fairy Foxgloves another non-native plant. In 1919 Shearer was still able to see the rare wild Greater Snapdragon *Antirrhium majus* in crevices in the cliffs however any within climbing range had been picked.

The soil under the Castle wall is almost black in contrast with the brown sandy colour of the natural soil at the base of the slopes. Until as late as the mid 19th century waste was pitched over the walls onto the upper slopes serving as the castle midden (Will, 2018). General rubbish, kitchen waste and the content of chamber

pots would have enriched the soil and there would have been a flora of plants like Stinging Nettles which proliferate in nitrogen-rich conditions. At the beginning of the 1800s the Burgh Council complained that the mess was spoiling the Back Walk experience for the developing tourist industry. As a result the sewerage was piped down to a tank in Butt Park where the farm was supposed to have used it as manure (John Harrison personal com.).

Figure 7. Teasel inflorescence.

At the bottom of this slope there is a wall with a newly upgraded tarmacked path. At its Ballengeich road end there is a large colony of Teasel plants and a sculpture celebrating their relationship with the Goldfinches that feed on the seed. The area these plants occupy is shown on old maps as a small triangular field which in 2007 still had a patch of grassland dotted with Primroses and purple Ground-ivy. It has recently succumbed to the advancing scrub of Brambles, Rasps and Rosebay Willow Herb. The spiny heads of Teasel (figure 7) were used by weavers in the 18 C to raise the nap of woollen cloth like Tweed. The heads were halved and nailed onto drums. The cloth was fed underneath the rotating drums and the barbs on the teasel heads picked up the threads in the wool (Mabey, 1988). A plant which has been lost from this area is the Field Bindweed with its attractive pink and white flowers however its bigger cousin Hedge Bindweed survives. A plant that seems more common today is Bittersweet or Woody Nightshade with its purple flowers and red berries. We found it clambering over the walls and hedges round these fields.

Along the side of this path there is continuous bank of Blackthorn bushes which produce a magnificent spring display of white blossom before their leaves appear. Occasionally they repay the locals patience and produce good crop of black sloes for the production of sloe gin. There is also a good collection of thistles along this path including the Spear Thistle our national emblem, the spiny stemmed Welted Thistle and the Creeping Thistle. A single plant of the rare Milk Thistle found by Forest was moved by Croal in the 1870s to the protection of the gardens of The Stirling Smith where it was still flourishing in 1908 (Morris, 1908).

At the south end of this track is the Butt Well one of the ancient wells of Stirling which was documented in the 1580s but is much older than that. Although the masonry and seat are still in place water no longer gushes from the spout. A number of plants have been described as growing at the Butt Well. We found the diminutive Ivy-leaved Speedwell along the base of the terrace as described by Chisholm (1932) but the medical herb Masterwort (*Peucedanum ostruthium*) has disappeared (Croall, 1882). Behind the well a stream runs down the hillside and in it is found the bright blue flowered Brooklime and sweetly scented Meadowsweet, which was originally used in making mead.

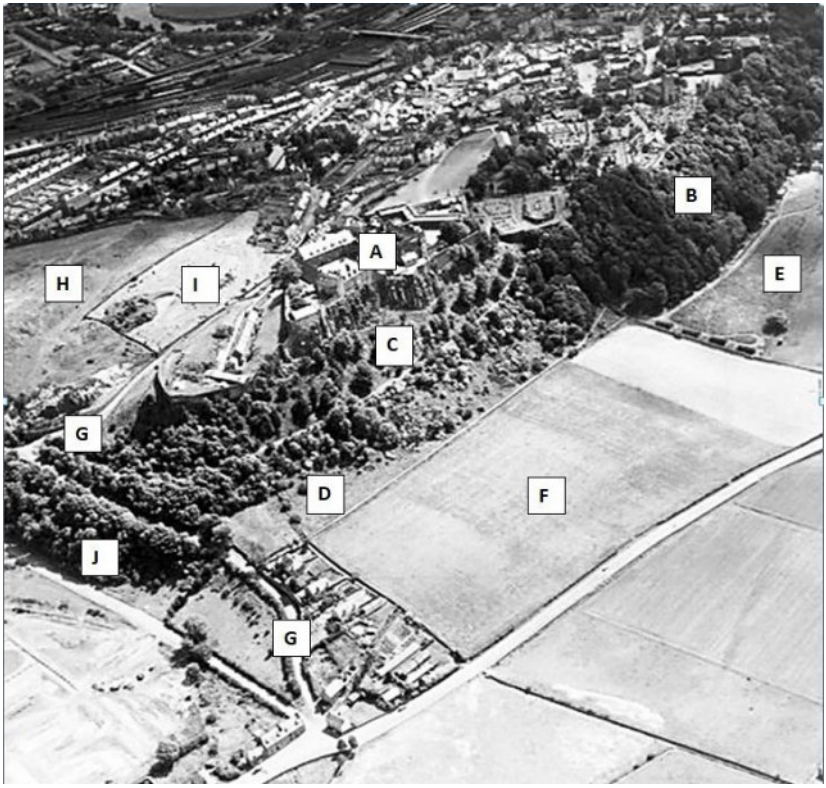
The Kings Knot, The Haining and the Butt Fields around the base of the Castle.

The Haining is the meadow presently surrounded by walls which sits between the Kings Knot and the Back Walk woodlands and is bounded on the east side by Royal Gardens (figures 3 and 6). According to John Harrison's (2016) account: *The Haining was the main focus of James IV's 'new garden' created between 1493 and 1506. It contained in excess of 2,500 trees many of them fruit trees and even vines in addition to flowers and vegetables. In 1582 James VI had given the Haining meadow and the steep slope above it to the widowed Countess of Mar his former nurse. This land ran up to the garden of the Erskine (Mar) family's mansion Mar's Wark built in the 1570s. In the later 17C the Earl of Mar's gardeners grew herbs, vegetables and fruit there to supplement what was available from the Mars Wark gardens. By 1726 a report found the fruit trees in the Haining (199 apple and pear trees, 86 Plums and 2 Gean) were all neglected as were the timber trees (Harrison 2013).*

Shirrah (1889) describes how the orchard continued to be used into the 1800s and a *venerable* old tree known as the Carnock Pear which was said to have been planted by James VI was blown down in an 1839 storm. In our surveys we have been unable to find any botanical relics of this period. Thereafter the Haining seems to have been mainly used for pasture. In the 1856 detailed OS map the boundary wall between the Haining and the King's Knot was shown to have an incomplete row of trees beside it. 160 years later an ancient hollow Ash which had the wall built round it still remains. Unfortunately the replacement generation of Ash saplings that are *springing* up along the wall have got Ash die-back which is infecting many of the young Ash on the Castle Mound with potentially serious consequences. Old pastures like the Haining which have remained untreated with fertilizers and herbicides are rare and usually retain traces of their relic flora. We found Yellow-rattle, Poppies, Corn Marigold, Cornflowers, Scentless Mayweed,

Oxeye Daisies, Common Knapweed, Common Spotted Orchid, Pignut, etc. (plate 7). Some of these may be the product of spreading modern wildflower seed mixes if so it is good to see an attempt being made to retain these rapidly disappearing species.

Figure 8. Aerial Photo 1948. With kind permission of Cambridge University Collection of Aerial Photography, copyright reserved.



(A) Castle; (B) Heavily wooded Back Walk Woods; (C) Trees growing up on slopes beneath the Castle; (D) Triangular meadow where teasels grow; (E) Nissen huts and tracks in the Haining; (F) Butts Field in cultivation; (G) Ballengeich Pass; (H) Treeless Gowan hills; (I) Ballengeich cemetery and (J) Woodlands along Back o'Hill Road.

During World War II a row of Nissen Huts with their semi-circular corrugated iron roofs were built in the field. The Pineapple-weed and Silverweed that are still present were probably associated with the cinder paths laid down to service these buildings. There are also a number of colonies of cultivated Narcissi

around the site of the huts which are probably associated with their occupancy after the war ended. In the NE corner is a colony of purple flowered Common Comfrey with its hybrid Russian Comfrey. In the stream running along the wall is an unusual Sharp-leaved Mint and blue flowered Brooklime. In addition there is an unwelcome colony of Japanese Knotweed a modern aggressive invasive species which has yet to succumb to herbicide treatment. This is one of the very few sites where we recorded Wild Garlic or Ransom which grows in profusion in many local woods.

Originally the wooded slope above the Haining was thought to have been terraced and planted with fruit trees for either James IV or the Erskines of Mar. Some of these terrace walls have been rebuilt to retain the current zig zag path and can be recognised by their constituent massive irregular stones (Harrison, 2016). We found no botanical relics of the orchard. The old boundary between the Burgh lands to the east and the Erskine's lands to the west ran along Royal Gardens and straight up the hillside where the remains of a wall are just visible (Harrison, 2016). In an 1870 photograph (figure 1) there is a boundary fence in the Haining between the woodland and the meadow. This has disappeared and the upper meadow boundary has been planted with Horse-chestnuts, Oak and Lime. In the corner next to Royal Crescent there is a rare Field Maple.

Cuckoo-pint or Lords and Ladies which was once very rare around Stirling (Croal, 1879) is flourishing in the Back Walk Woods near the Butt Well. The purple 'spadix' of its unusual inflorescence heats up to release volatile chemicals which attracts large numbers of small flies. They become trapped in a sheathing vase shaped leaf and they pollinate the tiny male and female flowers found hidden in the base (plate 7).

The octagonal stepped sculptured banks of the King's Knot are the only remains of the ancient Royal Garden of which there seems to be no botanical relics (figures 1 and 3). The 'cup and saucer' as the locals call it has been the subject of excellent historical reviews by Cook (1907), Digney and Jones (2013), Harrison (2016) and Brown (2017). Briefly, it is thought that James IV's 'Great Garden', which was started in 1493, occupied this area as well as the adjacent Haining. In the period 1501-3 extraordinary numbers of plants were purchased to stock it including 1,500 plum trees from Culross, 400 thorn trees for hedging, as well as flowers, herbs, beans and peas. It seems to have been well maintained until James VI inherited the English throne in 1603 and attention switched to the gardens of the English palaces (Digney and Jones 2013). When Charles I succeeded to the throne in 1625 he sent a warrant to the

Earl of Mar who was responsible for managing the castle commanding him to appoint a skilful and experienced gardener since he had word that his Stirling garden was *wilde and overgrown with bushes and brambles*. The appointee William Watts from 1627 constructed a dyke and fence round the site to keep out the deer and he is thought to have constructed the geometric earth works (Digney and Jones, 2013). Over the next century the garden seems to have been on minimum maintenance. Visitors could recognise the mounds but by 1777 one observer noted *long neglect and the natural wetness of the soil rendered the garden little better than a marsh*.

In 1810 the upgrading of Dumbarton and Raploch roads cut through the site. Subsequently the earthworks were used for grazing and the surrounding land was lost into the surrounding cultivated fields. On the occasion of Queen Victoria's visit to Stirling in 1842 Her Majesty expressed her regret at the neglected appearance of the site (Shirrah, 1889). The hint was taken and in 1867 the Office of Works restored the earthworks to its present condition. Many post cards from the 1870s onward show the Knot was grazed by sheep. Local custom had it that two old Hawthorns which stood on the bank and ditch on the north side of King's Knot were survivors of the original 16 C Royal Garden hedge the planting of which is recorded in the Lord High Treasurer's Accounts of 1501. When these trees blew down in 2011 analysis of the growth rings showed they had only been planted in the late 19th century (Digney and Jones, 2013).

One interesting botanical find in the King's Knot field was the Bulbous Buttercup the rarer of the three local buttercup species which grows along the Dumbarton Road wall. This colony may predate the metalled road since it continues up the verge on Queen's Road in front of the Golf Club house. This is close to the site of the six acre Park Loch which was stocked with Perch, Trout and Pike in the 16 C together with ornamental birds such as Herons, Cranes and Bitterns (Digney and Jones, 2013). The loch drained into the Town Burn which ran down the line of Dumbarton Road and was lowered at the end of the 18 C to drain the loch (Ronald, 1891). Although the old loch site near the first fairway sometimes fills with water (e.g. January 2018) we have found no floral relics of its watery past.

Cuckooflower or Lady's-smock was recorded as growing in abundance around the King's Knot by Forest in 1831. It is the food plant of caterpillars of the Orange Tip butterfly which recolonised the Stirling area after a long absence in 1990 and is now quite common. The plant is still found in the low hundreds round both the Haining and the King's Knot though the mowers have taken

their toll in the latter. Garlic Mustard another Orange Tip food plant is found growing prolifically along the woodland margin in the Haining.

The large field between the Raploch Road and the base of the Castle Rock was used for cutting and winning hay as far back as 1479. During the period 1493 – 1506 the landscape around the Castle was transformed and this relatively flat field was used for sporting activities including archery which gives it its current name The Butts (Harrison, 2016). In the many photographs spanning the last 150 years these fields usually appeared as heavily managed pasture or hay fields. A World War II postcard shows it had been ploughed and supported a cereal crop and the 1948 aerial photo in figure 8 also shows evidence of cultivation. This management has led to the loss of most meadow wild-flower species. The stream from the Butt Well runs down the edge of the Butt Field and terminates in a muddy pool. It usually dries out in the summer and is populated by Knotgrass, Redleg (Redshank) and Reed Canary-grass.

The Cliffs on the North Side of the Castle.

On the Stirling Smith's Ordnance Board Map the steep slopes on the north side of the Castle above Ballengeich Pass were described as *hill pasture* like those to the south. In this case an old map of the area shows a sheep fold beside the road (Cook, 1897). Post cards and aerial photographs of this slope show it was kept free of scrub and trees until the 1980s. During our surveys we have noticed a rapid growth of scrub and young trees. In 2007 one of our survey photographs of the Wall-flowers on the rocks beside Ballengeich Road included 14 flowering plants. Sadly by 2019 only three lonely Wall-flowers remain. The historic Ballengeich Cabbage patch was also lost to Daffodil planting in 2011 and the Giant Bellflowers on the slope disappeared in 2016.

Conclusions

The covering of the Castle Rock slopes with scrub and woodland usually arouses an adverse reaction when old photographs of the Castle are posted on the Old Stirling website. The bare slopes of a century ago make the Castle look altogether more imposing. When surveying for this publication I was mistaken for a Council Official and was chastised by a group of visitors who had walked round the higher Back Walk to photograph the Castle only to find it virtually invisible. As I hope this account relates the Castle Rock vegetation is as much part of the Castle's history as more solid artefacts and it deserves more sympathetic management.

Acknowledgement

In attempting to interpret the changing flora of the Castle Rock I have relied heavily on background historical facts derived from secondary sources. I would like to thank these local historians for all their hard work and particularly John Harrison who has spent many hours helping me with this project.

Note: The common plant names in this account are those used in Collins Flower Guide (Streeter, 2009). A complete list of plants on the Castle Rock will be included in Part 2 of this survey to be published in next year's 2020 FNH Journal volume 43.

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UPPER FORTH AREA BIRD REPORT 2018

N. Bielby

This is the 45th 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 that part of the Clyde drainage basin which fall in the Stirling Council area such as Loch Lomondside and the Endrick Water area (including Fintry and Balfron) all of which are covered by the Clyde bird report. The total area covered is c.222,554 ha. The report consists of a summary of the main bird news from 2018 followed by detailed species accounts.

Chris Pendlebury, the local SOC recorder, can be contacted by e -mail at chris@upperforthbirds.co.uk; by leaving a message on 07798 711134 Whilst our preference is for records to be provided through the BTO (British Trust for Ornithology) BirdTrack system (35,910 records by 156 contributers from 885 locations were entered into Birdtrack for our area in 2018), an alternative method is 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 Chris or the deputy recorder, Neil Bielby at n64b68@gmail.com or by phoning 01786 823830.

Much information and records - especially counts, rates and comparisons - come from the Wetland Bird Survey (WeBS) and Breeding Bird Survey / Waterways Breeding Bird Survey (BBS / WBBS) surveys carried out on behalf of the BTO. In 2018 a total of 67 randomly selected km squares were surveyed for the BBS which, along with four Waterways BBS (WBBS) sites, resulted in 284.9 linear km being perambulated. A total of 12,886 birds were recorded from 106 species by 37 surveyors with the coverage in each broad habitat type in the Upper Forth area being quite close to that of the actual. (The six broad habitat categories are: 'mountain & moorland'; 'conifer woodland'; 'deciduous woodland etc.'; 'farmland'; 'urban / suburban' and 'WBBS'. Note that the category 'deciduous woodland etc' refers to all habitats not found in the other five broad categories and includes scrub, marsh and water features. Because these categories are 'broad' most species occur in any of the categories.)

The monthly WeBS counts (Jan – Mar and Sep - Dec) are split into estuary and inland with the former being co-ordinated by Mike

Bell. The estuary counts, which are downstream from Cambus, are split into seven sectors in which 110,577 wildfowl and waders were counted in the 7 months (Jan-Mar & Sep-Dec) by 13 volunteers. Inland, 116 still sites and 148.5 km of rivers and canals were counted by 51 volunteers producing 41,033 wildfowl and waders in the same 7 months during which there were 635 counts on still sites and 793.8 km of river and canal were walked.

Note: a detailed weather report for 2018 can be found elsewhere in this journal.

HIGHLIGHTS OF THE YEAR

January

The birds of the month were Hawfinches on Holme Hill, Dunblane with the first three on the 9th and a max. of seven on the 21st. Six Little Egrets were on the Forth Estuary by Kincardine Br. (3rd). A ♂ Blackcap was in a Dunblane garden (1st) while three Shelducks were on the Blackdub Floods the next day. A Red-throated Diver was on the S. Alloa-Dunmore stretch of the R. Forth (11 Jan). 19 Oystercatchers on the R. Forth, Stirling were early inland returnees (13th). A Hen Harrier was over the R. Forth below Kippen (20th) with two on the nearby Coldoch Rd the following day when a Shelduck was unusually far inland on the Aberfoyle Floods. A White-fronted Goose was on Drip Moss (25th) with a Long-tailed Duck on the Lake of Menteith the following day.

February

The Hawfinches were still on Holme Hill with seven there (20th), two (22nd) and four (24th). A group of seven Snow Buntings were at Auchtertyre Fm, Tyndrum (3rd). A Ringed Plover at Cambusmore / Gart GP's was the earliest spring returnee there in 25 years of counts where seven Common Crossbills were also seen (3rd). A Green Sandpiper was on the Allan water nr Kinbuck (16th) with a Pintail and a Shoveler on L. Watston, Deanston the following day.

March

C.15 Waxwings were reported from the Old Doune Rd, Dunblane (2nd) while seven flew over Skinflats Pools (4th). C. 3-4 Hawfinches remained on Holme Hill, Dunblane throughout the month. A 2nd winter Little Gull was at Blackness (8th). A Red-throated Diver and three Guillemots were on the estuary off Blackness (11th) with c.55 Guillemots and at least one Razorbill there the following day. Between the 16th and the 20th there was a large Guillemot 'wreck' caused by the so called 'Beast from the

East'. They were reported from throughout the area, many on inland waterbodies with the furthest west being five on L. Katrine (20th). The maximum counts were c.70 at Skinflats TE and 58 on the R. Forth at Cambus (17th).

Other species blown in on these strong, bitterly cold easterlies were: c.20 Kittiwakes and a Razorbill on the R. Forth at the Black Devon (16th); two Red-throated Divers, a Shag, and two Kittiwakes at S. Alloa (17th); a Fulmar, eight Kittiwakes and eight dead Razorbills at Blackness (18th). A Long-tailed Duck and three Guillemots were on the Lake of Menteith (20th). A Red-throated Diver was on L. Chon (19th). A Little Egret was at Higgin's Neuk (22nd) and two Greenland White-fronted Geese were at Cambus (25th).

Year firsts: a Wheatear was at Powfoulis (24th).

April

Four Ringed Plovers and two Redshanks were at Cambusmore / Gart GP (1st) while two Black-throated Divers were on L. Iubhair (5th). Two Scaup and c.1,000 Black-tailed Godwits were at Kinneil (7th). A Glossy Ibis visited Skinflats (8th). Two Little Egrets were on the Powfoulis shore (8th) with four Redshanks at the head of L. Tay the day after. A Red-throated Diver, a Fulmar, c.10 Kittiwakes and a 'few' Guillemots were at Blackness when 18 Shelducks and a pair of Shovelers were at Cambus Village Pools (10th). Five Red-throated Divers and nine Scaup were at Kinneil (14th) followed by a Little Egret and 12 Twite on the Powfoulis shore the next day. An Iceland Gull was at Blackness and a White Wagtail was at the W end of L. Katrine (16th). 12 Whimbrel were at the Skinflats TE Pool (21st) with a further three at Blackness a day later.

Year firsts: Swallows were at Kinneil, Gartmorn Dam and Tullibody Inch when a Willow Warbler was at Skinflats Pools (7th). A Tree Pipit was near Dollar (10th). On the 15th there were Common Sandpipers at Skinflats Pools and Powfoulis with two Sandwich Terns also at Powfoulis. Two Blackcaps, a Sedge Warbler, a Whitethroat and two Grasshopper Warblers were at Kinneil (21st) with the first Swift of the year over Dunblane (29th).

May

The first Cuckoo of the year was reported from G. Lochay (1st).There were seven Whimbrel and six Wheatears at Skinflats (6th). A Little Ringed Plover was at the head of L. Tay when a Wood Sandpiper was on Longcarse (8th). A Bee-eater was recorded in the Trossachs (11th). A Temminck's Stint was at the head of L. Tay (25th)

with a Red-necked Phalarope there the next day and a Wood Sandpiper the day after that. A Dunlin, a Redshank and a ♂ Mandarin Duck were at the head of L. Tay (27th).

Year firsts: A Whinchat was at Skinflats Pools with Wood Warblers at Killin and G. Lochay (6th) while a Garden Warbler was in Callander the next day. Two Spotted Flycatchers were in G. Lochay (29th).

June

The head of L. Tay was the place to be with a Little Ringed Plover (5th), a first summer Little Gull there for the following 2 days, a Black-throated Diver 6th and a pair of Red-necked Phalaropes (9th).

July

A Ferruginous Duck on the north Skinflats Pool from the 20th – 25th was only the 4th record for the area.

August

A pair of Avocets fledged three young at Skinflats TE. This is the first recorded successful breeding of this species in Scotland (Scottish Birds 38:4 (2018) p314). A Little Gull was at Kinneil when two Pintails and seven Sanderling were at Skinflats Pools (6th). A Shoveler, a ♂ Mandarin Duck and a Black-tailed Godwit were at the head of L. Tay (9th). 1,219 Black-tailed Godwits, two Greenshanks, 1,409 Redshanks and a Turnstone (still in breeding plumage) were at Kinneil 22nd. A Guillemot flew over the head of L. Tay (29th). Nine Gadwall, 12 Shovelers and two Ruff were at Skinflats Pools (30th).

September

A Whimbrel was at the head of L. Tay (2nd) while an adult Mediterranean Gull was on the Forth Est. at Kennet Pans (8th). A Green Sandpiper and an Osprey were by the R. Teith at the Carse of Lecropt (10th). Eight Barnacle Geese flew over Dollar (14th). The first returning Pink-footed Geese were heard over Dunblane (15th). A ♂ Ring-necked Duck was on Gartmorn Dam (16th). A ♂ Mandarin was on the extensively flooded Balvag Marshes when two Guillemots were on L. Iubhair (20th). A Red-throated Diver and two Common Scoters were on the Forth Est. at Blackness with a Slavonian Grebe at the head of L. Tay when three Gannets flew over Stirling University (22nd). A Hen Harrier was at Buckieburn Resr. (23rd). There were two Gannets, an Eider, 1,090 Black-tailed Godwits and three Greenshanks at Kinneil (24th). Two Whooper Swans were on Gartmorn Dam when two Whimbrel and a Greenshank were on Longcarse (30th).

October

A Hen Harrier was at the Touch Resr's (1st). Gannets were observed flying over Flanders Moss (11th). A ringtail Hen Harrier was at L. Coulter (15th). Five Brent Geese were at the confluence of the Rivers Forth and Black Devon (19th). The long staying Ferruginous Duck on Skinflats Pools was last reported on the 20th when 15 Barnacle Geese were N. of Skinflats on the Forth Estuary and Whooper Swan numbers at Skinflats Pools peaked at 110. Two Scaup were also present on the pools with 38 Pintails on the estuary. A Merlin was seen at Skinflats Pools (23rd). 14 Common Scoters, two adult Pomarine Skuas, a juvenile Arctic Skua and an adult Little Gull were off Blackness when a lone Brambling was at Slamannan (27th). 12 Grey Partridges were on Longcarse (27th). A single Waxwing was at Gartmore (28th) while 10 were at nearby Aberfoyle (31st). C.50 Bramblings were at Kinbuck (28th).

November

Waxwings: 12 Victoria Park, Falkirk (10th); 17 Merchiston Rd, Falkirk (13th) with 32 there (21st). One Gartmore (19th); c.20 Carron Rd and 12 St Mungo's School, Falkirk (23rd) with a maximum of 31 at the latter (30th). The maximum count in Dunblane was seven (24th). Gartmorn Dam held Upper Forth record totals of 164 Mute Swans and 156 Goosanders (1st). There were 24 Whooper Swans at Mains of Powfoulis (5th). A Long-tailed Duck and a Jack Snipe were in the Skinflats Pools area (10th) with two Little Egrets there (23rd) followed by one Little Egret, 102 Pintails and 10 Twite the next day. A Jack Snipe was at L. Coulter when c.80 Tree Sparrows were on Flanders Moss (12th). A Jack Snipe was flushed at L. Ellrig when 20 Bean Geese were at Slamannan (15th). A ♀ Common Scoter was on the Lake of Menteith (19th) with another on L. Iubhair (24th). A Blackcap was in an Alloa garden (20th).

December

Waxwings: Up to 50 were in various locations around Falkirk (1st – 14th); 17 were in Bo'ness (4th); five were in Gartmore (9th) and a 'small group' were at Asda, Grangemouth (14th). A single Hawfinch was on Holme Hill, Dunblane during the first week of the month. A Little Egret, a Merlin and a Short-eared Owl were at Skinflats Pools when eight Whooper Swans were on Black Loch, Limerigg (4th). Two Blackcaps were in an Alloa garden. (6th). A Green Sandpiper was by the Allan Water, Kinbuck (8th). Eight Common Crossbills **were** at Cambusmore GP when a Shag flew W up the R. Forth below Gargunnock (9th). The returning Eurasion x American Wigeon hybrid was on Alloa Inch (11th). Five Whooper Swans were on the flooded Balvag Marshes when a Green Woodpecker was in Balquhidder (19th). In the Skinflats area there was an 'intermediate' Snow Goose (24th); a Merlin at Brackenlees Fm and c.76 Tree

Sparrows at nearby Stonehouse Fm. (26th) where a Hooded Crow hung around (24th - 29th). C.40 Twite were near Powfoulis (29th). Two Little Egret and c.45 Twite were noted at Skinflats TE when a Merlin hunted over the Blackdevon Wetlands (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 editors are grateful to all the contributors for submitting their records without which this report could not be written. Apologies to anyone who has been inadvertently missed out.

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SYSTEMATIC LIST

Codes – F, C and S refer to the Falkirk, Clackmannanshire and Stirling Council Areas respectively.

Names and species order: both the common and Latin names, along with the species order, have been in a continuous 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 the IOC International English names (2012) in brackets.

In this report a coded summary of general distribution is included after the species name. The codes used 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 (this normally applies to species recorded 20 or less times).

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

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 ('s) (apparently occupied nest (s)), AOT (apparently occupied territories), av (average), b (brood), b/lkm (birds per linear km), br (bridge), BoA (Bridge of Allan), BoD (Braes of Doune), bldgs. (buildings), conf (confluence), CP (country park), Cres (crescent), Dr (Drive), esp (especially), Est (estuary / estate), Fm (farm), FCS (Forestry Commission Scotland), F & C (Forth & Clyde), gdn (garden), G (glen), GC (Golf Club), GP (gravel pit), Hosp (hospital), Ho (house), Imm (immature), Incl. (including), Ind (industrial), juv (juvenile), Kinc. (Kincardine), L. (loch), max (maximum), mins (minutes), mon (monument), NR (nature reserve), nr (near), NH (new high), pr (pair), Pl (Place), resr. (reservoir), R. (river), Rd. (road), ssp (sub-species), Sta (Station), St (Stirling), TE (tidal exchange), UF (Upper Forth), Uni (University), y (young) & > (flying).

MUTE SWAN *Cygnus olor* (B, W)

Inland WeBS: 300 in Jan, 264 in Feb, 262 in Mar, 193 in Sep, 306 in Oct, 400 in Nov & 257 in Dec.
Forth Est. WeBS: 13 in Jan, 5 in Feb, 5 in Mar, 6 in Sep, 6 in Oct, 3 in Nov & 3 in Dec.

F Breeding: pr + 1Y Helix, F & C Canal 13 May (SW); pr + 4Y Skinflats Pools 5 Jun (NB); pr + 3Y Falkirk Wheel, F & C Canal 5 Sep (NB); pr + 4Y Falkirk, F & C Canal 10 Sep (AIB); pr + 1Y Glen Village, Union Canal 11 Sep (CM). Site max: 34 Helix Pond 21 Oct & 27 Kelpies, F & C Canal 3 Nov.

C Breeding: 2 nests R. Devon, Alva W. 27 Apr (DTh); pr + 2Y Delph Pond, Tullibody 12 Sep (NB); pr + 2Y Gartmorn Dam 13 Sep (NB); pr + 2Y Cambus Pools 17 Sep (RLG) & pr + 5Y Ditch, R. Devon 21 Sep (KTW). Site max: 164 (incl. 21 juv) Gartmorn Dam 1 Nov & 113 R. Devon (Alva-Tullibody Br) 20 Jan.

S Breeding: pr + 3Y head of L. Tay 5 Jun (JPH); pr + 3Y (only 1 reached adulthood) Ochlochy Pond 16 Jun (KJD); pr + 7Y Airthrey Loch 9 Sep (EG); pr + 3Y R. Teith, Callander 16 Sep (NB); pr + 3Y Lake of Menteith 17 Sep (NB) & pr + 2Y Cromlix Ho. L. 21 Sep (NB). Site max: 41 Lake of Menteith 10 Dec & 23 Blairdrummond Ponds 14 Dec.

WHOOPER SWAN *Cygnus cygnus* (W)

Inland WeBS: 28 in Jan, 17 in Feb, 38 in Mar, 0 in Sep, 4 in Oct, 28 in Nov & 31 in Dec.
Forth Est. WeBS: 0 in Jan, 0 in Feb, 0 in Mar, 0 in Sep, 26 in Oct, 19 in Nov & 23 in Dec.
Spring departure last: 2 L. Dochart 8 May (JPH). Autumn arrival first 3 Longcarse, 3 Skinflats TE & 1 Gartmorn Dam 22 Sep (JRC, GG, JP, DOE).

F Winter/spring site max: 11 L. Ellrig 6 Jan. Autumn/winter site max: 110 Skinflats Pools 22 Oct; 28 Mains of Powfoulis 5 Nov & 16 Blackness Bay 2 Oct.
C Winter/spring site max: 25 >N Cambus 9 Apr & 13 Devonmouth Pool 15 Mar. Autumn/winter site max: 55 Kennet Pans 10 Nov & 14 Clackmannan 28 Oct.
S Winter/spring site max: 26 >N G. Fillan 21 Mar; 17 L's Dochart & Iubhair 23 Feb & 15 L. Doine 23 Mar. Autumn/winter site max 31 L. Dochart 2 Nov; 30 Carse of Lecropt 15 Nov & 25 >SW Dunblane 25 Oct.

BEAN GOOSE *Anser fabalis* (W)

F Regular wintering flock of Taiga race birds in the vicinity of the Slamannan Plateau. Last 7 on 10 Feb (ME). First c.100 on 6 Oct (WT). Winter/spring max: 178 Slamannan 1 Jan (SWo). Autumn/winter max: 241 Slamannan area Oct (AMac).

PINK-FOOTED GOOSE *Anser brachyrhynchus* (W)

With several birds over-summering it is now very difficult to ascertain an accurate spring departure date however, 38 were at Cambus 15 May (GG). Autumn arrival: a skein > S Dunblane 15 Sep (NB).
Forth Est WeBS: 2,486 in Jan, 1,405 in Feb, 2,705 in Mar, 0 in Sep, 1,549 in Oct, 2,440 in Nov & 2,085 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: 2,961 Skinflats 11 Mar & 1,020 S. Alloa 11 Mar. Autumn/winter site max: c. 5,000 – 10,000 Hill of Kinnaird 19 Oct; c.3,600 S. Bellsdyke 5 Oct; c.2,090 Skinflats 2 Dec & c.1,000 Dunmore 19 Oct. A max. of 9 summering birds were in the Skinflats Pools to Higgin's Neuk area.
C Winter/spring site max: c. 3,000 Haugh of Blackgrange 17 Jan (put up by gunfire); c.2,400 Longcarse 8 Apr & c.1,600 Alloa Inches 6 Jan. Autumn/winter site max: c. 5,000

Clackmannan 28 Oct; c.4,100 Cambus 12 Oct; c. 1,500 Alloa Inches 11 Oct; c.1,400 Longcarse 22 Sep & c.1,300 Kennetpans 22 Oct. A max. of 17 summering birds were recorded on Longcarse 26 May with 2 on Kennet Pans 2 Sep.

S Winter/spring site max: c.2,920 Carse of Lecropt 2 Feb & 1,140 Throsk 11 Mar. Autumn/winter site max: c.7,500 >W Kinbuck 4 Nov; c.6,100 Polmaise Tip 25 Oct; c.2,000 Braes of Doune 29 Oct; c.2,000 Carse of Lecropt 17 Nov & 1,000 Blairdrummond 10 Nov.

*WHITE-FRONTED GOOSE (Greater) *Anser albifrons* (w)

F One *ssp albifrons* Slamannan 1 Jan (SWo).

C Two *ssp flavirostris* Cambus 25 Mar & 1 Longcarse 8 Apr (GG, JRC).

S One Drip Moss 25 Jan (NB).

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 muddied by the presence of an ever increasing number of resident feral birds whose winter population probably matches the Icelandic one now.

Forth Est. WeBS: 73 in Jan, 107 in Feb, 2 in Mar, 644 in Sep, 133 in Oct, 103 in Nov & 0 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: 149 St Helen's Loch 13 Feb. Summer (feral / naturalised birds): c.430 Skinflats Pools 9 Aug. Erratum: c.10,000 Blackness 22 Oct (volume 41) should have been c.1,000.

C Winter/spring site max: c.500 Cambus Pools NR 17 Feb; c.400 Alva 11 Mar & c.400 Longcarse 8 Apr. Summer (feral / naturalised birds): c.600 Longcarse 22 Sep & 594 Alloa Inches 11 Sep. Autumn/winter site max: 615 Tillicoultry 16 Nov; 361 Alva Wetland 3 Dec & 358 Kersiepow 5 Nov.

S Winter/spring site max: c.200 Blairdrummond Ponds 4 Feb; c.160 Blairdrummond Moss 20 Feb & c.150 R. Forth, Gargunnock 20 Feb. Summer (feral / naturalised birds): 208 Lake of Menteith 17 Jun. Autumn/winter site max: c.200 Blairdrummond Ponds 10 Nov; c.180 R. Forth, Gargunnock 19 Nov & 143 N. Third Resr. 12 Nov.

*SNOW GOOSE *Anser caerulescens* (Irr)

F One intermediate morph bird was nr Skinflats Pools 24 Dec (SWo).

CANADA GOOSE *Branta canadensis* (B, W)

Numbers continue to increase.
Inland WeBS: 750 in Jan, 619 in Feb, 529 in Mar, 882 in Sep, 1,281 in Oct, 1,006 in Nov & 621 in Dec.
Forth Est. WeBS: 13 in Jan, 2 in Feb, 8 in Mar, 214 in Sep, 33 in Oct, 15 in Nov & 0 in Dec.
BBS: recorded at 0.27 b/lkm (1997-2017 average: 0.11 b/lkm. Range 0.0 (1998) to 0.34 (2014) b/lkm).

F Site max: 170 Skinflats Pools 1 Oct; 158 Underwood 25 Oct & 144 St Helen's Loch (Bonnybridge) 15 Nov.
C Breeding: b's of 6,5,3,3 & 2 Gartmorn Dam 18 Jun (NT). Site max: 442 Gartmorn Dam 3 Oct.
S Breeding: Cambusmore / Gart GP: pr + 6 chicks 6 May with 9Y 3 Jun (NB). L. Chon: pr's with 4, 2 & 2 chicks 10 May (NB) & pr with b.5 Cornton Pond (Argaty) 4 Jun (KJD). Site max: 437 L. Rusky 16 Sep; c.300 Blairdrummond Ponds 10 Nov; 256 N. Third Resr. 12 Nov; 164 Gartartan Fields 10 Dec; 156 L. Venachar 11 Oct; 148 Balquhidder Glen 23 Nov; 135 R. Forth (Gargunnock) 20 Sep; 126 R. Forth (The Frews) 14 Oct & 100 Lake of Menteith 20 Mar.

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 of groups between Feb - Mar & Sep – Nov will be of wild birds on migration between Svalbard & the Inner Solway Firth.

F 23 >SW Skinflats 27 Sep; 2 Skinflats 30 Sep; 4 Airth 14 & 20th Oct; 15 Powfoulis 20 Oct & 15 E of Airth 21 Oct.
C One Blackgrange 11 Mar; 8 over Dollar 14 Sep & 4 Kennetpans 27 Oct.
S One Gogar 13th & 22nd March & 3 Polmaise Tip 25 Oct.

Presumed feral birds: 1 Gartmorn Dam 31 Oct & 1 N. Third Resr. 12 Nov.

*BRENT GOOSE (Brant Goose) *Branta bernicla* (p)

C Six mouth of the Black Devon 17 Oct (RLG).

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

Inland WeBS: 6 in Jan, 0 in Feb, 4 in Mar, 0 in Sep, 0 in Oct, 1 in Nov & 0 in Dec.
Forth Est. WeBS: 545 in Jan, 638 in Feb, 536 in Mar, 2,807 in Sep, 1,991 in Oct, 816 in Nov and 498 in Dec.

F Breeding: br of 5 chicks Kinneil 12 Jun (NB). Moult flock max counts: 4,204 Kinneil/Skinflats 9 Aug with 4,520 on 22 Aug

(DMB, MVB). Other site max: 210 Blackness Bay 16 Sep.

C Breeding - Tullibody Inch: 16 chicks 23 Jun & 23 juv 25 Aug (NB). Crèche of 10Y R. Forth (Cambus) 7 Jun & 9 Jul (GG, DH). Site max. 152 R. Forth, Longcarse 23 Jun; 18 Cambus Village Pools 10 Apr; 2 Blackdevon Wetlands 27 Jan; 1 Cambus Pools 17 Feb & 1 Alva floods 11 Nov.

S Site max: 3 Blackdub Floods 2 Jan; 1 Aberfoyle 21 Jan; 2 Allan Water, Kinbuck 10 Mar & 8 Bandeath 8 Apr.

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

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

S One ♂ head of L. Tay 5 May – 20 Aug (JPH) & ♂ Balvag Marshes 20 Sep (NB).

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

Inland WeBS: 547 in Jan, 336 in Feb, 319 in Mar, 18 in Sep, 65 in Oct, 409 in Nov & 412 in Dec.
Forth Est. WeBS: 1,562 in Jan, 1,177 in Feb, 1,376 in Mar, 35 in Sep, 160 in Oct, 1,025 in Nov & 1,304 in Dec.

F Winter/spring site max: c.400 R. Forth, S. Alloa – Dunmore 11 Jan; 157 Skinflats 17 Feb & c.150 Kinneil 9 Mar. Autumn/winter site max: 142 Carriden 10 Nov; c.140 Blackness 27 Oct. & 101 Skinflats 11 Nov.

C Winter/spring site max: 1,194 R. Forth, Cambus - Alloa 6 Jan & c.130 Gartmorn Dam 21 Jan. Autumn/winter site max: 981 R. Forth (Cambus-S. Alloa) 10 Dec & 164 Alva Wetlands 3 Dec.

S Winter/spring site max: 238 Cambusmore / Gart GP 7 Jan. Autumn/winter site max: 106 R. Forth, The Frews, 16 Dec.

GADWALL *Mareca strepera* (s, w)

F Site max: 5 Skinflats Pools 6 Nov & 5 St Helen's Loch, Bonnybridge 5 Oct.

C Site max: 11 Gartmorn Dam 21 Oct; 4 Longcarse 5 May; 3 Cambus Village Pools 7 Jun & 2 Blackdevon Wetlands 22 Apr.

S A ♂ head of L. Tay 6/7 Jun.

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

Inland WeBS: 1,442 in Jan, 982 in Feb, 559 in Mar, 657 in Sep, 1,446 in Oct, 1,593 in Nov & 1,413 in Dec.
Forth Est. WeBS: 2,073 in Jan, 2,038 in Feb, 2,106 in Mar, 630 in Sep, 815 in Oct, 2,314 in Nov & 3,527 in Dec.

F Winter/spring site max: 655 Kinneil 1 Feb & 349 Skinflats 17

Feb. Autumn/winter site max: 677 Kinneil 8 Dec; c.470 Skinflats 11 Nov; 169 R. Carron (Carron Ho.-A905) 8 Dec & 151 Skinflats Pools 22 Aug.

C R. Forth (Cambus-Alloa) monthly max: 1,184 Jan; 799 Feb; 1,308 Mar; 228 Apr; 432 Sep; 864 Oct; 666 Nov & 2,224 Dec. Other site max: 329 Kennetpans 17 Feb; c.250 Black Devon & Wetlands 17 Oct; 126 Cambus Village Pools 1 Jan & 127 Alva Wetland 3 Dec.

S Breeding: ♀ + min 2Y Blackwater Marshes 17 Jun (NB). Site max: c.260 R. Forth (A91-Fallin) 21 Jan; 241 L. Watston 14 Dec (NH); 202 Allan Water, Kinbuck 18 Oct; 184 Flanders Moss Lochan 30 Jan; 160 L. Coulter 12 Nov; 155 N. Third Resr. 12 Nov; 148 Touch Resr's 8 Nov. & 135 Cambusmore / Gart GP 7 Jan.

MALLARD *Anas platyrhynchos* (B, W)

Inland WeBS: 2,204 in Jan, 1,711 in Feb, 1,200 in Mar, 2,178 in Sep, 2,018 in Oct, 2712 in Nov & 1,963 in Dec.
Forth Est. WeBS: 296 in Jan, 162 in Feb, 95 in Mar, 184 in Sep, 163 in Oct, 363 in Nov & 334 in Dec.
BBS: recorded at 0.59 b/lkm (1997-2017 av: 0.61 b/lkm; range 0.33 (2007) to 0.98 (2006) b/lkm). Unsurprisingly, the highest recording rate was on WBBS at 2.62 b/lkm. The 20th most numerous species on this year's BBS.

F Breeding recorded at N. Pool, Skinflats; Union Canal, Falkirk; R. Carron, Falkirk & Powfoulis. (NB, WP, AB, SWo). Site max: 105 Grange Burn, Grangemouth 12 Feb.

C Breeding recorded on the Rhind Pool (NB). Site max: 241 Silverhills Pond, Kersiepow 5 Nov & 130 Gartmorn Dam 1 Nov.

S Breeding recorded at Cambusmore / Gart GP (NB). Site max: 324 Pendreich Pool, B of A 27 Jan; 246 head of L. Tay 20 Oct; 141 Airthrey L. 9 Sep; 135 Blairdrummond Ponds 20 Jan; 133 Balquhidder Glen 23 Nov; 122 L. Dochart 7 Sep; 109 N. Third Resr 12 Nov & 102 Lake of Menteith 13 Nov.

PINTAIL (Northern) *Anas acuta* (W)

Forth Est. max: 175 in Jan, 163 in Feb, 205 in Mar, 18 in Apr, 2 Aug, 2 in Sep, 12 in Oct, 82 in Nov & 134 in Dec.

*F Other sites: ♂ L. Ellrig 6 Jan (NB); ♂ Larbert Hosp Ponds 14 Oct & ♂ R. Carron, Carron Br to Carron House 14 Oct (AB).

*C One Longcarse 13 Mar & 5 May with 2 on 25 Nov (JRC).

*S One L. Watston 17 Feb & 1 Blairdrummond Ponds 22 Dec (DOE).

SHOVELER (Northern) *Spatula clypeata* (p)

F Breeding: 2 ad + 5 chicks Powfoulis 30 May with 5 chicks still present 14 Jun (SWo). Skinflats Pools (monthly max.): 6 on 7 Jan, 7 on 25 Jul, 15 on 6 Aug, 5 on 7 Sep, 1 on 22 Oct, 3 on 2 Nov & 1 on 26 Dec. St Helen's Loch, Bonnybridge (monthly max): 6 (5 ♂) on 13 Feb, 2 on 5 Oct & 1 on 4 Dec.

C Longcarse area (monthly max): 3 on 13 Jan, 4 on 20 Mar; 3 on 8 Apr, 1 on 16 May & 4 on 5 Aug. 1 Gartmorn Dam 25 Jul. Cambus Village Pools 4 on 17 Mar & 19 Apr.

S One L. Watston 17 Feb; ♀ head of L. Tay 3 – 18 Aug & 1 R. Forth (A91 – Fallin) 14 Oct.

POCHARD (Common) *Aythya ferina* (w)

Inland WeBS: 0 in Jan, 7 in Feb, 8 in Mar, 0 in Sep, 3 in Oct, 12 in Nov & 17 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): 1 in Apr, 1 in Jun, 6 in Aug, 5 in Oct & 2 in Nov. Other site max counts: 1 Larbert Hosp Ponds 17 Mar & 2 St Helen's Loch, Bonnybridge 4 Nov.

C Gartmorn Dam (monthly max): 5 in Feb, 4 in Mar, 3 in Sep, 3 in Oct, 12 in Nov & 14 in Dec.

S Blairdrummond Ponds (monthly max): 1 in Sep, 1 in Oct & 4 in Nov. Cambusmore / Gart GP (monthly max): 2 in Feb, 1 in Mar, 1 in Apr, 1 in May & 1 in Jun (all ♂). 2 Carron Valley Resr. 18 Feb. Max 2 ♂ head of L. Tay Feb & Mar. Lake of Menteith: 4 (3 ♂) on 13 Nov & a ♂ 10 Dec. 3 ♂ R. Lochay, Killin 17 Feb.

*RING-NECKED DUCK *Aythya collaris*

C An eclipse ♂ at Gartmorn Dam 16 – 21 Sep was the 3rd record for the area (GG et al.).

FERRUGINOUS DUCK *Aythya nyroca* (V)

C F A ♂ at Skinflats Pools 20 - 25 Jul was the 4th record for the area with another ♂ there (possibly the same bird) from 9 – 24 Oct being the 5th record for the area (SWo, JSy et al.).

TUFTED DUCK *Aythya fuligula* (B, W)

Inland WeBS: 327 in Jan, 337 in Feb, 384 in Mar, 95 in Sep, 247 in Oct, 406 in Nov & 429 in Dec.

F Site max: 97 N. Pool Skinflats 12 Oct.

C Site max: 111 Gartmorn Dam 14 Oct.

S Breeding: pr + b5 Cornton Pond, Argaty 4 Jun (KJD), ♀ with 2 chicks Ochlochy Pond 28 Jul (MVB). Site max: 122 Cambusmore/Gart GP 11 Aug (moult flock); 82 Lake of Menteith 10 Dec; 65 Blairdrummond Ponds 20 Jan & 41 Airthrey Loch 19 Mar.

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

Forth Est. WeBS: 0 in Jan, 5 in Feb & 0 in Mar. None Sep – Dec.

F Kinneil monthly max: 1in Feb; 7 in Mar; 9 in Apr; 2 in Aug; 2 in Nov & 3 in Dec. Other site max: 5 Carriden 17 Feb; 3 Bo'ness 18 Feb & 3 Skinflats 20 Oct.

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

Forth Est. WeBS: 6 in Jan, 6 in Mar & 11 in Sep.

F Blackness max: 1 in Mar & 31 in Sep. 10 Bo'ness 9 Sep. Kinneil max: 5 in Feb, 2 in Mar, 5 in Apr, 3 in May, 7 in Aug & 2 in Sep.

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

F One Skinflats Pools 27 Oct to 11 Nov (DOE, WT, MVB et al.).
C Two Gartmorn Dam 20 Feb (SR).
S ♀/imm Lake of Menteith 25 Jan & 20 Mar with a ♂ 22 Mar (NB, DT et al.).

*COMMON SCOTER *Melanitta nigra* (w)

F Blackness: 2 on 22 Sep with 14 on 29 Oct (DOE, EMcL) & 1 Bo'ness 10 Nov (AMo).
S ♀ L. Iubhair 24 Nov (JPH) & ♀ Lake of Menteith 10 Dec (NB).

GOLDENEYE (Common) *Bucephala clangula* (W)

Inland WeBS: 361 in Jan, 343 in Feb, 518 in Mar, 5 in Sep, 16 in Oct, 170 in Nov & 351 in Dec.
Forth Est. WeBS: 42 in Jan, 24 in Feb, 77 in Mar, 0 in Sep, 0 in Oct, 5 in Nov & 33 in Dec.

F Site max: 75 R. Forth (S. Alloa - Dunmore) 10 Dec.
C Site max: 89 Gartmorn Dam 20 Mar; 61 R. Forth, Tullibody Inch 20 Mar; 55 R. Devon (Tullibody Br.-Cambus Weir) 12 Jan & 45 R. Forth at Cambus 3 Jan.
S Winter/spring site max: 117 (42 ♂) Lake of Menteith 20 Mar; 33 L. Venachar 20 Feb; 29 Cambusmore / Gart GP 11 Mar; 27 L. Lubnaig 19 Mar & 27 R. Forth (A91-Fallin) 21 Jan. Autumn/winter site max: 78 (13 ♂) Lake of Menteith 13 Dec & 31 CVR 9 Dec.

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

Forth Est. WeBS: 29 in Jan, 33 in Feb, 29 in Mar, 81 in Aug, 41 in Sep, 20 in Oct, 24 in Nov & 72 in Dec.

F Kinneil monthly max: 3 in Jan, 1 in Feb, c.25 in Mar, 14 in Apr, 81 in Aug, c.30 in Sep, c.20 in Oct & 35 in Dec. Other site max: c.20 Blackness 23 Sep; 12 Bo'ness 22 Sep; 6 R. Forth, Dunmore 10 Dec; 4 Skinflats TE 8 Oct & 2 Skinflats Pools 10 May.

C Site max: 5 R. Forth at Cambus 25 Mar; 5 Gartmorn Dam 22 Sep & 2 Longcarse 30 Dec.

S Breeding: ♀ with 8 ducklings head of L. Tay 20 Jul (JPH). Site max: 6 head of L. Katrine 17 May; 3 R. Forth, Kildean 19 Mar; 2 L. Ard 20 Apr; 2 R. Forth, Carse of Lecropt 7 Jan; ♂ Cambusmore / Gart GP 1 Apr; 1 L. Achray 21 Apr & 1 R. Forth (A91-Fallin) 16 Nov. Max of 10 head of L. Tay 28 Mar to 12 Sep.

GOOSANDER (Common Merganser) *Mergus merganser* (B,W)

Inland WeBS: 100 in Jan, 118 in Feb, 113 in Mar, 70 in Sep, 143 in Oct, 246 in Nov & 139 in Dec.
Forth Est. WeBS: 7 in Jan; 6 in Feb, 0 in Mar, 55 in Sep, 31 in Oct, 3 in Nov & 15 in Dec.

F Site max: 47 Skinflats (WeBS) 9 Sep; 32 Kinneil 2 Sep; 23 R. Carron (Carron) 3 Aug; 17 Glensburgh 12 Jul; 15 (8 ♂) F & C Canal (Bonnybridge – Lock 16) 16 Feb; 15 Bo'ness 22 Sep; 15 (5 ♂) Black Loch (Limerigg) 4 Dec; 14 R. Forth (S. Alloa-Dunmore) 10 Dec & 9 F & C Canal (Lock 16 – R. Carron) 19 Feb.

C Breeding: ♀ with 8 x ⅓ grown Y tidal R. Devon 10 Jul (DH) - probably nested further upstream and drifted down (ed). Site max: 156 (9 ♂) Gartmorn Dam 1 Nov (a new record count for the U.F.); 16 (11 ♂) Delph Pond (Tullibody) 3 Jan (NH); 16 R. Forth at Cambus 25 Mar & 12 (6 ♂) R. Devon below Cambus Weir 5 Nov.

S Breeding: ♀ with 12 ducklings head of L. Tay 12 Jun (JPH). Site max: 25 head of L. Earn 26 Jan; 21 Blairdrummond Ponds 24 Nov; 19 R. Forth (St Br – A91) 29 Oct; 17 R. Teith, Carse of Lecropt 9 Mar; 16 R. Teith, Callander 18 Jan & 14 (10 ♂) R. Forth (Fallin) 28 Mar.

RED GROUSE (Willow Ptarmigan) *Lagopus lagopus* (B, W)

BBS: recorded at 0.12 b/lkm (1997-2017 av: 0.14 b/lkm. Range: 0.03 to 0.37 b/lkm). Quite widespread but only in heather habitat and then in small numbers at a rate of 0.26 b/lkm.

C Four Colsnaur Hill 10 Feb.

S Seven Craigengelt Wind Fm 1 Sep; 6 Low Botaurnie, G. Lochay 5 Apr & 2 Kippen Muir 13 Dec.

*PTARMIGAN (Rock Ptarmigan) *Lagopus muta* (b, w)

S Two Beinn Sheasgarnaich 21 Apr; 2 Meall Ghaordaidh 8 May (♂ displaying); 1 Ben Challum 6 Jun & 3 An Caisteal 30 Aug (GG, NMcW, AIB, VW).

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

C Two ♀ Menstrie Glen 3 May (GG).

S One Moorend, Invertrossachs 10 Feb (IM); lekking birds heard Kenknock 21 Apr (GG); ♀ Sheriff Muir 29 Apr (NB); 10 E of L. Arklet 28 Apr & 13 on 3 May (SB, ER); 1 Gleann Breac-nic 6 May (CW); 2 L. Chon 8 May (PR) & 6 (5 ♂) Marbeg, L. Tay 11 May (JPH).

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

Occasionally released for shooting it is thought unlikely that the small feral population is self-sustaining.

C Eight by R. Devon below Balquharn 29 Oct.

S 37 Stonehill, Dunblane 9 Oct & 93 on 20 Nov; 14 Kippen 8 Dec; 11 Carse of Lecropt 24 Nov & 1 centre of Dunblane 28 May.

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: 12 Skinflats Pools 23 Nov & 2 Airth 5 Mar.

C Site max: 22 Longcarse 25 Nov; 8 Gartmorn Dam 24 Nov; 2 Blackdevon Wetlands 11 Mar & 2 Kennet Pans 7 May.

S Site max: 3 Cambuskenneth 22 Mar & 2 N. Third Resr 12 Nov.

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

S One Doune 1 Jun (DOE).

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

Large numbers released on shooting estates, otherwise widespread but in small numbers. BBS: recorded at 0.41 b/lkm (1997-2015 av: 0.51 b/lkm. Range: 0.22 to 0.8 b/lkm).

F Breeding: two ad + 7 chicks Powfoulis 30 May (SWo).

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

F One R. Forth (S. Alloa-Dunmore) 11 Jan; 2 Kinneil 18 Mar, 5 Kinneil 14 Apr; 1 Blackness 22 Sep & 1 Kinneil 8 Nov (DT, JRC, SWo, DOE, JRC).

S One Lake of Menteith 17 Mar (GG); 1 L. Chon 19 Mar & 1 L. Venachar 20 Mar (GG, TM, SH).

*BLACK-THROATED DIVER (Black-throated Loon) *Gavia arctica* (b)

S Two L. Venachar 31 Mar; 1 head of L. Tay intermittently 24 Apr – 19 Aug; L. Iubhair: 2 on 5 Apr, 3 on 24 Apr & 1 on 25 Apr; 3 L. Ard 20 Apr & 1 L. Voil 5 May (NB, JPH, FM, DA).

LITTLE GREBE *Tachybaptus ruficollis* (B, w)

Inland WeBS: 69 in Jan, 65 in Feb, 96 Mar, 81 in Sep, 81 in Oct, 55 in Nov & 91 in Dec.

F Breeding: b1 St Helen's Loch, Bonnybridge 10 Jun (MVB). Site max: 20 Drumbowie Resr. 1 Sep & 7 Little Denny Resr. 13 Mar & 1 Sep.

C Breeding: ad with 1Y Blackdevon Wetlands 31 May (NB) & 4 ad's with 3Y Gartmorn Dam 24 Jul (GG). Site max: 9 Gartmorn Dam 3 Dec.

S Breeding: Site max: 35 Cambusmore / Gart GP 2 Sep; 24 L. Lubnaig 19 Mar; 10 L. Dochart 22 Dec; 11 Blairdrummond Ponds 24 Jul & 8 L. Ard 10 Dec.

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

Inland WeBS: 3 in Jan, 17 in Feb, 30 in Mar, 36 in Sep, 18 in Oct, 24 in Nov & 17 in Dec.
Forth Est. WeBS: 4 in Jan, 14 in Feb, 6 in Mar, 5 in Sep, 30 in Oct, 11 in Nov & 20 in Dec.

F Monthly max: Blackness: c.20 in Mar, 2 in Apr, 5 in Sep & 3 in Oct. Kinneil: 8 in Jan, 13 in Feb, 34 in Mar, 6 in Apr, 2 in May, 3 in Jun, 1 in Jul, 15 in Aug, 21 in Sep, 29 in Oct, 20 in Nov & 32 in Dec. Other site max: 10 Bo'ness 22 Sep.

C Monthly max Gartmorn Dam: 5 in Feb, 2 in Mar; 1 in Apr, 1 in May, 2 in Jun, 12 in Jul, 1 in Sep, 15 in Oct, 14 in Nov & 7 in Dec.

S Breeding: 4 large, striped juv Lake of Menteith 17 Sep (NB). Lake of Menteith monthly max: 1 in Jan, 11 in Feb, 20 in Mar, 12 in Jun, 37 in Sep, 17 in Oct, 13 in Nov & 10 in Dec. Other sites max: 1-5 Cambusmore / Gart 11 Mar-2 Sep; 2 Blairdrummond Ponds 17 Mar; 2 Carron Valley Resr 30 Apr & 14 May; 2 L. Venachar 20 Mar; 2 N. Third Res. 24 Mar & 1 L. Rusky 10 Mar.

*SLAVONIAN GREBE (Horned Grebe) *Podiceps auritus* (irr)

S One head of L. Tay in winter plumage 22 Sep (JPH).

GANNET (Northern) *Morus bassanus* (p)

F Site max: c.50 Forth Est, Powfoulis 8 Oct; c.50 Skinflats Pools area 7 Oct; c. 40. Kinneil Kerse 29 Sep; 3 Blackness 30 Oct & 2 Airth 8 Oct.

C Site max: 17 Blackdevon Wetlands 30 Sep - mostly juvs; 14 Longcarse 30 Sep & 2 Alloa Inch 10 Oct.

S Site max: 29 'Stirling' 29 Sep; 3 over St. Uni. 25 Sep; 2 Doune 10 Oct; 1 Drip Moss 7 Oct; 1 B of A 7 Oct; 1 R. Teith, Lanrick 8 Oct; 1 Cambusmore/Gart GP 8 Oct & 1 R. Teith, Carse of Lecropt 8 & 15 Oct.

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

Inland WeBS: 149 in Jan, 89 in Feb, 70 in Mar, 113 in Sep, 129 in Oct, 126 in Nov & 118 in Dec.
Forth Est. WeBS: 64 in Jan, 41 in Feb, 23 in Mar, 79 in Sep, 53 in Oct, 39 in Nov & 52 in Dec.

F Site max: 55 Skinflats (WeBS) 9 Sep; 41 Higgin's Neuk area 22 Sep; 38 mouth of the R. Carron 18 Aug; 30 Skinflats Pools area 21 Dec & 25 R. Forth (S. Alloa – Dunmore) 10 Dec.
C Site max: 32 Gartmorn Dam 1 Nov; 17 R. Forth, Cambus 2 Apr & 11 Blackdevon Wetlands 17 Oct.
S Monthly site max: Lake of Menteith: 37 in Jan, 38 in Feb, 10 in Mar, 11 in Sep, 28 in Oct, 34 in Nov & 30 in Dec. Other site max: 69 L. Coulter 13 Jan (dropped in for 10 mins on passage W –E) NH; 43 Carron Valley Resr 9 Sep; 18 head of L. Tay 18 Nov; 17 Cambusmore / Gart GP 2 Sep (NH); 13 L. Laggan, Kippen 9 Dec & 11 N. Third Resr 15 Oct.

*SHAG (European) *Phalacrocorax aristotelis* (irr)

F One S. Alloa shore 17 Mar (DOE).

LITTLE EGRET *Egretta garzetta* (w)

F One Bo'ness 22 Sep; 2 S. Kincardine Br. area 11 Nov with 1 on 22 Mar & 29 Dec & 1 Kinneil 8 & 17 Sep. Skinflats TE: 1 from 2 – 18 Jan; 2 on 9 Sep with 2 on 30 Dec. Skinflats Pools area: 1 on 1 Feb, 1 on 13 Aug with 1- 2 from 23 Nov – 3 Dec.
*C One R. Forth, Longcarse 1 May (DMB).
*S One W Carse Fm., R. Forth 27 Sep (CSW).

GREY HERON *Ardea cinerea* (B, W)

Inland WeBS: 51 in Jan, 78 in Feb, 72 in Mar, 60 in Sep, 72 in Oct, 87 in Nov & 77 in Dec.
Forth Est. WeBS: 25 in Jan, 18 in Feb, 13 in Mar, 64 in Sep, 36 in Oct, 33 in Nov & 28 in Dec.
BBS: recorded at 0.11 b/lkm (1997-2017 av: 0.12 b/lkm. Range 0.03 (1997) to 0.23 (2005) b/lkm). Again unsurprisingly, the highest recording rate was on WBBS at 0.42 b/lkm.

F Breeding: 4 aon's Dalderse Sewage Works (AB). Site max: 39 Skinflats WeBS 9 Sep.
C Site max: 12 R. Devon (Alva) 18 Mar & 12 Tullibody Inch 6 Jan.
S Breeding: 9 aon's Nyadd (NB). Site max: 24 Drip Moss 29 Mar; 13 Blairdrummond Ponds 22 Dec & 11 head of L. Tay 13 Jul.

GLOSSY IBIS *Plegadis falcinellus* (v)

F One Skinflats Pools 8 Apr (MA). This is the 4th record (3rd) bird for the area.

RED KITE *Milvus milvus* (b ,W)

Inland WeBS counts: 3 in Jan, 4 in Feb, 4 in Mar, 1 in Sep, 3 in Oct, 9 in Nov & 8 in Dec.

*C Two in the Ochils above Alva 26 Mar & 1 Colsnaur Hill 28 May (AE).

S Breeding: c.24 monitored pr's in Central produced c.13 Y (CSRSG). Max of c.60 Argaty 11 Nov; 7 L. Mahaick 4 Dec & 7 Ashfield 15 Nov. Regular around BoD, BoA, Callander, Cromlix, Dunblane & Stirling. Occ. sightings in areas of Carron Valley Resr., Earlsburn Resr's, Fintry Hills, Flanders Moss, Gargunnock, G. Dochart & Menteith.

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

S One sub-adult over Kirkton Fm, G. Fillan 2 Feb (JPH) & 1 over a location in the Trossachs 4 Jun (CMcI).

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

F One Skinflats Pools area 29 Apr & pr there 2 May (SWo).

C One Blackdevon Wetlands 22 Apr (MVB) & a Juv dropped into the Tullibody Inch reedbeds 2 Sep (GG).

S Imm. Gargunnock Br. 20 Sep (RB).

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

S Male R. Forth, Kippen 20 Jan (RJS); 1 Ashfield 14 Mar (CRM), 2 Burnfoot Moor 22 Mar; 1 Sheriff Muir 17 May; 1 Argaty 8 Aug (DOE); 1 Buckieburn Resr. 23 Sep with a ♂ there 9 Dec (AMcP); 1 G. Tye 27 Sep (DOE); 1 Touch Resrs 28 Sep (CSW); ♂ Glentye Hill 1 Oct (KJD); ringtail L. Coulter 15 Oct (NB); 2 Braes of Doune 29 Oct with 1 on 6 Nov (CRM) & 1 W Flanders Moss 23 Dec (DOE).

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

S Breeding: 4 pr's fledged 9 Y in the area. These are quite widely spread so there are probably more (CSRSG). Other records: 2 L. Lubnaig 5 Apr (MH); 1 Drumloist 15 Apr (DOE) & 1 Ashfield 12 Nov (CRM).

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

Inland WeBS counts: 0 in Jan, 5 in Feb, 4 in Mar, 2 in Sep, 7 in Oct, 3 in Nov & 3 in Dec. Thinly spread throughout the majority of the recording area, only really absent from bare hills. Details of various behaviour was recorded. Contributors are encouraged to submit breeding records.

S Breeding: Y bird calling from a conifer wood, Cambusmore 2 Sep (NB).

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

The most numerous raptor recorded throughout the majority of the recording area. Contributors are encouraged to submit breeding records, esp. of discrete areas.
Inland WeBS counts: 39 in Jan, 71 in Feb, 55 in Mar, 39 in Sep, 45 in Oct, 53 in Nov & 47 in Dec.
BBS: recorded at 0.34 b/lkm (1997-2017 av: 0.36 b/lkm. Range: 0.24 (2013) to 0.55 (1997) b/lkm). Recorded on all habitat categories except urban & suburban with the highest recording rate being on deciduous woodland etc. at 0.56 b/lkm.

F No notable records.
C Six Longcarse 6 May.
S Breeding: ad + 2 juvs G. Lochay 10 Jul (JHN). Max: 9 Dochart Haughs 24 Feb;
8 R. Teith, Lecropt 26 Jan; 7 Carse of Lecropt 27 Feb; 7 L. Iubhair 8 Apr & 7 G. Lochay 29 May.

*HONEY BUZZARD (European) *Pernis apivorus* b

Location in the Trossachs: the ♂ of a pr was present from 24 May with the ♀ from 2nd Jun. Both birds then present until 30 Aug with wing-clapping behaviour being observed (CMcI).

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

S Breeding: 8 occupied terrorties (CSRSG). Other records: three sub-adult birds (2 ♀, 1 ♂) >N above Strathfillan 9 Feb (JPH); 1 Beinn Heasgarnaich 21 Apr (GG); 1 Braes of Balquhidder 21 Apr (DA); 1 G. Finglas 6 May (WT); 1 Gleann Breac-nic 6 May (CW); 1 Drumloist 26 May (DOE); 1 G. Lochay 13 Jun (CW) & 1 Cononish 28 Oct (IMcP).

OSPREY (Western) *Pandion haliaetus* (B)

Breeding: 38 Y fledged (CSRSG).
First record of the year: 2 L. Rusky 5 Apr (DT). Last record: 1 L. Ard 30 Aug (JC).

C 1 Gartmorn Dam 7 Apr & 18 Jun.
S Summer: present and nesting throughout the district: particularly CVR, Callander, Doune, Menteith, L Tay / G. Dochart & the Trossachs.

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

Inland WeBS counts: 6 in Jan, 2 in Feb, 2 in Mar, 0 in Sep, 3 in Oct, 5 in Nov & 4 in Dec. (Spread thinly throughout most of the recording area. Contributors are encouraged to submit breeding records. Normally only single birds seen).

C One was feeding on a juv Starling Blackdevon Wetlands 31 May.
S Four Dumyat 9 Mar.

*MERLIN *Falco columbarius* (b?w)

F One Kinneil 21 Oct (SWo); 1 Skinflats TE 27 Oct (DOE) & ♀ Brackenlees Fm, Skinflats area 26 Dec (SWo).
C One Tullibody Inch 6 Jan & 14 Apr (DMB, JRC) with 1 Blackdevon Wetlands 30 Dec (RE).
S One Earslburn Resr's 27 Mar; 1 Kippen Moor 19 Apr (RJS); 1 Botaurnie, G. Lochay 23 Jun (JDG) & 1 Lairhill, Sheriff Muir 8 Aug (MVB).

PEREGRINE (Peregrine Falcon) *Falco peregrinus* (B, W)

Widely, but thinly spread 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)

Widespread in suitable habitat but greatly under-recorded. Most records are of birds heard rather than seen.

F Site max: 2 Skinflats Pools 3 Dec & 1 Kinneil 20 Aug.
C Breeding: ad + 6 chicks CVP's 12 Jun (DH) & ad with 3 chicks Cambus Pool 12 Jul (RSe). Site max: 3 Longcarse/ Tullibody Inch 10 Jun, 27 Aug, 6 & 26 Oct. (recorded here throughout the year); 2 Blackdevon Wetlands 17 Oct & 1 West Pools, Alva 3 Dec.
S Breeding: juv head of L. Tay 5 Aug (JPH). Site max: 1 head of L. Tay 18 Jul (present from Apr – Sep).

MOORHEN (Common) *Gallinula chloropus* (B, W)

Inland WeBS: 61 in Jan, 57 in Feb, 52 in Mar, 56 in Sep, 114 in Oct, 144 in Nov & 99 in Dec.

F Breeding: 7 (incl 2 juv) W. Mains Pond 7 Sep (DLT) & ad + 5 juv Union Canal, Bantaskine 10 Aug (WMP). Skinflats Pools monthly max: 14 in Aug, 18 in Sep, 23 in Oct & 5 in Nov. Other site max: 18 Forth/Clyde Canal (Lock 16- R. Carron) 11 Nov & 9 Glen Marsh 10 Nov.
C Breeding: pr + 1 chick Cambus Village Pool 9 Jun (DH). Site max: 7 Gartmorn Dam 13 Sep & 12 R. Devon (Alva-Tullibody Br) 8 Oct & 11 Nov.
S Breeding: 1 juv Airthrey Loch 2 Oct (CW, MW). Monthly max Airthrey Loch: 13 in Jan, 7 in Feb, 13 in Mar, 7 in Sep, 12 in Oct, 12 in Nov & 11 in Dec. Other site max: 7 Cultenhove Dam 15 Oct.

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

Inland WeBS: 180 in Jan, 194 in Feb, 136 in Mar, 89 in Sep, 169 in Oct, 244 in Nov & 380 in Dec (wintering numbers have started to

increase again in the last 3 years).

F Breeding: b.4 Helix Pond 13 May (SW) & 4 Y St Helen's Loch 1 Sep (NB). Site max: 39 Skinflats Pools 9 Sep & 7 Oct & 34 Helix Park Pond 16 Dec.

C Breeding: pr + 2 juv Devonmouth Pool 9 Jun (DH). Gartmorn Dam monthly WeBS max: 19 in Jan, 33 in Feb, 20 in Mar, 18 in Sep, 43 in Oct, 9 in Dec & 178 in Dec.

S Lake of Menteith max: winter/spring 68 on 25 Jan, autumn/winter 105 on 10 Dec. Other site max: 33 Quarry Loch, Blairdrummond 20 Jan.

OYSTERCATCHER (Eurasian) *Haematopus ostralegus* (B, W)

Inland WeBS: 30 in Jan, 241 in Feb, 358 in Mar, 2 in Sep, 11 in Oct, 5 in Nov & 0 in Dec. Forth Est.

WeBS: 586 in Jan, 324 in Feb, 186 in Mar, 134 in Sep, 217 in Oct, 186 in Nov & 149 in Dec.

BBS: recorded at 0.24 b/lkm (1997-2017 av: 0.71 b/lkm. Range 0.24 (2016 - 2018) to 1.64 (2003) b/lkm). Recorded in all habitat categories except conifer with the highest rate being on WBBS at 1.12 b/lkm.

Early inland spring return: 19 by R. Forth, Stirling 13 Jan (SM); 1 Ashfield 14 Jan (CJP) & 1 head of L. Tay 3 Feb (JPH).

F Breeding: pr with 1 x 40% grown Y on roof of Ind. bldg., Bonnybridge 25 May (NB). Site max: 333 Kinneil (WeBS) 14 Jan & 216 Kinneil 22 Aug. 185 Skinflats Pools 7 Sep.

C Site max: c.50 Longcarse 30 Dec & c.40 Alva Wetlands 11 Mar.

S Breeding: pr nested on Barbush (Dunblane) roundabout fledging 2 chicks 26 May (MVB) & pr with 3Y Atholl Pl, Dunblane reared 1 to independence 6 Jun, (KJD). Site max: 84 Blairdrummond Ponds 17 Mar & 52 head of L. Tay 13 Jul.

*AVOCET (Pied) *Recurvirostra avosetta* (V)

F Breeding: a pr at Skinflats TE were observed displaying and mating 24 Apr. They nested and hatched 3 chicks 30 May with 3 Y still present 20 Jun (this is the first confirmed breeding for this sp' in the UF and for Scotland (SWo, AB, RD et al.). Powfoulis tidal area: 4 on 21 Apr, 2 on 22 Apr & 1 on 25 Jul (AB, SW). Two ad Skinflats Pools 21 Apr with 1 ad on 25 Jul (AB, SWo). All these records refer to the 15th occurrence in the UF.

C Two Longcarse 6 May (DOE). This is the 2nd record for Clackmannanshire after 1 Kennet Pans 12 Apr 2014 (JRC).

*LITTLE RINGED PLOVER *Charadrius dubius* (Irr)

S One on sandbank head of L. Tay 8 May & 5 Jun (JPH).

RINGED PLOVER (Common) *Charadrius hiaticula* (b, W)

Forth Est. WeBS: 56 in Jan, 18 in Feb, 5 in Mar, 5 in Sep, 0 in Oct, 2 in Nov & 0 in Dec. Inland return: 1 Cambusmore/Gart GP 4 Feb (earliest spring record here. (EG)).

F Monthly max at Kinneil: 39 in Jan, 15 in Feb, 5 in Mar, 4 in Jun, 7 in July & 10 in Aug. Other site max: 42 Carriden shore 14 Jan; 22 Blackness (UF part) 16 Sep; 8 Skinflats Pools 4 Aug & 3 Skinflats TE 21 Apr.

C Site max: 134 Longcarse 19 Aug & 5 Kennet Pans 18 Mar.

S Breeding: pr + 1 chick Cambusmore/Gart GP 3 Jun. Monthly max Cambusmore/Gart GP: 2 in Feb, 3 in Mar, 5 in Apr, 6 in May & 2 in Jun. Other sites: 3 Claish Pools, Callander 10 Mar & 1 to 2 head of L. Tay from 28 Mar-2 Sep.

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

Forth Est. WeBS: 63 in Jan, 102 in Feb, c.30 in Mar, 0 in Sep, 57 in Oct, 154 in Nov & 74 in Dec.

F Monthly max Kinneil: 98 in Jan, 131 in Feb, c.45 in Aug, 23 in Sep, c.150 in Oct, 241 in Nov & 20 in Dec.

*C C. 30 King's Seat Hill 24 Dec; 12 Blairdenon Hill 1 Oct (KJD) & 1 Tullibody Inch 19 Aug.

*S Probable breeding birds: 2 Beinn Heasgarnaich 21 Apr, 1 Meall Buidhe, Tyndrum 24 May; single birds Beinn nan Imirean & Meall Glas 10 Jun; 10 calling birds spread around Meall na Samhna 10 Jun & 1 Meall Ghaordaidh 13 Jun (GG, JPH, CRM, CW). 1 Kirkton Fm, Tyndrum 6 Apr & 7 Ben Challum 5 Oct (JPH).

*GREY PLOVER *Pluvialis squatarola* (p/w)

F Skinflats Pools & shore: 4 on 22 Aug with 1 on 13 & 18 Aug (MVB, SWo, DOE) then 1 on 13 & 18 Oct (RSM, GB).

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

Inland WeBS: 99 in Jan, 143 in Feb, 64 in Mar, 200 in Sep, 105 in Oct, 66 in Nov & 53 in Dec. Forth Est.

WeBS: 501 in Jan, 157 in Feb, 29 in Mar, 363 in Sep, 598 in Oct, 683 in Nov & 672 in Dec.

BBS: recorded at 0.14 b/lkm (1997-2017 av: 0.71 b/lkm. Range 0.14 (2018) to 1.72 (2000) b/lkm). The highest recording rate was on WBBS at 0.5 b/lkm.

F Kinneil monthly site max: c.520 in Jan, c.620 in Feb, c.300 in Aug, c.200 (WeBS) in Sep & 417 (WeBS) in Dec. Skinflats monthly site max: c.260 in Aug, 205 (WeBS) in Sep, 380 (WeBS) in Oct, 523 (WeBS) in Nov & c.180 (WeBS) in Dec.Other site max: 89 St Helen's Loch, Bonnybridge 1 Sep.

C Breeding: bird on nest in spring sown cereal Longcarse 12

May (NB). Site max: c.190 Longcarse 11 Oct & 145 on 31 Aug.

S Breeding: 2 ♀ on nests Kippenrait, Dunblane 13 May (KJD). Site max: 124 Cambusmore/Gart GP 4 Feb.

KNOT (Red) *Calidris canutus* (W)

Forth Est. WeBS: 1,640 in Jan, 2,393 in Feb, 127 in Mar, 7 in Sep, 33 in Oct, 44 in Nov & 82 in Dec.

F Site max: 2,393 Kinneil 17 Feb. Kinneil summer: 1 on 16 May was 70% 'red' while 5 on 9 Aug were still in breeding plumage (DMB) with 87 on 22 Aug. Skinflats Pools: 1 on 16 Jul, 1 on 18 Aug & 4 on 21 Sep. 5 Blackness Castle 30 Sep.

*SANDERLING *Calidris alba* (p)

F Kinneil: 1 on 12 Jun (in breeding plumage), 3 on 2 Aug & 1 on 9 Aug (NB, DT, DMB). 7 Skinflats 6 Aug (DMB).

*TEMMINCK'S STINT *Calidris temminckii* (V)

S One head of L. Tay 25 May (JPH). This is the 4th record for the Upper Forth.

*LITTLE STINT *Calidris minuta* (Irr)

F One Skinflats Pools 17 Sep (DOE).

DUNLIN *Calidris alpina* (b? W)

Forth Est WeBS: 4,400 in Jan, 5,992 in Feb, 622 in Mar, 105 in Sep, 459 in Oct, 1,359 in Nov & 2,807 in Dec.

F Kinneil monthly max: 4,839 in Jan, 5,947 in Feb, c.500 in Mar, c.400 in Jul, 525 in Aug, 77 in Sep, 280 in Oct, 4,050 in Nov & 2,587 in Dec. Skinflats Pools & shore monthly max: 9 in Jan, 35 in Feb, 6 in Mar, c.110 in Jul, c.180 in Aug, 25 in Sep, 179 in Oct, 164 in Nov & 180 in Dec.

C Longcarse: 6 in Jun, 6 in Jul & 18 in Aug.

*S One Cambusmore / Gart GP 14 May (DT). Head of L. Tay: 1 on 27 Apr (1st) then 1 to 3 until last 2 on 19 Aug (JPH).

RUFF *Calidris pugnax* (w, p)

F Skinflats Pools max: 6 in Aug & 1 in Sep (AE, SWo et al.). 2 Kinneil 7 Oct (JRC) & 1 R. Carron, Glensburgh (MVB).

*C 1 Alloa Inch 30 Oct (NB) & 1 Kennet Pans 11 Nov (PW9).

*JACK SNIPE *Lymnocryptes minimus* (w)

F Three Larbert Hosp. Lochs 12 Nov & 1 L. Ellrig 15 Nov (RS, NB).

S One R. Forth (A91-Fallin) 21 Jan & 1 L. Coulter 12 Nov (DJ, NB).

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

Inland WeBS: 80 in Jan, 23 in Feb, 41 in Mar, 11 in Sep, 33 in Oct, 70 in Nov & 24 in Dec. Forth Est.
WeBS: 4 in Jan, 0 in Feb, 0 in Mar, 0 in Sep, 1 in Oct, 3 in Nov & 7 in Dec.
BBS: recorded at 0.21 b/lkm (1997-2017 av: 0.1 b/lkm. Range 0.03 (1998) to 0.21 (2018) b/lkm). The highest recording rate was on mountains & moorland at 0.4 b/lkm (there were no records from the conifer, WBBS and urban habitats).

F Drumming: Darnrig Moss 5 Jun (RD); Site max: 68+ Larbert Hosp. Ponds 20 Jan; 12 Skinflats Pool 4 Aug & 10 L. Ellrig 15 Nov.
C Site max: c.20 R. Devon, Dollar 2 Dec & 13 Blackdevon Wetlands 16 Sep.
S Drumming: head of L. Tay 7 May (JPH). Site max: 18 L. Coulter 18 Nov; 15 head of L. Tay 13 Jul & 15 R. Forth (The Frews) 16 Dec.

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

Inland WeBS: 3 in Jan, 5 in Feb, 1 in Mar, 0 in Sep, 0 in Oct, 1 in Nov & 0 in Dec. Widespread but secretive in suitable habitat.

F Two Kinneil 20 Feb. Singles recorded at Skinflats & Skinflats Pools.
*C Two Sheardale, Dollar 9 Mar (KB).
S Roding: head of L. Tay 13 Apr, 29 Apr & 7 May (JPH). 35 Edra, L. Katrine 20 Dec; 3 Hungryhill Wood, Keir 2 Nov; 2 L. Rusky 11 Jan & 2 Cambusmore/Gart GP 4 Feb; Singles Callander; Carse of Lecropt, Doune; Drip Moss; Holme Hill, Dunblane; R. Forth (A91-Fallin); R. Teith, Lanrick & Sheriffmuir Woods.

BLACK-TAILED GODWIT *Limosa limosa* (W)

Forth Est. WeBS: 482 in Jan, 635 in Feb, 388 in Mar, 1,293 in Sep, 1,661 in Oct, 1,375 in Nov & 79 in Dec.

F Kinneil monthly max: c.790 in Jan, c.1010 in Feb, c.1,000 in Mar, c.500 in Apr, 255 in May, c.700 in Jul, c.1,550 in Aug, 1,101 in Sep, 1,295 in Oct, c.860 in Nov & c.450 in Dec. Skinflats Pools & shore monthly max: 4 in Jan, 19 in Feb, 6 in Mar, 45 in Apr, 112 in Jul, 245 in Aug, 26 in Sep, 225 in Oct & c.350 in Nov. Other sites max: c. 520 R. Forth (Alloa – Kinc. Br) 7 Nov; c. 170 Blackness 23 Sep & c.140 Carriden, Bo'ness 7 Oct. *Inland: 4 L. Ellrig 1 Sep (NB).
C Longcarse monthly max: 7 in May, 1 in Jul, 1 in Aug & 12 in Sep. 11 Kennet Pans 15 Apr.
*S One summer plumaged bird head of L. Tay 9 Aug (JPH).

BAR-TAILED GODWIT *Limosa lapponica* (W)

Forth Est. WeBS: 89 in Jan, 137 in Feb, 141 in Mar, 19 in Sep, 0 in Oct, 61 in Nov & 55 in Dec.

F Kinneil monthly max: 89 in Jan, 137 in Feb (1 bird in full summer plumage), 141 in Mar; 28 in Apr, 1 in Jul, 8 in Aug, 17 in Sep; 3 in Oct; 61 in Nov & 26 in Dec. Other site max: c.20 Blackness 27 Oct & 5 Skinflats Pools 18 Jul.

*C Seven Kennet Pans 15 Apr & 1 there 27 Aug (DMB, GG).

WHIMBREL *Numenius phaeopus* (p, w)

F Skinflats Pools monthly max: 1 in Apr, 1 in Aug & 1 in Sep. Kinneil Lagoon: 7 on 16 Jul, 14 Aug & 9 Dec. Other site max: 12 Skinflats TE 21 Apr & 6 on 6 May. 4 over Bo'ness 20 Aug.

*C Monthly site max Longcarse: 10 in May, 1 in Aug & 2 in Sep (DOE, GG, NB).

*S C.20 >W Dunblane 2 Aug (CRM) & 1 head of L. Tay 2 Sep (JPH).

CURLEW (Eurasion) *Numenius arquata* (B, W)

Inland WeBS: 2 in Jan, 14 in Feb, 179 in Mar, 82 in Sep, 64 in Oct, 20 in Nov & 37 in Dec. Forth Est.

WeBS: 946 in Jan, 1,658 in Feb, 661 in Mar, 535 in Sep, 691 in Oct, 827 in Nov & 799 in Dec.

BBS: recorded at 0.24 b/lkm (1997-2017 av: 0.59 b/lkm. Range 0.24 (2018) to 0.98 (2003) b/lkm). The highest recording rate was on farmland at 0.45 b/lkm.

F Skinflats monthly max: 168 in Jan, 528 in Feb, 216 in Mar, 210 in Jul, c.100 in Aug, 257 in Sep, 167 in Oct, 441 in Nov & 405 in Dec. Kinneil monthly max: 254 in Jan, 391 in Feb, c.110 in Jul, c.90 in Sep, 353 in Oct, 257 in Nov & 132 in Dec. Other site max: 222 Higgin's Neuk 18 Mar; c.150 Powfoulis 7 Jan, c.150 Skinflats TE 30 Dec & c.50 Blackness 22 Sep.

C R. Forth (Cambus-S. Alloa) monthly max: 356 in Jan, 349 in Feb, 175 in Aug, & c.180 in Nov. Other site max: 91 Cambus Village fields 21 Feb.

S Site max: 174 Bandeath 8 Apr & 51 head of L. Tay 28 Mar.

COMMON SANDPIPER *Actitis hypoleucos* (B)

BBS: recorded at 0.06 b/lkm (1997-2017 av: 0.07 b/lkm. Range 0.05 (1999) to 0.12 (2017) b/lkm). First of year: one Cambusmore/ Gart GP 5 Apr (DT). [10 year range 5 - 20 Apr]. Last of year: 1 Tullibody Inch 8 Sep (GG).

C Site max: 7 Longcarse 19 Jul.

S Site max: 12 head of L. Tay 17 Jul; 9 Cambusmore/Gart GP 3 Jun; 4 CVR 14 May; 4 Blairdrummond Ponds 19 May & 4 Carse of Lecropt 21 May.

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

S One Allan Water, Kinbuck 16 Feb & 8 Dec (CJP) & 1 R. Teith, Carse of Lecropt 10 Sep (KJD).

*WOOD SANDPIPER *Tringa* glareola (Irr)

C One The Rhind 8 May (GG et al.).

S One head of L. Tay 27 May (calling) (JPH).

GREENSHANK (Common) *Tringa nebularia* (w, p)

F Kinneil monthly max: 3 in Jan, 5 in Feb, 5 in Mar, 2 in Jul, 5 in Aug, 4 in Sep, 6 in Oct, 6 in Nov & 5 in Dec. Skinflats Pools monthly max: 1 in Feb, 1 in Jul, 1 in Aug, 1 in Oct & 1 in Nov. Blackness: 1 on 9 Mar & 30 Sep with 3 on 7 Oct. 3 Skinflats TE 2 Jan. 1 R. Carron, Skinflats on 7 Oct & 8 Dec.

*C Longcarse: 1 on 23 Jun, 19 Aug & 30 Sep (NB, JRC). 1 Kennet Pans 14 Apr (GG) & 1 heard Devonmouth Pool 5 Jul (DH).

*S 1 head of L. Tay 12 & 29 Apr (JPH) & 1 R. Teith, Lecropt 17 Nov (DOE).

REDSHANK (Common) *Tringa totanus* (B, W)

Inland WeBS: 1 in Jan, 5 in Mar, 4 in Sep, 3 in Oct & 2 in Nov. Forth Est. WeBS: 2,116 in Jan, 2,278 in Feb, 2,104 in Mar, 2,263 in Sep, 2,736 in Oct, 2,901 in Nov & 2,634 in Dec.

F Kinneil monthly max: c.600 in Jan, c.1,180 in Feb, c.200 in Mar, 285 in Apr, 5 in Jun, c.510 in July, c.2,230 in Aug, 935 in Sep, 1,243 in Oct, 1,385 in Nov & 1,077 in Dec. Skinflats monthly max: 1,317 in Jan, 1,280 in Feb, c.1,200 in Mar, c.320 in Jul, c.100 in Aug, 1,161 in Sep, 1,192 in Oct, 1,148 in Nov & 1,170 in Dec. Other site max: c.100 Blackness 27 Oct & 49 S. Alloa 11 Mar.

C Site max: 28 R. Forth, Longcarse 6 Jan; 2 Alva Floods 17 Mar; 2 R. Devon, Alva 18 Mar & 2 Rhynd Pool 23 Jun.

S At the head of L. Tay from 28 Mar to 24 Jul with a max. of 32 on 2 May (JPH). 2 Cambusmore GP 1 Apr (NB) & 2 R. Forth (A91-Fallin) 14 Oct (DJ).

TURNSTONE (Ruddy) *Arenaria interpres* (w)

Forth Est. WeBS: 20 in Jan, 8 in Feb, 2 in Sep, 4 in Oct & 10 in Nov.

F Non WeBS records Kinneil: 2 on 15 Apr, 2 on 26 Jul, 1 on 2 Aug; 1 on 22 Aug (still in breeding plumage) & 2 on 30 Dec. Carronmouth: 1 on 14 Jan & 2 on 9 Sep.

*RED-NECKED PHALAROPE *Phalaropus lobatus* (V)

S A ♀ feeding at the head of L. Tay, Killin 26 May is the 2nd record for the U.F. A pr feeding in the same location on 9 Jun is the 3rd record for the U.F. with probably the same ♀ present the following day (JPH).

*POMARINE SKUA (Pomarine Jaeger) *Stercorarius pomarinus* (Irr)

F Four Skinflats Pools >NW 26 Oct. 3 pale & 1 dark morph (AB) & 2 Blackness 27 Oct (EMcL).

*ARCTIC SKUA (Parasitic Jaeger) *Stercorarius parasiticus* (p)

F One Blackness 31 Oct (EMcL).

*GREAT SKUA *Stercorarius skua* (Irr, p)

F Three Kinneil 16 Sep (ER). 1 Kinneil 10 Oct (MM).

* KITTIWAKE (Black-legged) *Rissa tridactyla* (P, w)

F Two S. Alloa shore; 3 Higgin's Neuk & 2 Skinflats TE 17 Mar (DOE). 1 Blackness 13 Apr (DMB).

C C.50 R. Forth off Blackdevon Wetlands 16 Mar (JSq) & 1 Kennet Pans 18 Mar (GG).

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

Inland WeBS: 1,077 in Jan, 1,104 in Feb, 1,016 in Mar, 513 in Sep, 686 in Oct, 876 in Nov & 929 in Dec.

Forth Est. WeBS: 1,918 in Jan, 581 in Feb, 124 in Mar, 2,050 in Sep, 284 in Oct, 314 in Nov & 936 in Dec.

BBS: recorded at 0.11 b/lkm (1997-2017 av: 0.98 b/lkm. Range: 0.1 (2017) to 3.47 (1997) b/lkm). The highest recording rate was on WBBS at 0.65 b/lkm.

F Site max: c.1680 Skinflats Pools 14 Jan; c.1,650 Dunmore 9 Sep & c.1,000 Kinneil 9 Mar.

C Site max: c.650 Longcarse 27 Aug & c.600 Cambus >E to roost 17 Oct.

S Breeding: c.30 Ashfield Pools 'attempted to nest but failed' May (DWP). Site max: c.300 'anting over B of A in evening' 11 Aug (DMB) & c.220 Blairdrummond Ponds 26 Mar.

*LITTLE GULL *Hydrocoloeus minutus* (Irr)

F Blackness: 1 on 8 Mar & 1 on 28 Oct (EMcL). Kinneil: 1 moulting ad 6 Aug & 1 on 17 Oct (DMB, JRC). 1 Skinflats Pools 20 Jul (SWo).

S 1st summer bird on sand bank head of L. Tay 6-9 Jun (JPH).

*MEDITERRANEAN GULL *Ichthyaetus melanocephalus* (s, w)

F One Skinflats Pools 17 Mar (ad), 16 Jul & 3 Aug (SWo, GG).

C Two Kennet Pans 31 Aug & 1 on 8 Sep (JRC, GG).

COMMON GULL (Mew Gull) *Larus canus* (B, W)

Inland WeBS: 1,272 in Jan, 386 in Feb, 475 in Mar, 1,272 in Sep, 899 in Oct, 738 in Nov & 515 in Dec.

Forth Est. WeBS: 80 in Jan, 293 in Feb, 81 in Mar, 320 in Sep, 109 in Oct, 13 in Nov & 202 in Dec.

BBS: recorded at 0.41 b/lkm (1997-2017 av: 1.36 b/lkm. Range: 0.18 (2015) to 3.31 (1998) b/lkm). The highest recording rate was

on farmland at 0.9 b/lkm closely followed by WBBS at 0.81 b/lkm.

F Site max: 1,028 Slamannan 6 Jan; 409 St Helen's Loch 5 Oct & c.200 Skinflats Pools 6 Nov.
C Site max: 122 Gartmorn Dam 1 Nov.
S Breeding: 6 chicks hatched from 2 nests on sandbank at the head of L. Tay 15 Jun (JPH). 1 aon on pier pillar at Stronachlachar 17 May & 1 aon Kenknock, G. Lochay 7 Jun (NB). 4 aon's Cambusmore GP 3 Jun (NB). Site max: 855 R. Forth, the Frews 15 Sep; c.200 Blairdrummond Ponds 18 Mar & 101 Killin Marshes 14 Oct.

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

Inland WeBS: 11 in Jan, 27 in Feb, 303 in Mar, 1,442 in Sep, 1,173 in Oct, 119 in Nov & 37 in Dec.
Forth Est. WeBS: 0 in Jan, 4 in Feb, 15 in Mar, 67 in Sep, 54 in Oct, 11 in Nov & 4 in Dec.
BBS: recorded at 1.08 b/lkm (1997-2017 av: 0.98 b/lkm. Range: 0.53 (2016) to 1.89 (2009) b/lkm). The highest recording rate was in urban habitat at 5.5 b/lkm but it was recorded in all six broad habitat categories. The 14th most numerous species on this year's BBS.

F Breeding: 2 aon's on roofs of Bonnybridge Ind. Est. 25 May. Site max: 148 L. Ellrig 1 Sep & c.90 Larbert Hosp. Ponds 9 Sep.
C Breeding: 26 aon's Kelliebank Ind Est, Alloa 26 May (NB). Site max: c.270 Longcarse 2 Sep & 98 Gartmorn Dam 14 Oct.
S Breeding: 5 aon's Cambusmore/Gart GP 3 Jun (NB). Site max: c.940 R. Forth, The Frews 15 Sep; c.110 Gogar 19 Apr & c.110 circling above Dunblane 13 May.

HERRING GULL (European) *Larus argentatus* (b, W)

Inland WeBS: 308 in Jan, 66 in Feb, 307 in Mar, 46 in Sep, 50 in Oct, 744 in Nov & 263 in Dec.
Forth Est. WeBS: 754 in Jan, 496 in Feb, 103 in Mar, 1,206 in Sep, 876 in Oct, 66 in Nov & 395 in Dec.
BBS: recorded at 0.14 b/lkm (1997-2017 av: 0.51 b/lkm. Range: 0.1 (2000) to 4.17 (1999) b/lkm). The highest recording rate was in urban habitat at 0.71 b/lkm. Numbers much reduced in recent years following the closure of open refuse tips and greater recycling of food waste.

F Site max: c.850 Grangemouth Docks (feeding on spilt fish feed) 9 Sep; 208 Avon Valley, Slamannan 6 Jan & c.100 Skinflats Pools 6 Nov.
C Breeding: min 2 aon Kelliebank Ind. Est, Alloa 26 May (NB).

Site max: c.430 R. Devon (Tullibody Br – A 907) 13 Nov.
S Site max: c.200 Buckieburn Resr. 9 Dec.

*ICELAND GULL *Larus glaucoides* (Irr)

F One 1st winter bird Blackness 16 Apr (AP). One Kinneil Lagoon 2 Jun (SWo).

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

Inland WeBS: 24 in Jan, 10 in Feb, 15 in Mar, 42 in Sep, 9 in Oct, 29 in Nov & 23 in Dec.
Forth Est WeBS: 14 in Jan, 7 in Feb, 11 in Mar, 6 in Sep, 8 in Oct, 9 in Nov & 12 in Dec. Recorded in small numbers. Widespread but scarce inland.

F Site max: 35 Kinneil 23 Dec; 12 Blackness 23 Sep; 6 Black Loch, Limerigg 13 Mar & 6 Helix Pond, Falkirk 21 Oct.
C Site max: 12 R. Forth, Longcarse 17 Aug.
S Site max: c.30 R. Forth, The Frews 15 Sep; c.10 Buckieburn Resr 24 Nov; 7 Lake of Menteith 20 Feb. 1-2 sporadically head of L. Tay throughout the year.

*LITTLE TERN *Sternula albifrons* (Irr)

F One Skinflats Pools 16 Jul is the 5th record for the Upper Forth (GG, SWo).

SANDWICH TERN *Thalasseus sandvicensis* (s, P)

First for year: 17 Kinneil 14 Apr (SWo). Last of year 42 Blackness Castle 30 Sep (GB).

F Site max: 203 Blackness 16 Sep; 57 Kinneil 22 Aug; c.50 Bo'ness 22 Sep; c.30 Skinflats 3 Aug & 15 Skinflats TE 22 Sep.
C Site max: 18 Kennet Pans 2 Sep & 13 Tullibody Inch 19 Aug.

COMMON TERN *Sterna hirundo* (S)

First of year: 3 Kinneil 30 Apr (DT). [10 year range 26 Apr – 18 May]. Last of year 1 juv R. Carron, Grangemouth 9 Sep (MVB).

F Site max: c.90 Skinflats Pools & shore 6 Aug; 45 Kinneil 9 Aug; c.40 Blackness Castle 17 Aug & 2 Skinflats TE 6 May.
C Site max: 13 R. Forth, Longcarse; 12 R. Forth, Cambus 10 Jun & 1 Kennet Pans 25 Jul. 2 'Commic Terns' head of L. Tay 24 May (JPH).

*ARCTIC TERN *Sterna paradisaea* (p)

F Three Kinneil 8 May (RS) & 10 Blackness Castle 17 Aug (GB).
*S Four head of L. Tay 18 Jun (JPH).

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

A large 'wreck' caused by the so called 'Beast from the East' occurred in mid March with a total of 267 birds recorded in the UF area on 17 Mar.

F C.70 Skinflats TE 17 Mar, c.50 Higgin's Neuk & c.50 S. Alloa shore 17 Mar. 16 Skinflats WeBS & 1 R. Carron, Carronshore 18 Mar (AB); 15 Kinneil 26 Mar; 5 Skinflats Pools & shore 8 Oct; 1 Kinneil 6 & 10 Oct; 6 Kinneil & 1 Kinc. Br 7 Oct.

C 58 R. Forth at Cambus 17 Mar; 35 R. Forth, Longcarse 20 Mar; 20 R. Forth, Blackdevon Wetlands 16 Mar; 11 Kennet Pans 18 Mar; 1 + 5 corpses R. Forth, 5 Apr with 2 there 14 Apr; 2 Alloa Inches 11 Oct & 1 Kennet Pans 21 Oct.

S Records from many locations between the 16th – 20th March incl. 34 on the R. Forth (A91 – Fallin); 5 L. Ard & L. Katrine; 3 Carse of Lecropt & 2 dead by the A84 at Nyadd. 5 Bandeath 8 Apr. 1 head of L. Tay 29 Aug then 1-2 head of L. Tay – Strath Fillan 17 – 26 Sep.

*RAZORBILL *Alca Torda* (Irr)

F Two S. Alloa shore 17 Mar & 1 Kinneil 15 Apr (DOE, AB).

C One Kennet Pans 18 Mar (GG).

FERAL PIGEON *Columba livia* (B, W)

BBS: recorded at 0.65 b/lkm (1997-2017 av: 0.97 b/lkm. Range: 0.29 (2016) to 2.19 (1997) b/lkm). The highest recording rate was in urban habitat at 2.79 b/lkm. The 19th most numerous species on this year's BBS.

F Max: c.90 Stonehouse Fm (NS 9184) 12 Nov.

C Max: 95 Blackdevon Wetlands 16 Oct.

S Max: c.50 Carse of Lecropt 7 Jan.

STOCK DOVE *Columba oenas* (B, W)

Widely but thinly spread in farmland areas. Usually encountered in groups of <4. BBS: Recorded at 0.06 b/lkm (1997 -2017 av: 0.05 b/lkm. Range: 0.01 to 0.12 b/lkm).

F Site max: 16 Powfoulis 5 Oct.

C Site max: 10 Longcarse 10 Mar.

S Site max: 10 Bandeath 8 Apr.

WOOD PIGEON (Common) *Columba palumbus* (B, W)

BBS: recorded at 2.95 b/lkm (1997-2017 av: 3.51 b/lkm. Range: 2.48 (1997) to 4.78 b/lkm (2012). The highest recording rate was in urban habitat at 6.93 b/lkm followed by 6.12 b/lkm on farmland habitat but was recorded in all six broad habitat categories. The 2nd most numerous species on this year's BBS.

F Site max: c.700 Kinneil 1 Feb; c.300 Slamannan 29 Jan & c.300 Skinflats Pools 6 Nov.

C Site max: c.250 Cambus Pools 17 Jan.

S Site max: 4,707 Ashfield 12 Nov (mig. count); 1,374 Braes of Doune 16 Nov (mig. count) & c.400 Blairdrummond 10 Nov.

COLLARED DOVE (Eurasian) *Streptopelia decaocto* (B, W)

BBS: recorded at 0.15 b/lkm (1997-2017 av: 0.26 b/lkm). Range: 0.13 (2014) to 0.48 (2006) b/lkm). The highest recording rate was in urban habitat at 1.21 b/lkm.

F Max: 8 Carronshore 5 Nov.
S Max: 12 Blairdrummond 4 Mar.

CUCKOO (Common) *Cuculus canorus* (B)

BBS: recorded at 0.26 b/lkm (1997-2017 av: 0.09 b/lkm. Range: 0.03 (2009) to 0.26 (2018) b/lkm). Recorded at the highest rate in deciduous woodland etc. habitat at 0.58 b/lkm. Numbers and range appear to be increasing. Most records relate to singing ♂'s. First spring records: Singles Dumyat & Sgiath an Iubhair (NN 4008) 19 Apr (CR, GA). [10 year range 14 to 28 April]. Last record: 1 L. Mahaick 2 Jul (DOE).

*F One Kinneil Ho Wood 19 May '1st for many years here' (AIB) & 1 Middle Baenego, Denny 21 Jun (NB).
*C One Cow Wood, Aberdona 1 Jun (DH).
S Widespread in the 'highland glens' along with the lowland moors and mosses. Site max: 4 Tyndrum 18 May; 4 G. Lochay 29 May; 4 W Flanders Moss 1 Jun; 3 G. Dochart 12 May & 3 head of L. Katrine 17 May.

*BARN OWL (Western) *Tyto alba* (b, w)

Mostly singles spread thinly throughout the lowland area and year. Several reported as roadkill.

F Singles recorded from Bowtrees & Skinflats Village area.
*C Park Fm, Clackmannan 8 Sep (GG).
S Breeding: 13 pr's were monitored on FCS land (DOE). Singles reported from Argaty; A811, Boquhan; Callander; Cauldhame; B of A; Dunblane; Kirkton Fm; M9 Carse of Lecropt; Sheriff Muir & Strath Fillan.

TAWNY OWL *Strix aluco* (B, W)

Widespread but under-recorded.

F Recorded from: Carron, Falkirk.
C Breeding: 2-3 Juv's heard calling in Dollar 8 Jul (GG).
S Breeding: ad feeding a juv head of L. Tay 25 Sep (JPH). Recorded from: Balquhidder; Blairdrummond, Cauldhame, B of A; Craigforth; Dunblane; Doune; Drip Moss; Drumloist; G. Lochay; Hill of Row; Hilton (NS 5996); Inverlochlarig; Invertrossachs; Killin; Kinbuck; Lake of Menteith; L. Chon; L. Lubnaig; L. Mahaick; S. Kirklane & Sheriff Muir.

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

F One Skinflats Pools 5 May & 10 Nov (AB, SWo).
C One Law Hill, Dollar 20 Aug (KB).

S Breeding: 2 fledged juv Drumdhu Wood, Callander 19 Jun (WW). Other records: 1 hooting Drumallan, Kinbuck 24 Mar (KJD); 1 L. Ard Forest 8 Apr (SB) & 1 hunting by the Macrae mon., Sheriff Muir 3 Dec (KJD).

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

Breeding: 1 successful breeding pr (CSRSG).

F One Skinflats Pools 6 Jan & 6 Nov (AB, DN).
C One Law Hill 4 Jun (KB).
S One Gleann Breac-nic 6 May; 1 G. Beich, L. Tay 16 May & 1 L. Mahaick 6 Nov (CW, SR, DOE)

SWIFT (Common) *Apus apus* (B)

Recorded throughout the area. BBS: recorded at 0.02 b/lkm (1997-2017 av: 0.41 b/lkm. Range: 0.02 to 0.98 b/lkm). The highest recording rate was in urban habitat at 0.57 b/lkm. First for year: 1 Bo'ness 30 Apr (RS); 2 Glensburgh & 1 Cambus 4 May (AE, DH) then Skinflats Pools & Killin Marshes 5 May (AB, JPH, NB). [10 year range 14 April to 4 May]. Last 1 BoA 24 Aug (DMB).

F Max: c.40 Dawson Pl. (Bo'ness) 4 Aug.
C Max: c.30 Gartmorn Dam 25 Jul.
S Max: c.90 Dunblane 27 Jul.

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

Inland WeBS: 3 in Jan, 1 in Feb, 2 in Mar, 5 in Sep, 3 in Oct, 2 in Nov & 1 in Dec. Breeding in small numbers in suitable habitat throughout the area. More widespread outwith the breeding season.

F Recorded from: Bo'ness; F & C Canal (Falkirk & Larbert); Kinneil; R. Carron (M876 – Carron; Union Canal & Greenbank; Skinflats Pools & Skinflats TE.
C Recorded from: R. Devon, (Alva – Cambus) & R. Forth at Cambus.
S Recorded from: Allan Water (Ashfield, Dunblane & Kinbuck); Blairdrummond Ponds; Castle Park Pond, Stirling; G. Lochay; head of L. Tay; L. Katrine; R. Forth (Flanders Moss W, Lecropt & Old Mills) & R. Teith (Doune & Callander).

*BEE-EATER (European) *Merops apiaster* (V)

S One at 'a location in the Trossachs' 11 May is the first record for the Upper Forth (CMcI).

GREEN WOODPECKER (European) *Picus viridis* (b, w)

Recorded thinly throughout the area and year.

F Recorded from Wallacebank Wood.

C Recorded from: Aitkinhead (NS 9494), Alva, Menstrie & Dollar Glen.
S Recorded from: Argaty, Balquhidder, Daldorn, Dunblane, Killin, Leny, L's. Achray, Venachar & Voil; Plean CP & Waltersmuir Woods (Dunblane).

GREAT SPOTTED WOODPECKER *Dendrocopos major* (b, w)

BBS: recorded at 0.06 b/lkm (1997-2017. average 0.07 b/lkm. Range 0.0 (1997) to 0.15 (2012) b/lkm). The highest recording rate was in conifer habitat at 0.25 b/lkm.

F Max: Five Callendar Park area 3 Mar.
S Max counts: 5 Doon Hill, Aberfoyle 24 May; 4 Lake of Menteith 17 Jun & 4 Carse of Lecropt 14 Oct.

SKYLARK (Eurasion) *Alauda arvensis* (B, W)

BBS: recorded at 1.41 b/lkm (1997-2017 av: 1.68 b/lkm. Range: 1.25 (1997) to 2.71 (2000) b/lkm). The highest recording rate was in the mountain & moorland habitat at 2.33 b/lkm where it was the 2nd most numerous species after Meadow Pipit. The 9th most numerous species on this year's BBS.

F Max: c.50 Skinflats Pools 9 Aug.
C Max: c.90 Blackdevon Wetlands 30 Sep
S Max: c.220 Carse of Lecropt 7 Feb & 95 Braes of Doune 2 Nov.

SAND MARTIN *Riparia riparia* (B)

BBS: recorded at 0.9 b/lkm (1997-2017 av: 0.58 b/lkm. Range: 0.02 (2003) to 1.34 (2009) b/lkm. The wide annual range is largely due to changing colony locations). First for year 4 Blairdrummond Ponds 30 Mar (DOE) [10 year range of 4 Mar to 11 Apr]. Last 15 Falkirk 23 Sep (SWo). The 17th most numerous species on this year's BBS.

F Breeding: 2 birds visiting holes in Bo'ness Old Harbour Wall 15 Apr (AB). Site max: c.500 Skinflats Pools 6 - 18 Sep.
C Site max: c.70 the Rhind 8 May & 55 Gartmorn Dam 7 Apr.
S Site max: c.200 head of L. Tay 9 May (JPH).

SWALLOW (Barn) *Hirundo rustica* (B)

BBS: recorded at 1.27 b/lkm (1997-2017 av: 2.16 b/lkm. Range: 1.0 (2016) to 3.53 (2009) b/lkm). The highest recording rate was on the farmland habitat at 3.2 b/lkm. First for year: 1 R. Forth, Longcarse & 1 Blackness 7 Apr (GG, EMcL). [10 year range of 8 Mar to 13 Apr]. Last: 4 Kirkton Fm, Tyndrum 8 Oct (JPH).
Breeding records please. The 12th most numerous species on this year's BBS.

F Max: c.50 Skinflats Pools 18 Aug & 17 Sep.
C Max: c.60 Kennet Pans 2 Sep.

HOUSE MARTIN (Common) *Delichon urbicum* (B)

BBS: recorded at 0.28 b/lkm (1997-2017 average: 0.75 b/lkm. Range: 0.23 (2016) to 1.29 (2003) b/lkm). The highest recording rate was in urban / suburban areas at 1.79 b/lkm. Breeding records please. First of year: 2 R. Devon, Cambus 10 Apr (DH). [10 year range of 2 - 16 Apr]. Last: 3 Falkirk 23 Sep (SWo).

S Max: c.80 Gartrenich Moss 28 Apr & 45 Aberfoyle 1 Sep.

TREE PIPIT *Anthus trivialis* (B)

BBS: recorded at 0.22 b/lkm (1997-2017 av: 0.09 b/lkm. Range: 0.0 (2004) to 0.24 (2017) b/lkm). The highest recording rate was in deciduous woodland etc. habitat at 0.82 b/lkm. First of year: 1 'between Dollar & Tillicoultry' 10 Apr (KB). [10 year range of 2 Mar to 27 Apr]. Last: 1 Skinflats Pools 18 Aug (DOE).

*F One Larbert Ho. Woods 19 Apr (RS).
*C One Ochil Woodland Park 22 Apr; 1 Dollar Glen 2 May & 2 Menstrie Glen 6 May.
S Breeding: 18 aot's Tyndrum 18 May (DMB) & 1 aot Kippenross, Dunblane 17 Jun (KD). Max: 12 G. Buckie 3 Jun & 10 Kilmahog 20 May. Widespread to N & W of Stirling, scarcer elsewhere.

MEADOW PIPIT *Anthus pratensis* (B, W)

BBS: recorded at 6.11 b/lkm (1997-2017 av: 4.97 b/lkm. Range: 2.71 (1997) to 7.38 (2016) b/lkm). The highest recording rate was in the mountain & moorland habitat at 12.11 b/lkm but was recorded in all habitats except urban. The most numerous species on this year's BBS.

F Max: 51 Kinneil 4 Mar & c.50 Blackness 22 Sep.
C Max: c.55 Tullibody Inch 8 Sep.
S Max: c.70 Blairdrummond 17 Apr & 58 Kirkton Fm 25 Apr.

*ROCK PIPIT (Eurasian) *Anthus petrosus* (w)

F One Skinflats TE 9 Mar (TC) & 1 Blackness 22 Sep (DOE).
C Two Longcarse 10 Mar (JRC).

GREY WAGTAIL *Motacilla cinerea* (B, w)

Recorded in small numbers in suitable habitat throughout region. A partial migrant. Inland WeBS: 7 in Jan, 3 in Feb, 13 in Mar, 20 in Sep, 7 in Oct, 7 in Nov & 4 in Dec.

C Max: Four Cowden Japenese Gdn 29 Aug.

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

Recorded throughout the area. BBS: recorded at 0.21 b/lkm (1997-2017 av: 0.35 b/lkm. Range: 0.17 (2013) to 0.77 (1998) b/lkm). Recorded at the highest rate on farmland at 0.55 b/lkm.

F Site max: 20 Skinflats Pools 17 Sep.

C Site max: 65 in arable field to S of Gartmorn Dam 3 Oct & 23 Cambus Village Pools 1 Feb.
S Site max: 174 head of L. Tay 14 Sep.

*WHITE WAGTAIL *Motacilla alba* (p)

F One Skinflats TE 19 Apr (TC) & 1 Skinflats Pools 21 Sep (AB).
S One L. Katrine 15 Apr & 1 L. Chon 10 May (AD, NB). One head of L. Tay 27 Apr, 29 Apr & 22 May (JPH).

WAXWING (Bohemian) *Bombycilla garrulus* (w)

Last of 17/18 winter: 7 Skinflats 4 Mar (SWo). 1st of 18/19 winter: 8 Braes of Doune 30 Oct (CRM). Last of 2018: 10 Bellsdyke Rd, Larbert 17 Dec (DT).

F Many records in the Bainsford / Carron area of Falkirk from 10 Nov to 9 Dec with a max of 32 on 21 Nov. 17 Bo'ness 4 Dec (RMcN).
*C Three Menstrie 15 Nov (GG).
S Site max: 14 Braes of Doune 16 Nov; 7 Dunblane 24 Nov & 5 Gartmore 10 Dec.

DIPPER (White-throated) *Cinclus cinclus* (B, W)

Recorded on suitable watercourses throughout the area. Inland WeBS: 37 in Jan, 45 in Feb, 49 in Mar, 24 in Sep, 32 in Oct, 31 in Nov & 28 in Dec.

F Site max: 6 R. Carron (M876-Larbert) 21 Mar & 12 Oct.
C R. Devon: Vicar's Br-Tillicoultry monthly max: 9 in Jan, 17 in Feb, 14 in Mar, 15 in Oct, 16 in Nov & 18 in Dec. Other site max: 6 R. Devon (Alva – Tullibody Br) 24 Feb.
S Breeding: singing ♂'s Eas Gobhain & R. Garbh Uisge, Callander 11 Jan (NB). Site max: 6 Allan Water, Dunblane 30 Dec; 5 Eas Gobhain & 5 R. Teith, Callander 11 Jan; 5 Allan Water (Ashfield-Dunblane) 16 Feb & 5 L. Lubnaig 19 Mar.

WREN (Eurasian) *Troglodytes troglodytes* (B, W)

Widespread and abundant. BBS: recorded at 1.16 b/lkm (1997-2017 av: 1.89 b/lkm. Range: 0.78 (2011) to 2.37 (2000) b/lkm). The highest recording rate was in deciduous woodland etc. at 2.8 b/lkm but the rate in all the other habitats was only a little lower except in mountain & moorland where it was 0.1 b/lkm. The 13th most numerous species on this year's BBS.

S Site max: 21 Lake of Menteith 17 Jun & 12 W BoA 7 May.

DUNNOCK *Prunella modularis* (B,W)

Widespread and common. BBS: recorded at 0.26 b/lkm (1997-2017 av: 0.46 b/lkm. Range: 0.26 b/lkm (2018) to 0.76 b/lkm (2005)). The highest recording rate was in urban habitat at 0.71 b/lkm.

F Max: 6 Campbell Christie Dr, Falkirk 22 Dec.
C Max: 4 Gartmorn Dam CP 24 Feb.
S Max: 6 Hill of Row 11 Mar; 5 Holme Hill, Dunblane 24 Feb & 5 Doune 3 Mar.

ROBIN (European) *Erithacus rubecula* B, W)

Widespread and common. BBS: recorded at 0.77 b/lkm (1997-2017 av: 1.19 b/lkm. Range: 0.77 (2018) to 1.52 b/lkm (2004)). The highest recording rate was in deciduous woodland etc.. habitat at 1.94 b/lkm followed by conifer woodland at 1.58 b/lkm. The 18th most numerous species on this year's BBS.

F Max: 11 F & C Canal (Helix to Falkirk Wheel) 5 Jan.
S Max: 16 BoA W. 8 Apr; 10 Holme Hill (Dunblane) 24 Mar & 10 Laighhills, Dunblane 27 Mar.

REDSTART (Common) *Phoenicurus phoenicurus* (B)

Found in low numbers mostly to the N & W of Stirling. First spring record: 2 G. Dochart & 1 Killin 21 Apr (JPH, DMB). [10 year range of 10 – 29 Apr]. Last: 1 Finlarig, Killin 9 Jul (JHN).

S Breeding: 13 territories Tyndrum 18 May (DMB). Max: 9 G. Buckie 3 Jun & 4 G. Lochay Power Sta 18 May.

WHINCHAT *Saxicola rubetra* (B)

BBS: recorded at 0.05 b/lkm (1997-2017 average: 0.09 b/lkm. Range: 0.01 (2007) to 0.22 (1997) b/lkm). Recorded mostly to the N & W of Stirling. First spring record 19 Menstrie Glen 6 May (JRC). [10 year range of 15 Apr to 6 May]. Last 1 Kirkton Fm 31 Aug (JPH).

F Max: 5 R. Avon, Slamannan 17 Aug.
S Max: 6 Sheriff Muir 17 May & 6 Pass of Leny 29 Jun.

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

BBS: recorded at 0.07 b/lkm (1997-2017 average: 0.06 b/lkm. Range: 0.0 b/lkm (2012) to 0.19 b/lkm (2008)). In 2018 Stonechat numbers appear to have almost recovered after they were decimated during the prolonged snow cover of the 2009/10 and 2010/11 winters.

F Site max 2 Skinflats Pools 13 Jan & 2 Kinneil 4 Feb.
C Site max: 3 Blackdevon Wetlands 18 Jan & 3 Alva Glen 30 Oct.
S Site max: 4 W. Flanders Moss 1 Jun & 4 Kirkton Fm., Tyndrum 31 Aug.

WHEATEAR (Northern) *Oenanthe oenanthe* (B)

BBS: recorded at 0.13 b/lkm (1997-2017 av: 0.18 b/lkm. Range: 0.07 b/lkm (2004) to 0.3 b/lkm (2015)). The highest recorded rate was on mountains and moorlands at 0.19 b/lkm while the

rate of 0.18 b/lkm on farmland was presumably mostly of 'Greenland' passage birds during May. First spring record 6 Longcarse & 2 Bandeath 8 Apr (JRC, DMB). [10 year range of 14 Mar to 8 Apr]. Last 2 Skinflats Pools 16 Sep (ER).

C Max: 7 The Nebit 13 Jul & 6 Wood Hill 31 Aug. Birds showing the characteristics of 'Greenland' birds (*O o leucorhoa*) on Longcarse: 1 on 1 May, 6 on 6 May, 1 on 11 May & 2 on 12 May (DMB, DOE, NB).

S Max: 6 Botaurnie, G. Lochay 23 Jun & 4 Kirkton Fm, Tyndrum 18 Apr.

*RING OUZEL *Turdus torquatus* (b)

F One Kinneil 19 Oct (RS).

S One Dumyat 19 Apr (CR); 1 Creag Mac Ranaich, Lochearnhead 7 May (KJD); 1 High Botaurnie, G. Lochay 19 May with 2 there 23 Jun (JDG) & 1 Craigruie, L. Voil 9 Jun (DI).

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

Widespread and common. BBS: recorded at 1.36 b/lkm (1997-2017 av: 2.12 b/lkm. Range: 1.28 (2016) to 2.72 (1999) b/lkm). The highest recording rate was in urban/suburban areas at 4.79 b/lkm but was recorded in good numbers on the other habitat categories except mountain and moorland where it was scarce. The 10th most numerous species on this year's BBS. First singing bird of the year: 1 Forth St, Cambus 16 Feb (DH).

F Max: 12 F & C Canal (Helix to Falkirk Wheel) 5 Jan.

C Max: 14 Cambus Pool 14 Dec & 12 Forth St, Cambus 14 Feb.

S Max: 13 Braes of Doune 29 Oct; 12 Stirling G.C. 30 Mar; 12 BoA W. 7 May; 11 Broomridge, Stirling 19 Feb & 10 Lake of Menteith 17 Jun.

FIELDFARE *Turdus pilaris* (W)

Last spring record 35 Kilbryde 10 Apr (DOE) was within the 10 year range: 25 Mar to 14 May. First autumn record of 3 Kinneil 10 Oct (DN) was within the 10 year range: 3 Sep to 22 Oct.

F Site max: c.190 Skinflats Pools 13 Dec.

C Site max: c.120 Longcarse 27 Oct.

S Site max: c.990 Braes of Doune 29 Oct; c.400 Dunblane 25 Oct & c.180 Auchlyne, G. Dochart 30 Oct. A bird plucked by the resident Peregrine was found at Dunblane Cathederal 10 Dec (CRM).

SONG THRUSH *Turdus philomelos* (B, W)

A partial migrant. BBS: recorded at 0.41 b/lkm (1997-2017 av: 0.52 b/lkm. Range: 0.24 (2011) to 0.82 (2000) b/lkm). The highest recording rate was in deciduous woodland etc. at 1.25 b/lkm but as with Blackbird, was recorded in all six broad habitat

categories in similar numbers except mountain and moorland where it was scarce. First song of the year: Cambus 19 Feb (DH).

S Max: 17 Kilmahog 20 May & 15 Killin Marshes 17 Mar.

REDWING *Turdus iliacus* (W)

Last spring record: Skinflats Pools 7 Apr (AB) is within the previous 10 year range: 7 Mar to 1 May. First autumn record: Carron 28 Sep (AB) is within the previous 10 year range: 16 Sep to 12 Oct.

F Max: c.200 F & C Canal (Bonnybridge – M80) 25 Oct & c.200 Blackness 27 Oct.

S Max: 1,860 passage birds Braes of Doune 29 Oct & 289 Ashfield 27 Oct. A bird, freshly plucked by the resident Peregrine, was found at Dunblane Cathederal 23 Dec (CRM).

MISTLE THRUSH *Turdus viscivorus* (B, W)

BBS: recorded at 0.16 b/lkm (1997-2017 av: 0.16 b/lkm. Range: 0.06 to 0.3). Recorded in low numbers on all habitat categories except urban / suburban with the highest being in conifer at 0.57 b/lkm.

S Max: 38 Berryhill, N. Third 6 Sep & 13 Drumloist Rd 15 Oct.

GRASSHOPPER WARBLER (Common) *Locustella naevia* (b)

Widely but thinly spread throughout the area. First spring record Balquhidder Glen 19 Apr (FM). [10 year range 17 to 23 Apr].

C Breeding: pr feeding Y R. Devon, Dollar 11 Jul (KB).

SEDGE WARBLER *Acrocephalus schoenobaenus* (B)

BBS: recorded at 0.03 b/lkm (1997-2017 av: 0.1) Range: 0.03 (2018) to 0.27 (2012) b/lkm). Surprisingly, the highest recording rate was in urban / suburban areas at 0.14 b/lkm closely followed by WBBS at 0.12 b/lkm. Fairly scarce elsewhere. First spring record: Skinflats Pools 21 Apr (AB) [10 year range of 21-27 Apr]. Last: 1 Kennet Pans 27 Aug (GG).

F Max: 10 Skinflats Pools 15 May & 27 Jun.

C Max: 14 Tullibody Inch 6 May with 13 singing ♂ 's there 12 May.

S Max: 6 W. Flanders Moss 1 Jun.

*REED WARBLER (Eurasion) *Acrocephalus scirpaceus* (b)

Breeding of the species in the Upper Forth area was first confirmed in 2011. First spring record: 2 Tullibody Inch 5 May (JRC). Last: 1 Skinflats Pools 25 Jul (DOE).

F Two Skinflats Pools 6 Jun (DT) & 1 Skinflat's TE 16 May (TC).

C Breeding: max 2 singing ♂'s Tullibody Inch 5 May-1 Jul (JRC, DOE, NB). Singing ♂ Blackdevon Wetlands 13 May (NB).

BLACKCAP (Eurasian) *Sylvia atricapilla* (B)

Found throughout the area. BBS: recorded at 0.2 b/lkm (1997-2017 av: 0.15 b/lkm. Range: 0.07 (1999) to 0.25 (2012) b/lkm). The highest recording rate was in deciduous woodland etc. at 0.56 b/lkm. First spring records: singles Larbert Ho Pond; Stirling & Dunblane 16 Apr (AB, CJP, CRM). [10 year range 23 Mar to 16 Apr]. Last 1 Broomridge, Stirling 22 Oct (DT). [It is difficult to separate the few over-wintering birds from E. Europe with the genuine summer migrants].

F Winter records: 1 Oakview, Falkirk 22 Feb (WT) & 1 Carron, Falkirk 11 Nov (AB). Max: 15 Skinflats Pools 21 Apr & 7 Larbert Ho Woods 19 Apr.

C Winter records: 1 Dollar 2 Feb (KB); Alloa 21 Nov & 5 Dec (IR).

S Winter records: ♂ Dunblane 10 Jan (MVB); ♂ BoA 11 Jan (DMB); ♂ & ♀ BoA 11 Mar (MVB) & 1 Dalzell Wood, L. Ard Forest 23 Dec (LMcB). Max: 7 Blairdrummond Ponds 19 May.

GARDEN WARBLER *Sylvia borin* (B)

Recorded throughout the area in smaller numbers than Blackcap. First spring record 1 Kingseat Pl, Falkirk 21 Apr (WP) [10 year range 5 Apr to 23 May]. Last Skinflats Pools 26 Aug (AB).

S Max: 3 G. Lochay 18 May.

WHITETHROAT (Common) *Sylvia communis* (B)

BBS: recorded at 0.14 b/lkm (1997-2017 av: 0.20 b/lkm. Range: 0.11 (2015) to 0.32 (2000) b/lkm). First spring record Skinflats TE 25 Apr (TC) [10 year range 9 Apr to 2 May]. Last: 2 Skinflats Pools 30 Aug (DT).

F Max: 10 Kinneil 22 Jun & 6 Skinflats Pools 18 Aug.

*LESSER WHITETHROAT *Sylvia curruca* (b?)

F One Kinneil 29 Apr (RS).

WOOD WARBLER *Phylloscopus sibilatrix* (B)

First spring record 1 E end L. Katrine 20 Apr (GA). [10 year range: 17 Apr to 5 May]. Last 1 Pass of Leny 4 Aug (GG).

*C Woodland Park, Alva 27 May (RSm).

S Max: 7 G. Lochay Power Sta. 18 May & 5 Doon Hill, Aberfoyle. Also recorded from: Balquhidder Glen, Bracklinn Falls (Callander), Colhallan Wood, G. Buckie, G. Dochart, Inverlochlarig, Invertrossachs, Killin, Kilmahog, Kippenrait Glen, Dunblane; L. Achray & Mine Wood, BoA.

CHIFFCHAFF (Common) *Phylloscopus collybita* (B, w)

BBS: recorded at 0.16 b/lkm (1997-2017 av 0.13 b/lkm. Range: 0.01 (1997) to 0.26 b/lkm (2012)). The highest recording rate was on farmland at 0.37 b/lkm. Numbers have increased noticeably over the past 20 years and the sp's is now widespread in suitable habitat. A few birds overwinter which makes recording the first spring record difficult. First singing record 1 Ochlochy Park, Dunblane 6 Apr (KJD).

*F Winter records: 1 Skinflats TE 20 Feb with 2 at Kingseat Pl, Falkirk 19 Nov (TC, WP).

*C Winter: 1 Menstrie Glen 4 Nov & 2 Cambus Pools 8 Nov (JRC, CRM).

S Breeding: 1 carrying food Dunblane 9 Jul (CRM). Winter: 1 Blairdrummond 18 Mar (DOE). Max: 10 L. Katrine 15 Apr.

WILLOW WARBLER *Phylloscopus trochilus* (B)

Widespread. BBS: recorded at 1.8 b/lkm (1997-2017 av: 1.69 b/lkm. Range: 1.15 (2007) to 2.84 (1997) b/lkm). The highest recording rate was in deciduous woodland etc. at 5.15 b/lkm. The 7th most numerous species on this year's BBS. First of year 1 Skinflats Pools & Gartmorn Dam 7 Apr (AB, GG). [10 year range 3 - 10 Apr]. Last: 1 Blairdrummond Ponds 27 Sep (NB).

F Max: 30 Skinflats Pools 4 Aug.

C Max: 18 Gartmorn Dam 18 Jun.

S Breeding: 31 aot's Tyndrum 18 May (DMB). Max: 15 Blackwater Marshes & 15 Lake of Menteith 17 Jun.

GOLDCREST *Regulus regulus* (B, W)

Widespread. BBS: recorded at 0.27 b/lkm (1997-2017 av: 0.48 b/lkm. Range: 0.17 (2009) to 1.07 (2005) b/lkm). As expected, the highest recording rate was in conifer woods at 2.47 b/lkm.

F Breeding: 3 fledglings Kingseat Pl, Falkirk (WP). Max: 14 Callendar Park 3 Mar.

S Max: 10 Cambusmore/Gart GP 4 Feb & 10 Lanrick Est. 8 Oct.

SPOTTED FLYCATCHER *Muscicapa striata* (B)

First spring record 1 G. Finglas 6 May (WT). [10 year range: 2 to 20 May]. Last: 1 Skinflats Pools 21 Sep (AB). Found in ever decreasing numbers – mostly to the N & W of Stirling.

*F One Skinflats Pools 17 Sep (DOE).

*C One Balquharn Burn, Alva 29 May (AE).

S Max: 4 Pass of Leny 29 Jun.

*PIED FLYCATCHER (European) *Ficedula hypoleuca* (b)

S One singing ♂ G. Lochay 6 May (JPH). [10 year range: 27 Apr to 24 May].

*BEARDED TIT (Bearded Reedling) *Panurus biarmicus* (b?)

F One Kinneil 3 Jan (RSm) & 4 Skinflats Pools 26 Oct (AB).

C Breeding: 1 ad + 2 poss. Juv heard Alloa Inch area 19 Aug (DMB). Monthly max in Alloa Inch area: 3 Jan, 2 Jun, 2 Aug, 3 in Sep, 8 in Oct & 10 Nov (JRC, NB, DOE, DT, GG). 2 Cambus Pool 3 Feb (JRC).

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

Widespread. BBS: recorded at 0.07 b/lkm (1997-2017 av: 0.14 b/lkm. Range: 0.03 (2009) to 0.38 (1997) b/lkm). The highest recording rate was in the conifer wood & edge habitat at 0.38 b/lkm.

F Max: 15 Skinflats Pools 4 Aug.

C Max: 14 Cambus Pools 8 Dec & 14 West End Park, Alloa 30 Dec.

S Max: 18 Lanrick, R. Teith 15 Nov.

BLUE TIT (Eurasian) *Cyanistes caeruleus* (B, W)

Widespread. BBS: recorded at 0.96 b/lkm (1997-2017 av: 1.55 b/lkm. Range: 0.8 (2016) to 2.51 (2005) b/lkm). Recorded in all six broad habitat categories with deciduous woodland etc. being the highest at 2.26 b/lkm. The 16th most numerous species on this year's BBS.

F 16 Polmont Woods 7 Nov & 11 Campbell Christie Dr., Falkirk 9 Jun.

S Max: 15 Holmehill, Dunblane 14 Jan; 13 BoA 7 May & 11 in a Dunblane gdn 10 Dec.

GREAT TIT *Parus major* (B, W)

Widespread. BBS: recorded at 0.98 b/lkm (1997-2017 av: 0.86 b/lkm. Range: 0.41 (2000) to 1.32 (2010) b/lkm). Deciduous woodland etc. returned the highest rate at 2.59 b/lkm. The 15th most numerous species on this year's BBS.

F Max: 15 S. Alloa – Dunmore 31 Aug.

C Max: 10 Gartmorn Dam CP 7 Apr.

S Max: 19 BoA 7 May & 16 Holmehill, Dunblane 14 Jan.

COAL TIT *Periparus ater* (B, W)

Widespread. BBS: recorded at 0.27 b/lkm (1997-2017 av: 0.48 b/lkm. Range: 0.14 (2009) to 1.00 (2002) b/lkm). The highest rate was in the conifer wood & edge habitat at 1.96 b/lkm.

S Max: 14 Invertrossachs 26 Dec & 11 Ashfield 12 Nov.

NUTHATCH (Eurasian) *Sitta europaea* (B)

After the first record in 1999 breeding was recorded in 2009. Now widespread with numbers increasing.

F Max: 11 Callendar Park area 3 Mar.

S Breeding: family party Killin Marshes 10 Jun (JPH). Max: 6 Doon Hill, Aberfoyle 12 Apr & 25 Jun; 6 Holme Hill, Dunblane 17 Jun & 5 W. Flanders Moss 1 May.

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

Widespread in small numbers.

F Breeding: ad with 2 calling recently fledged juv Skinflats Pools 5 Jun (NB).

C Five Gartmorn Dam CP 27 Oct.

S 8 Lanrick Est. 8 Oct & 4 Blairdrummond 17 Jul.

MAGPIE (Eurasion) *Pica pica* (B, W)

Widespread in Falkirk and Clackmannan districts plus the Stirling area. Very unusual N of the Highland Line. BBS: recorded at 0.36 b/lkm (1997-2017 av 0.49 b/lkm. Range 0.31 (2003) to 0.75 (2010) b/lkm). Most numerous in urban/suburban habitats at 2.86 b/lkm. No records from the mountain and moorland category.

F Max: c.30 Kinneil 12 Jan.; 27 F & C Canal, Falkirk Wheel – Underwood 6 Jan & 19 Skinflats Pools 12 Feb.

C 22 Cambus 20 Feb & 10 Blackdevon Wetland 29 Jan.

S Max: 14 Broomridge, Stirling 24 Mar & 19 Apr.

JACKDAW (Western) *Coleus monedula* (B, W)

BBS: recorded at 1.84 b/lkm (1997-2017 av 2.43 b/lkm. Range: 1.56 (2016) to 3.27 (2005) b/lkm). Recorded in all six broad habitat categories but most frequent in urban/suburban areas at 6.93 b/lkm followed by farmland at 5.05 b/lkm. The 6th most numerous species on this year's BBS.

F Site max: c.100 Slamannan 29 Jan.

C Breeding: 'several pr's nesting in the stone piers of the dismantled railway br. across the R. Forth at the Rhind 8 May (GG). Site max: 168 Cambus Pools 25 Feb.

S Site max: c.400 Holme Hill, Dunblane 8 Aug; 356 >ENE over Dunblane to roost; c.180 Flanders Moss E 1 Dec & c.170 N. Third Resr. 17 Feb.

ROOK Corvus *frugilegus* (B, W)

BBS: recorded at 1.82 b/lkm (1997-2017 av: 3.28 b/lkm. Range: 1.37 (2016) to 6.74) b/lkm). Most frequent on farmland at 4.32 b/lkm followed by WBBS at 3.92 b/lkm. The 8th most numerous species on this year's BBS.

F Max: c.200 Slamannan 29 Jan.
C Max: c.128 Orchard Farm, Longcarse 28 Dec.
S Breeding: 320 nests Dunblane in Apr - a decrease of 26 on 2017 (MVB). Max: c.200 Lecropt 22 Dec.

CARRION CROW *Corvus corone* (B, W)

Ubiquitous. BBS: recorded at 2.0 b/lkm (1997-2017 av: 3.18 b/lkm. Range 2.0 (2018) to 6.22 (2005) b/lkm). Recorded in all six broad habitat categories but most frequent in farmland at 4.8 b/lkm followed by urban/suburban areas at 3.43 b/lkm. The 5th most numerous species on this year's BBS.

F Max of c.200 on Slamannan Plateau 29 Jan; 73 Bo'ness (feeding on Buckthorn berries) 17 Jan & 58 S. Broomage 23 Sep.
S Max of 24 Old Mills Fm, R. Forth, Stirling.

HOODED CROW *Corvus cornix* (b, w)

Hybrids with Carrion Crow occur in a fairly narrow transition band running E-W across the area to the N of Callander – most notably in Balqhuidder Glen.

F One was in the Stonehouse Fm – Skinflats Pools area 24-29 Dec (SWo).
S Max: 5 Inverlochlarig 3 Jun; 4 Kirkton Fm 13 Mar; 4 Auchlyne, G. Dochart 22 Apr & 4 head of L. Tay 16 Jun. Most pure birds are found in the far northwestern part of the area. 1 Blairdrummond Moss 4 Mar & 1 BoA 7 May were outwith the normal range (DOE, JS).

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

Now widespread but mostly in small numbers apart from non-breeding groups. BBS: recorded at 0.18 b/lkm (1997-2017 av 0.09 b/lkm. Range 0.01 (2000) to 0.18 (2018) b/lkm).

F Max: 6 Larbert Loch 14 Oct. Recorded in smaller numbers around this District.
C Recorded in small numbers (max 2) around the County.
S Breeding: 40-45 sites were monitored but productivity was low (CSRSG). A family party of 2 ad & 4 juv were on Creag nan Bodach (NN 4537) 7 Jun (NB). Max: 14 Brae of Cessintully 17 Sep. 1 at the rookery on Randolph Hill, Dunblane was chased off by the Rooks 4 Mar (MVB).

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

BBS: recorded at 2.85 b/lkm (1997-2017 av: 4.87 b/lkm. Range: 2.08 (2016) to 10.70 (2000) b/lkm). Most frequent in urban/suburban areas at 19.5 b/lkm (the highest rate for any sp's in any habitat). The 4th most numerous species on this year's BBS. 1st fledged juv of the year Blackdevon Wetland 31 May (NB).

F Site max: c.500 Slamannan 29 Jan.
C Site max: c.500 Tullibody Inch 6 Jan.
S Site max: c.300 Buchlyvie 10 Feb & c.200 Drip Moss 18 Mar.

HOUSE SPARROW *Passer domesticus* (B, W)

BBS: recorded at 1.3 b/lkm (1997-2017 av: 1.7 b/lkm. Range: 1.2 b/lkm (2016) to 2.93 b/lkm (2010)). Most frequent in urban/ suburban areas at 11.0 b/lkm. The 11th most numerous species on this year's BBS.

F Max: c.30 Larbert Railway Sta. 24 Feb.
C Max: c.20 Longcarse 18 Aug.
S Max: c.60 Broomridge 12 Jul; c.45 Doune 17 Nov & c.40 E. Flanders Moss 5 Mar.

TREE SPARROW (Eurasian) *Passer montanus* (B, W)

BBS: recorded at 0.1 b/lkm (1997-2017 average: 0.1 b/lkm. Range: 0.00 b/lkm (2002) to 0.28 (2010) b/lkm).

F Breeding: ad + 3 recently fledged Y Campbell Christie Dr, Falkirk 13 Jun (SWo). Max: 76 Skinflats fields 26 Dec & 45 Skinflats Pools 27 Oct.
C Breeding: ad feeding 1Y Cambus 8 Jun (DH). Max: c.30 Blackdevon Wetland 30 Sep & 12 Gartmorn Dam CP 21 Sep.
S Breeding: ad carrying food to an active nest at Kippenross, Dunblane 27 May (KJD). Max: flock of c.100 Carse of Lecropt 23 Sep & c.70 Doune 24 Nov. Regular visitors to several garden feeders in Stirling & Dunblane.

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

BBS: recorded at 2.91 b/lkm (1997-2017 av: 3.85 b/lkm. Range: 2.91 (2018) to 5.15 (1998) b/lkm). Recorded in all six broad habitat categories but most frequent in conifer woodland at 8.54 b/lkm followed by deciduous woodland etc. at 6.21 b/lkm. The 3rd most numerous species on this year's BBS.

S Site max: c.350 Stonehill, Dunblane 1 Dec; c.300 Sheriff Muir 20 Nov; c.200 Coldoch (NS 6698) & c.150 Flanders Moss W. 27 Nov.

BRAMBLING *Fringilla montifringilla* (W)

Last spring record: 1 Kirkton Fm 19 Apr (JPH). First autumn record: 5 Kinbuck 18 Oct (CJP).

*F Six Beam Fm Rd (NS 8476) 4 Nov & 1 Skinflats 10 Nov (WT, SWo).
*C 1 Dollar 21 Jan & 1 Gartmorn Dam 27 Dec (KB, DMB).
S Site max: c.100 Stonehill, Dunblane 1 Dec; 89 Braes of Doune 29 Oct; c.50 >low over the Perth Rd, Dunblane & c.50 Kinbuck 28 Oct.

GREENFINCH (European) *Chloris chloris* (B, W)

Still widely but now thinly spread, numbers have fallen by c.90% in the last decade largely due to the parasite *Trichomonosis gallinae*. BBS: recorded at 0.07 b/lkm (1997-2017 av: 0.47 b/lkm. Range: 0.03 (2017) to 1.07 (2005) b/lkm). Recorded at the highest rate in urban/suburban areas at 0.43 b/lkm.

F Breeding: 4 recently fledged Y Campbell Christie Dr, Falkirk 13 Jun (SWo). Max: 18 Campbell Christie Dr, Falkirk 3 Mar.
S Site max: 60 Dykedale, Dunblane 12 Oct & 51 Leewood Rd, Dunblane 10 Mar.

GOLDFINCH *Carduelis carduelis* (B, W)

BBS: recorded at 0.45 b/lkm. (1997-2017 av: 0.44 b/lkm. Range: 0.12 (1998) to 1.00 (2010) b/lkm). The highest recording rate was in urban/suburban areas at 1.5 b/lkm.

F Site max: c.110 Kincardine Br 26 Aug; c.80 Skinflats Pools 11 Aug; c.70 Skinflats 20 Aug & c.70 Kinneil 2 Sep.
C Site max: 46 Gartmorn Dam 7 Mar.
S Site max: c.190 Jerah Plantation 9 Aug – feeding on thistles (MVB).

SISKIN (Eurasian) *Spinus spinus* (B, W)

BBS: recorded at 0.19 b/lkm (1997-2017 av: 0.33 b/lkm. Range: 0.1 (2000) to 0.75 (1997) b/lkm). As would be expected, the highest recording rate was in conifer woodland at 1.52 b/lkm.

F Site max: c.20 Langlees, Falkirk 6 Jan.
C Max: 35 Cambus Pool 14 Dec.
S Site max: 81 Newton Cres, Dunblane 5 Mar; c.75 central Dunblane gdn 13 Mar; 72 Glen Rd, Dunblane 16 Mar; c.60 Bochastle, Kilmahog 18 Jan & c.60 Carse of Lecropt 17 Nov.

LINNET (Common) *Linaria cannabina* (B, W)

BBS: recorded at 0.1 b/lkm (1997-2017 av: 0.27 b/lkm. Range: 0.05 (2005) to 0.83 (2006) b/lkm). Essentially a farmland bird where it was recorded at 0.32 b/lkm.

F Site max: c. 190 Powfoulis 2 Oct & c.60 Skinflats Pools 18 Aug & 11 Nov.
C Nine Longcarse 13 May.
S Site max: c.400 Stonehill, Dunblane 16 Dec; c.50 Cambusmore / Gart GP 17 Mar & 14 Oct & c.50 Carse of Lecropt 22 Dec.

TWITE *Linaria flavirostris* (b, W)

F Site max: 45 Skinflats TE 30 Dec & 17 Kinneil 9 Dec.
C Max: 18 Longcarse 27 Oct.
S Breeding season: 3 Kirkton Fm 17 May (JPH). Max: c.30 G. Lochay 6 Oct & 12 Dalbrack 24 Aug.

LESSER REDPOLL *Acanthis cabaret* (b, W)

BBS: recorded at 0.13 b/lkm (1997-2017 av: 0.10 b/lkm. Range: 0.01 (2008) to 0.35 (2015) b/lkm). The highest recording rate on BBS was in the deciduous woodland etc. habitat at 0.47 b/lkm.

F Max: 10 Larbert House Loch 14 Oct.

C Max: c.20 Cambus Pool 1 Dec.

S Site Max: c.20 Dunblane 28 Jan & 15 Hill of Row 11 Mar.

*COMMON REDPOLL *Acanthis flammea* (Irr)

S Tyndrum 2 May (DMB).

CROSSBILL (Red) *Loxia curvirostra* (b, W)

BBS: recorded at 0.06 b/lkm (1997-2017 av: 0.07 b/lkm. Range: 0.00 (2010) to 0.56 (2012) b/lkm). Only recorded in the deciduous (0.3 b/lkm) and conifer habitats (0.19 b/lkm.

F Max: c.30 Torwood 3 Jun.

C Max: 19 Birkhill Plantation 16 Jun.

S Max: 18 Braes of Doune 29 Oct; 15 Cambusmore/Gart GP 4 Feb; 15 L. Mahaick 4 Nov & 15 over Dunblane 28 Dec. Recorded in small numbers at several other sites.

BULLFINCH (Eurasian) *Pyrrhula pyrrhula* (B, W)

Recorded in low numbers in the lowlands. BBS: recorded at 0.05 b/lkm (1997-2017 av: 0.05 b/lkm. Range: 0.01 (2003) to 0.12 (1998) b/lkm).

F Breeding: 2 ad + 4Y Kingseat Pl, Falkirk 19 Jun (WP). Max: 9 Reid's Pond, Falkirk (NS 8781) 28 Feb.

C Site max: 12 Gartmorn Dam 13 Mar.

S Site max: 15 Drumloist Rd 15 Oct; 15 L. Mahaick 29 Dec & 14 Holme Hill, Dunblane 14 Jan.

*HAWFINCH *Coccothraustes coccothraustes* (v)

*F Two Skinflats TE 2 Jan (RS).

S An unprecedented irruption for the U.F. occurred in Dunblane during the first quarter of the year. It was centered on Holme Hill with the first record of 3 birds on 9 Jan, there was a max. of 7 birds on 19 Feb with the last one on 3 Apr (MVB, NB, CRM, CJP et al).

*SNOW BUNTING *Plectrophenax nivalis* (W)

C One Ben Cleuch 20 Dec (JR).

S 14 Braes of Doune windfarm 7 Jan (CJP); 7 Gleann a' Chlachain, Strath Fillan 3 Feb (JPH), 3 An Caisteal 30 Aug (VW) & 1 Stronend 17 Nov (JR).

YELLOWHAMMER *Emberiza citrinella* (B, W)

BBS: recorded at 0.35 b/lkm (1997-2017 av: 0.46 b/lkm. Range: 0.08 (2003) to 0.74 (2010) b/lkm). As would be expected, most frequent on farmland at 1.45 b/lkm.

F Site max: c.30 Higgin's Neuk 5 Mar.
C Site max: 46 Cambus - Longcarse 28 Dec.
S Site max: c.50 E. Flanders Moss & 45 Carse of Lecropt 22 Dec.

REED BUNTING (Common) *Emberiza schoeniclus* (B, W)

BBS: recorded at 0.25 b/lkm (2004-2017 av: 0.23 b/lkm. Range: 0.10 (2005) to 0.45 (2006) b/lkm). Recorded fairly evenly in all habitat categories except conifer woodland but was most frequent on WBBS and farmland at 0.38 b/lkm.

F Breeding: ad feeding young Mungal, Falkirk 13 Jun (SWo). Max: 15 S. Alloa – Dunmore 11 Jan.
C Breeding: 4 singing birds Tullibody Inch 12 May (NB). Max: 8 Blackdevon Wetlands 31 May.
S Site max: c.40 E Flanders Moss 18 Feb & 25 Carse of Lecropt 7 Feb.

ESCAPED SPECIES

WOOD DUCK *Aix sponsa*

F Juv ♂ R. Carron, Falkirk 9 Sep (AB).

DIAMOND DOVE *Geopelia cuneate*

C One Brookfield Pl, Alva 7 May (RE).

HYBRIDS

EUROPEAN x AMERICAN WIGEON

C ♂ Alloa Inch 8 Dec (DMB). (Presumed to be the same hybrid from 2017).

TUFTED DUCK ♂ x POCHARD ♀

C A bird on Devonmouth Pool (7 May) closely resembled a Lesser Scaup (*Aythya affinis)* but close scrutiny of photographs suggested that the black nail on the bill was possibly too large for that species [although it was smaller than for the TU ♂ x PO ♀ hybrid as depicted in recent Bird ID Guides] (NB).

HAWFINCH IN THE UPPER FORTH REGION DURING THE WINTER OF 2017/2018

Chris Pendlebury

Hawfinch (*Coccothraustes coccothraustes*) is a very scarce resident and passage migrant in Scotland, although it is likely to be under-recorded owing to its reclusive nature (Zonfrillo 2007). In Upper Forth the species was formally a rare breeder, but was not recorded in the region between 1992 and 2015. In the winter of 2017/2018 there was an influx of hawfinch into the UK, including into the Upper Forth region. This is an account of the records in Upper Forth during that period, putting them into an historical context. Whilst between the 1940s and 1980s the breeding range of hawfinch in Scotland extended across Borders, Dumfries & Galloway, Upper Forth, Perth & Kinross, Angus & Dundee and possibly also in North-east Scotland, breeding is now confined to Borders, Perth & Kinross and North-east Scotland (Zonfrillo 2007).

Figure 1. Hawfinch.

Photograph courtesy of John Nadin

Since formal bird recording started in the Upper Forth region, hawfinch was recorded annually in small numbers in the 1970s and 1980s, mostly in the vicinity of Bridge of Allan, Dunblane and Doune (data taken from Forth Naturalist and Historian; see Table 1). During this time breeding was noted in Bridge of Allan in 1973, and in Doune in 1986; and a pair was also recorded in Lochearnhead in 1986. Towards the end of the 1980s the remaining regular site for this species was Moray Park in Doune, with birds recorded in small numbers during the winter; the species was last recorded here in 1991.

Table 1. Records of Hawfinch from 1973 to 2016 in the Upper Forth region, taken from Forth Naturalist and Historian.

Location	Details
Argaty	1 on 7-8 November.
Kinbuck	1 flying north-east over at 08:35 on 8 November.
Blairlogie	1 on 10 November.
Powfoulis	2 on 2 January.
Dublane	All at Holme Hill: 3 on 9 January, 2 on 20 January, 7 on 21 January, 3 on 24 February, 4 on 25 February; 4 on 2 March; 1 on 3 March; 6 on 4 March.

There was then several years before the species was recorded again in the Upper Forth region, with the next record being of two birds in Kippen in 2013. In 2016 there were records from Dunblane and the Bridge of Allan area, which included a flock of 7 birds at Logie Kirk in May. The first records in the Upper Forth region during the autumn of 2017 were at Argaty on 7-8 November, one flying north-east over Kinbuck on 8 November, and one at Blairlogie on 10 November. These may have all been migrating individuals due to the small cluster of dates and short periods of time the birds were present for.

In 2018 there were two birds recorded at Powfoulis on 2 January, followed by several records in Dunblane in January, February and March. All records in Dunblane were in the Holme Hill area, with a maximum of 7 individuals recorded. Full details of these Dunblane records, along with the others during 2017/2018 are provided in Table 2.

Whilst the influx of hawfinch records in the Upper Forth region in the winter of 2017/2018 is likely to have been part of the wider UK influx, it did also take place after an increase in records in the region during the previous winter. It will be interesting to determine whether records do continue in the area, with Dunblane and Logie Kirk presumably the best locations to search for this species.

Table 2. Records of Hawfinch in the winter of 2017/2018 in the Upper Forth region.

Year	Details
1973	1 pair raised 3 young in Bridge of Allan.
1974	1 female at Bridge of Allan site on 30/4.
1976	2 females in Bridge of Allan on 23/5.
1977	1 in Mine Wood on 21/5; 2 over White Hill on 1/6.
1979	Singles in Bridge of Allan on 1/3 and 16/12.
1980	2 in Bridge of Allan on 2/5; 1 in Dunblane on 16/11.
1981	2 in Dunblane on 11/1 and 20/2.
1983	1 in Bridge of Allan on 6/7; 1 pair bred in Doune on 16/3; 1 in Doune on 12/11.
1984	1 in Dunblane on 14/2.
1986	3 at Laighills Park, Dunblane on 15/2; 4 Doune on 19/2; 1 found dead in Dunblane on 10/8; pair at Lochearnhead on 16/7.
1987	1 in Deanston on 28/11.
1988	2 at Moray Park, Doune on 4/2, plus 1 in December.
1989	1 at Moray Park, Doune on 31/1.
1991	1 at Moray Park, Doune on 13/1; 4 over Doune on 3/2.
2013	2 in Kippen on 2/2, with 1 still on 3/2.
2016	1 in Dunblane on 12/5; 7 at Logie Kirk on 29/5; and 1 female at Blairlogie on 30/12.

References

Zonfrillo, B. 2007. Hawfinch *in* The Birds of Scotland, edited by Forrester, R.W and Andrews, I.J. The Scottish Ornithologists' Club, Aberfeldy.

RINGING REPORT - 2018

Dr. Ben Darvill

The following report highlights a selection of notable observations from bird ringing activities during 2018. For access to additional information, visit:

https://www.bto.org/our-science/projects/ringing/publications/online-ringing-reports.

A total of 3,561 birds were ringed in the 'Upper Forth' region in 2018, with the commonest species ringed being blue tit (566), willow warbler (428), siskin (262), great tit (257) and whitethroat (149). Comparing the Central region to Britain and Ireland ringing totals, of particular significance were the ringed totals for osprey (33/186=18%), ruff (1/7=14%), buzzard (48/530=9%), goosander (1/12=8%), golden eagle (5/71=7%) and raven (14/274=5%). Other notable/scarce species ringed in the region in 2018 include Goshawk (11), Peregrine (9), Jack Snipe (5), Barn Owl (84), Grasshopper Warbler (7), Redwing (49), Tree Sparrow (22), Pied Flycatcher (18) and Tree Pipit (44).

Notable ringing recoveries during 2018 are as follows.

MUTE SWAN *Cygnus olor*

A first-year female ringed at Castle End Park, Stenhousemuir was caught by a ringer at Linlithgow Loch in 2012 and has subsequently been caught on and off at this site. It was caught again in 2018 at the same site, aged 13 years and 11 months. Another female, this time ringed as an adult in Cumbernauld in 2008, was seen again on Airthrey Loch (Stirling Uni) in 2015. Further sightings, based on a unique pattern of coloured rings, confirmed its presence again in 2017 and 2018.

SHELDUCK *Tadorna tadorna*

A German-ringed Shelduck was recovered in the Upper Forth region in 2018. A nestling ringed in 2009 at Wheldrake Ings, East Cottingworth was identified from colour-rings at Blackness in Sept 2019, aged 9 years (287 km). A first-year bird ringed in 2013 at Seal Sands, Teesmouth was also seen at Blackness, freshly dead in Nov 2018 (5 years old, 213 km). The longevity record for this species is 19 years 7 months 27 days.

SHAG *Phalacrocorax aristotelis*

A nestling ringed on the Isle of May in June 2017 was identified from colour-rings at Blairlogie (~9 months old, 83km).

OSPREY *Pandion haliaetus*

Birds ringed in the Upper Forth region were recovered in several overseas countries in 2018. Three were seen/recovered in Senegal, two in Portugal, and singles in France, the Netherlands, Guinea Bissau, North Atlantic and North Sea. Within-UK movements included a nestling ringed in Highland in 2016 which was identified from colour-rings in Aberfoyle in July 2018 and was then seen at Restronguet Point (Cornwall) - a distance of 782km from its place of birth.

OYSTERCATCHER *Haematopus ostralegus*

A bird ringed in Upper Forth was recovered in France in 2018. Within-UK movements include a nestling ringed at Braeminzion, Angus in May 2018 which was identified from colour-rings at Blackness in August 2018 (~3 months, 91 km).

BLACK-HEADED GULL *Chroicocephalus ridibundus*

Four Norwegian-ringed birds were found/observed in Upper Forth in 2018. A nestling ringed in the Moorfoot Hills, Scottish Borders, in June 2008 was seen alive (ring read in field) at Callendar Park, Falkirk, in March 2018 (9 years and 8 months, 51 km). This was one of the oldest birds of this species recovered in the UK in 2018. The longevity record for this species was set in 2018, with a first-year bird ringed in Herefordshire in 1986 seen alive in Germany in June 2018 (32y 3m 26d, 798 km).

Notable within-UK movements include a first-year bird ringed at the Ythan Estuary in August 2016 which was caught at Blackness Castle in December 2018 (2 years and 3 months, 174km) and an adult female ringed in Grantown-on-Spey and seen at Linlithgow Loch in November 2018 (5 months, 149 km).

COMMON GULL*Larus canus*

Two Norwegian-ringed birds and one from the Baltic Sea were seen/recovered in Upper Forth in 2018. A first-year bird ringed at Blackness Castle in September 2018 was identified from colour-rings Kinnegar, Down in November 2018, ~2 months after ringing - a movement of 212 km.

TAWNEY OWL *Strix aluco*

A Tawny Owl which had been ringed as an adult female in Glenbranter Forest, Argyll and Bute, was first seen in the Upper Forth region in 2013 when it was caught by a ringer in Loch Ard Forest. In May 2018 it was caught again, this time in Achray Forest. At at least 9 years and 11 months old, this is one of the oldest Tawny Owls recovered in the UK in 2018. The longevity record for this species is 23 years 5 months 27 days

BLUE TIT *Cyanistes caeruleus*

A second-year female ringed in Ross Wood, Stirling, in June 2013 was killed by a cat in Kippen in September 2018. At around ~6 years old at the time of death, this was an unusually old bird. Only 38% of juveniles survive their first winter, and a typical adult lifespan is three years old. The longevity record for this species is 9 years 8 days.

WILLOW WARBLER *Phylloscopus trochilus*

A bird that had been ringed in the Upper Forth was recovered in Belgium during 2018. An adult that had been ringed at Kinneil Lagoons in August 2018 was recovered fifteen days later near Warrington, 300km away.

SEDGE WARBLER *Acrocephalus schoenobaenus*

There were two notable recoveries of this species. Firstly, a first-year bird ringed at Kinneil Lagoon on 25th August 2018 which was caught by a ringer at Pett Level in Sussex five days later (636km). Another first-year bird ringed at Kinneil, this time on 30th August, was caught by a ringer 16 days later in Stepro, Rochefort, France (1,136 km away).

BLACKCAP *Sylvia atricapilla*

A juvenile ringed at Kinneil Lagoon on the 4th August 2018 was caught by a ringer ~2 months later at Squire's Down in Dorset - 567 km away from the ringing site. Another individual, a first-year male, was also caught at Kinneil a few weeks later, on the 1st September 2018. It was caught by a ringer 29 days later on Sandwich Bay Estate in Kent, 622 km from the ringing site.

BLACKBIRD *Turdus merula*

Two individuals which had been ringed in the region were recovered in Norway in 2018 and a single bird was recovered in the Netherlands. Additionally, three Norwegian-ringed birds were recovered in the Upper Forth region during 2018.

PIED FLYCATCHER *Ficedula hypoleuca*

Single birds, ringed in Upper Forth, were recovered in Norway, Denmark, the Netherlands, France, Morocco, Algeria and Guinea.

LESSER REDPOLL *Acanthis cabaret*

A second-year male ringed at Kinneil Lagoon in August 2018 was caught by a ringer near Wakefield, West Yorks., on the 28th October (~3 months, 300km).

SISKIN *Spinus spinus*

Five Belgian-ringed birds were recovered in the Upper Forth region in 2018. Among within-UK movements, notably long distances included a bird ringed in Romsey, Hants, which was recovered in Dunblane (2 years and 1 month, 601km).

YELLOWHAMMER *Emberiza citrinella*

An individual which had been ringed as a second-year male at Blair Drummond was caught for the fifth time at the same site in April 2018 (4 years and 9 months, 0 km).

How can you get involved?

If reading about these fascinating ringing discoveries has inspired you to find out more, or to get involved, visit http://www.bto.org/volunteer-surveys/ringing/ringing-scheme

DUNBLANE AND KIRKTON WEATHER REPORTS, 2018

Neil Bielby and John Holland

Dunblane

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 19 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 and additional weather records from Kirkton Farm, Strathfillan (NN 359283; 170 m a.s.l.) 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 (> 0.2mm), 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. (LTA = long term average. Unless stated otherwise, the Met Office use the period 1981-2010 for their LTA).

The mean temperature for 2018 of 8.48°C was only 0.01°C below the norm but it was notably drier with precipitation of 970.4 mm (38.2 inches) being 173.7 mm (16%) below the average. The wettest month was January with 161.1 mm whilst the driest was May with 27.9 mm. The warmest month was July (mean temp. 17.12°C) and the coldest January (mean temp. 1.44°C). The highest recorded temperature was 32.1°C (28th June) and the lowest -8.1°C (8th January). There were 76 air-frosts (mean 70) while snow lay on the ground at 09.00 hours on 31 occasions (mean 21). Temperatures of

over 25.0°C were recorded on 13 days (one in May, seven in June and five in July). There were 159 (49%) 'rain days' of the 324 days when readings were possible with the highest 24 hour total being 25.0 mm (measured at 09.00 hours on the 2nd of January). The average barometric pressure was 1012.1 mb (mean 1011.5 mb) with a high of 1039 mb (26th February) and a low of 981 mb (3rd January). It was calm on 41 % of mornings at 09.00 although a wind developed later on c.50 % of these days. Turning to the seasons: Winter (Dec. 2017 – Feb. 2018) was colder (-0.29°C) and wetter (+16 %) than average. Spring (Mar. – May) was warmer (+0.67°) and drier than the norm (-10 %). Summer (June – July) was hotter (+0.71°C) and much drier (-38 %) while autumn was very slightly cooler (-0.02°C) and quite a bit wetter (+35%) than average (plates 8, 9 and 10).

January was colder and wetter than the LTA with the mean temperature of 1.44°C being the lowest since 0.91°C in 2011. The month high was 9.7°C (28th) and the low was -8.1°C (8th). There were 14 air-frosts (mean 14). Precipitation of 161.1 mm was 26 % above the LTA with measurable amounts on 24 days (mean 20). The highest 24 hour total was 25.0 mm (22nd) while snow lay on the ground at 09.00 hours on 10 occasions (mean 8). The average barometric pressure was 1004 mb (mean 1008 mb) with a high of 1033 mb and a low of 981 mb. The lowest temperature in Scotland was -13.7°C at Altnaharra, Sutherland (21st) with the highest being 12.9°C at Dunbar (28th). The largest 24 hour precipitation total was 82.2 mm recorded at 09.00 hours at Alltdearg House, Skye (15th) while a snow depth of 38 cm was recorded at Eskdalemuir (17th).

Wet weather prevailed for the first 5 days of the year with 45.4 mm of precipitation, 25.0 mm of this falling on the 2nd. A thin covering of wet snow fell during the night of the 2nd / 3rd. Contrary to the forecast, the fifth named storm of the winter 'Eleanor' passed across the UK to the south of the Central Belt during the 3rd. Wales and the western half of England bore the brunt with gusts of 100 mph recorded on Great Dun Fell, Cumbria. Dumfries and Galloway was the worst affected area of Scotland with c.18,000 homes having their power cut off and many roads blocked by flooding and fallen trees – especially around the coast. Across England, many garden trampolines found new homes and lorries were blown over on both the M5 and the A15. A spell of more settled weather began on the 6th as high pressure developed. This resulted in some hard frosts (-8.1°C 8th) while the daytime maximum on the 7th was only -2.5°C. Damp and dreich weather ensued from the 9th – 14th with some flights out of Glasgow Airport being cancelled due to fog on the 10th and 11th. Virtually

continuous snow showers during the day & night of the 16th / 17th resulted in a depth of 21.5 cm (8.5 inches) by 09.00 hours on the 17th. This caused much disruption throughout Scotland with the M74 being closed at Beattock for several hours – jack-knifed lorries being the major cause - resulting in a backlog of 7 miles. Many schools in the Borders and Highlands were closed on the 17th. A further 8.9 cm of snow fell during the night of the 18th / 19th to be followed by an almost cloudless & calm day on the 20th. Another 3 cm of snow fell during the afternoon of the 21st before storm 'Georgina' brought strong southerly, then south-westerly winds (gusting to 85 mph in the west of Scotland), heavy rain and a rapid thaw to the Central Belt during the night of the 23rd / 24th. The storm continued for most of that day with gusts reaching 85 mph in South Uist and 100 mph on the north-western hills. The 25th and 26th saw a quiet interlude with good sunny periods before more strong winds and rain on the 27th followed by mixed weather until the month end.

February was colder and drier than average. The mean temperature of 1.58°C was 1.42°C below the LTA making this the second coldest February after the 0.04°C mean in 2010. The mean low of -1.23°C was 1.41°C below the LTA while the max. of -3.4°C (28th) was the lowest daytime temperature max. at this station for this month - the previous being -0.9°C (1996). There were 17 air-frosts (mean 13) and 2 ground frosts while snow lay on the ground at 09.00 hours on 4 occasions (mean 5). The mean high of 4.38°C was 1.45°C below the average making this the 2nd lowest after 3.06° C in 2010. The highest temperature recorded was 11.5°C (19th) and the lowest was -6.4°C (7th). Precipitation of 56.1 mm was only 59 % of the average with recordable amounts on 16 days (mean 17). The highest daily amount was 7.2 mm of melted snow (28th). The mean barometric pressure was 1015 mb (average 1010 mb) with a high of 1039 mb and a low of 990 mb.

Across Scotland the mean temperature was 1.0°C below the LTA but it was the second sunniest February in a series dating back to 1929. Some UK extremes: a maximum temperature of 14.2°C was recorded in Cardiff (19th) while the minimum temperature of -11.7° C was at Farnborough, Hampshire (28th). In the 24 hours ending at 09.00 on the 13th, 49.6 mm of rain fell at L. Shiel (Argyll). A snow depth of 21.0 cm was measured at Copley, C. Durham (28th) while the strongest wind gust was 79 mph at Capel Curig in N. Wales (10th). The month began with several sunny days before snow during the night of the 5th / 6th deposited 4 cm. There was a little further light snow during the afternoon of the 7th before milder conditions the next day saw the snow disappear. The following 4 days were mostly sunny before we awoke to a thin covering of wet

snow on the 12th. Mixed, often quite windy weather ensued (there was a gust of 73 mph in S. Uist, 14th), until high pressure built from the 19th with this eventually reaching 1028 mb on the 21st. A short interlude of milder weather saw the temperature rise to a year high of 11.5°C on the 19th (12.8° Grangemouth). A spell of dry weather started on the 19th and lasted until the 27th when an easterly airstream developed. This heralded the approach of the so called 'Beast from the East' weather system which was caused by a sudden stratospheric warming of the Polar vortex 16 miles above the North Pole (-75C to -35C) 2 weeks earlier. This pushed the jet-stream south and allowed cold Polar air to flood south over Siberia. Due to these changes, an easterly airstream developed across continental Europe with the much forecast snow arriving during the night of the 27th / 28th. A depth of 13.5 cm (5.5 in) had accumulated by 14.00 on the 28th.

Travelling became extremely difficult and the virtually continuous heavy snow showers on a bitterly cold E 3-4 worsened conditions steadily. It continued snowing through the evening and night causing c.1,000 vehicles to be stranded in an 8 mile tailback on the M80 between junctions 8 (Denny) and 9 (Stirling). This stretch of the M80 remained blocked along with the M876 north of Junction 1 until c.16.00 the following day. All flights were cancelled at both Edinburgh and Glasgow Airports on the 28th while c.1,600 schools were closed across Scotland and public transport was severely disrupted. The maximum daytime temperature on the 28th was -3.4°C (-4.9°C Braemar).

March was colder than the norm but precipitation was equal to the LTA. The mean temperature of 2.95°C was 1.93°C below the LTA (1.7°C below Scotland wide) making this the 3rd coldest March after 1.73°C (2013) and 2.57°C (1994). The maximum 24 hour temperature of -1.4°C on the 1st (-2.9°C Braemar and Dalwhinnie) was the first time the temperature had stayed below zero degrees centigrade in this month during the 24 years that records have been kept at this station. The maximum daily high of 10.9°C (28th) was also the lowest during this time. There were 18 air-frosts (mean 11). Precipitation of 97.2 mm was very close to the average with measurable amounts on 15 days (mean 17). Snow lay on the ground at 09.00 hours on 13 occasions (mean 4) making this the second highest number after 16 in 2010.

The snow depth at this station at 09.00 on the first day of spring was 23 cm (46 cm Bishopton, Glasgow) as the heavy snow showers continued throughout the night and into the day on the unrelenting, biting easterlies. A 'red' alert warning (the highest)

was issued by the Met Office for the Central Belt advising against any travel due to risk to life. Most train services in Scotland were cancelled and both Edinburgh and Glasgow Airports remained closed. Schools in the Central Belt (and further afield) remained closed for the rest of the week. Almost all minor roads where snow had fallen were blocked by drifting and the motorways and A roads were only kept open with great difficulty and continuous effort by snowploughs. A monthly low of -5.3°C was recorded on the 1st (-10.7°C Cawdor Castle, Highland). Although the showers slowly ceased on the 2nd, drifting snow still filled in the roads where they were open to fields to the E. The M9 across the Carse of Stirling was almost blocked southbound where a van had gone down the embankment and through the fence into a field. The A9 between Bannockburn and Larbert was also almost blocked by drifts in several places. Conditions (and the wind) slowly eased on the 3rd / 4th as Central, Southern and Eastern Scotland began to dig themselves out. A slow thaw then followed with most of the snow disappearing by the 11th leaving only the drifts. The milder spell continued until high pressure built again over Northern Europe. This produced more strong (max. force 6) cold easterlies from the 14th – 19th (74 mph S. Uist, 14th). These carried snow flurries which produced 1 cm at 09.00 hours on the 18th. The weather then became milder with a maximum temperature of 9.9°C on the 24th (15.1°C Fyvie Castle, Aberdeenshire). The only notable rain was 15.8 mm during the morning of the 23rd.

April was cooler and wetter than average. The mean temperature of 7.2°C was 0.59°C below the LTA with the mean night low being 0.18°C above and the mean daily high being 1.36°C below their LTA's. The minimum temperature was -3.8°C (5th) and the maximum temperature was 15.8°C (20th). The daily high of 1.0° C (4th) was the lowest for April at this station (after 2.5°C in 2000). There were 5 air-frosts (average 5) and one ground frost. Precipitation of 83.1 mm was 34 % above the average with measurable precipitation on 19 days (average 15) and a maximum 24 hour total of 24.0 mm (3rd). There were 3 days when snow lay at 09.00 – a new high for the month. The mean barometric pressure was 1010 mb (average 1012 mb).

From the 2nd – 6th it was wet and cold with wet snow and sleet mixed in with the rain at times. There was a thin covering of wet snow from the 3rd – 5th with night frosts (-3.8°C, 5th. -8.8°C Tulloch Br. 1st) from the 2nd – 5th. Nunraw Abbey (E. Lothian) reported a depth of 18 cm of snow (5th). A switch from easterly to south-westerly winds on the 7th introduced milder conditions before a colder easterly airstream re-established itself on the 10th. The

weather continued mixed for the next 2 weeks. A pattern of afternoon showers, some heavy with a few of hail, existed from the 24th – 29th with the 30th being sunny and calm all day.

May was warmer and drier than average. The mean temperature of 12.59°C was 1.51°C above the LTA with the mean daily high of 18.35°C being 2.1°C above average and the mean night low of 6.82° C being 0.91°C above average. The maximum day temperature was 25.6°C (28th) and the minimum night temperature -1.1°C (1st). Rainfall of 26.3 mm was the third lowest after 18.7 mm (2008) and 19.9 mm (2001). There were measurable amounts on 8 days (average 16). The mean barometric pressure was 1018 mb (average 1013). The mean temperature for Scotland was 1.9°C above the long -term average thus equalling the warmest May with that of 2008. It was also the country's sunniest May in a series dating back to 1929. The only part of Scotland not to enjoy the warm weather in the second half of the month was the east coast where haar and cloud persisted on many days.

The 1st provided the only frost of the month (-1.1°C. -4.6°C Aboyne). A south-westerly airstream brought mostly overcast, damp weather until the 6th. This and the 7th were overcast in the morning but sunny and warm in the afternoon / evening (22.0°C, 7th). More mixed weather with spells of rain followed until the 12th which was a gloriously sunny day. A belt of rain during the night of the 12th / 13th produced 6.0 mm before building barometric pressure (1032 mb, 17th) brought a prolonged spell of warm, dry and mostly sunny weather with temperatures peaking at 25.6°C (28th. 27.5°C Achnagart 29th). Only 0.7 mm of rain fell from the 13th to the month end but an easterly airstream developed from the 22nd which depressed temperatures on the east coast.

June was warmer and drier than normal with the mean temperature of 15.57°C being 1.5°C above the LTA. Rainfall of 50.9 mm was 69 % of the LTA with measurable amounts on 11 days (mean 15). Scotland wide the mean temperature was 1.7°C above the long-term average making it the third equal warmest June in a series dating back to 1910. 44.6 mm of rain fell at Achnagart, Ross & Cromarty (13th). The highest official Scottish temperature was 31.9° C at Bishopton, Glasgow with a UK high of 33.0°C at Porthmadog, Wales (both 28th).

More humid conditions on the 1st & 2nd caused short electrical storms during the afternoons but, despite warnings of torrential downpours, only 6.5 mm fell here. It was very warm with a year high temperature of 27.1°C (2nd). The next 7 days were dry with good spells of warm sunshine (25.6°C, 9th) after early haar burnt off

before another electrical storm broke at 16.30 on the 9th. Again, despite warnings of torrential downpours, this station only received 3.4 mm but only 2 miles away, large hailstones brought traffic to a halt on the M9 between Dunblane and Stirling at 16.30. Flash floods did occur elsewhere and in Lenzie (E. Dunbartonshire) a house roof was set ablaze by a lightning strike. A quiet spell followed until storm 'Hector' crossed the country from west to east during the 14th.

Strong winds were the main feature reaching 32 mph in the Central Belt with gusts of up to 52 mph. It was much windier in the hills with a gust of 100 mph recorded on Cairngorm summit. Predictably, several ferry services were cancelled but only a few trees were blown over. Two days later another Atlantic front deposited 12.7 mm of rain during the day ensuring that gardens will no longer require watering for a while. The 18th was a windy day with south-westerly gusts of 44 mph through the Central Belt. After another belt of wet weather had deposited 15.4 mm during the night of the 18th / 19th barometric pressure built over the country yet again (1031 mb, 22nd) which eventually resulted in temperatures peaking at 32.1°C (28th) which is the highest June temperature at this station after 29.3°C in 2009.

July was warmer and drier than average with the mean temperature of 17.12°C (17.3°C across the UK) being 1.28°C above the LTA making it the third warmest July at this station. The maximum daytime temperature was 28.0°C (27th). Rainfall of 35.5 mm was only 41 % of the LTA with measurable amounts on 10 days (mean 16). The mean temperature for Scotland was 1.7°C above the LTA making it the 4th warmest July in a series dating back to 1910. The Scottish maximum temperature of 30.4°C was at Lossiemouth (27th) while that for the UK was 35.3°C in Faversham, Kent (26th). A UK minimum temperature of 0.9°C was recorded at Tulloch Bridge, Inverness-shire (7th).

The sunny, warm & dry weather spell continued for the first 14 days of the month. Maximum daytime temperatures remained above 20.0°C with a peak of 26.8°C (4th). The 24 days without rain from the 21st June to the 15th July is the longest dry spell at this station improving on the 19 days in March 2003. The 11.4 mm of rain between the 15th and 20th broke the drought and was welcomed by parched gardens. After a little rain on the 23rd the following 4 days were sunny, increasingly warm and humid with temperatures peaking at 28.0°C (27th). Atlantic weather systems then finally made it to the UK producing more much needed spells of rain accompanied with occasional thunder and lightning from the 28th to

the month end.

August was cooler and drier than average. The mean temperature of 14.38°C was 0.71°C below the LTA with a daytime high of 22.9°C (2nd) and a night low of 4.6°C (25th). Rainfall of 67.1 mm was 23 % below the LTA although there were measurable amounts on 22 days (mean 17 days) with the highest 24 hour total being 7.4 mm (10th). The average barometric pressure was 1012 mb with a high of 1024 mb and a low of 996 mb. Across Scotland the mean temperature was 0.1°C below the LTA with 92 % of average rainfall and 88 % of average sunshine. The maximum temperature was 26.9°C (Lossiemouth, 2nd) with the lowest being -1.3°C (Braemar, 31st) while the highest 24 hour rainfall total was 34.0 mm at Kirriereoch, Kirkcudbrightshire. Lerwick enjoyed 14.3 hours of sunshine on the 12th.

A procession of Atlantic weather fronts crossing the country resulted in more unsettled and cooler weather. Spells of rain, often in the form of showers, were regular but amounts were moderate. Clear skies during the night of the 10th - 11th saw the temperature fall to 5.6°C (2.1°C Kirkton). The unsettled weather on a mostly south-westerly airstream continued until the 26th with some rain most days. The 24th and 25th bucked this pattern being dry and sunny, albeit fresher with winds from a north-westerly airt on the 24th. This, along with clear skies, saw temperatures fall to 4.6°C (1.4° C Kirkton) in the early hours of the 25th – the lowest since May 17th. A day of rain on the 26th saw the maximum temperature struggle to only 11.5°C, the lowest since 8.9°C on 3rd May. The final 5 days of the month were largely dry with some good sunny spells.

September was cooler than usual but with average rainfall. The mean temperature of 11.19°C was 1.05°C below the LTA with a high of 18.9°C (1st) and a low of -0.4°C (23rd). This was only the 5th year in 24 years of recording at this station that there has been an air-frost in September. Total rainfall of 84.0 mm was only 0.4 mm above the LTA with measurable amounts on 21 days (mean 16 days). The average barometric pressure was 1014 mb (LTA 1014 mb) with a high of 1034 mb (24th) and a low of 993 mb (18th - storm 'Ali'). The mean temperature for Scotland of 10.5°C was 0.4°C below the 1981-2010 average with a high of 25.8°C at Lossiemouth on the 2nd and a low of -2.5°C in Braemar (3rd). Rainfall in the eastern half of the country was around average but in the north-west it was 150 % of the norm.

The first half of the month was distinctly 'autumnal' with some low night temperatures (4.2°C, 6th & 4.1°C, 15th) and mixed weather. Heavy rain during the night of the 10th / 11th produced 17.6 mm

which was the highest 24 hour total since 24.0 mm on the 3rd April. Fresh to strong south-westerly winds predominated from the 13th to the 17th. On the 19th the first named storm of the winter, 'Ali', hit Scotland. Heavy rain started at 07.30 hours and continued until 12.00 hours producing 16.0 mm. This was followed by a mixture of sunshine and very blustery showers. The day started relatively calm but the wind speed rapidly increased from 10.00 reaching a maximum recorded speed on the Tay Road Bridge of 102 mph at 15.00 hours. A woman was killed when the caravan she was in blew over a cliff and into the sea in County Galway while a man was also killed by a falling tree near Newry, County Armagh. Closer to home, the cruise ship 'Nautica' broke from her moorings at Greenock and a freight train was derailed by a fallen tree on the Highland Main Line between Blair Atholl and Kingussie. By 16.00 hours c.30,000 homes were without power in Scotland. A falling tree crushed a car and damaged the roof of the Cambusbarron Co-op store. All trains out of Edinburgh Waverley and Glasgow's Central and Queen Street stations were suspended for a time. The winds eased through the night of the 19th / 20th becoming calm by late afternoon on the 20th. Four sunny days then followed which, combined with the clear nights and north-westerly airstream, produced the first frost of the winter, -0.4C on the morning of the 23rd which was cloudless, as was the next day as the barometric pressure reached a month high of 1034 mb. A south-westerly airstream then developed which gave some blustery days but only a little rain. The early morning of the 28th was clear and calm with temperatures dropping to 0.5°C which produced a ground frost.

October was colder and drier than the norm with the mean temperature of 8.15°C being 0.46°C below the LTA. This was mostly due to the mean night low temperature being 0.83°C below the LTA. The daytime high of 18.0°C (10th) was the equal second highest for October after 18.3°C in 2003 while the night low of -4.6° C was 3.2°C below the average. There were 6 air-frosts (mean 3). Rainfall of 68.5 mm was only 54 % of the LTA with measurable amounts on 17 days (mean 25). The maximum daily amount was 15.0 mm (13th). The average barometric pressure of 1015 mb was 5 mb above the mean with a high of 1033 mb (22nd) and a low of 990 mb (12th). The mean Scottish temperature of 9.1°C was 0.1°C above the 1981-2010 average. The minimum night temperature in Scotland was -6.5°C in Aboyne, Aberdeenshire (31st) while 6 cm of snow lay at Tomnavoulin, Morayshire on the 27th.

After a damp 1st the 2nd was sunny but with fresh to strong north-westerly winds. The sun shone throughout the 5th and 6th before more unsettled, often windy weather pertained. This culminated in

storm 'Callum' which deposited 28.2 mm of rain during the 12th / 13th. Much more rain fell in the west with the A85 between Lix Toll and Crianlarich partially flooded while the A83 was blocked yet again by a landslip at the 'Rest and be Thankful'. A warm southerly airstream, originating in North Africa, saw temperatures reach an unseasonably warm 18.0°C on the 10th (22.3°C Floors Castle, Borders). The weather was quieter from the 14th with damp periods interspersed with sunny spells, the latter lighting up the spectacular autumn foliage. Rainfall totals were low and it was largely calm as the barometric pressure reached 1029 mb (18th). Despite the barometric pressure rising further to 1033 mb (22nd) there were fresh south-westerly winds from the 21st – 23rd but as this system subsided a cold northerly airstream set in from the 26th. This was accompanied by much sunshine and very clear air, the latter allowing good views of the bright, waning gibbous moon – even during the first hours of daylight. Showers over the high hills dusted them with the first snow of the winter and a frost of -0.8°C (28th) froze the garden pond for the first time this winter. The cold blast lasted until the 31st with a minimum night temperature of -4.6° C (29th).

November was milder and wetter than the norm with the mean temperature of 6.1°C (6.2°C Scotland) being 1.5°C above the LTA (+1.3°C Scotland wide). The monthly high temperature was 12.3°C (15th) with a low of -2.7°C (2nd) while there were only 2 air-frosts (mean 8). Rainfall of 156.9 mm was 37 % above the LTA with measurable amounts on 26 days (mean 20) whereas for Scotland as a whole it was 3 % below the LTA. Average barometric pressure of 1008 mb was the same as the LTA with a high of 1035 mb (18th) and a low of 984 mb (10th). A high of 17.9°C was recorded at Lossiemouth (3rd) with a low of -6.4°C at Aviemore on both the 19th and 20th. The north-west of Scotland was dry and exceptionally sunny.

There were good sunny periods during the first 2 days of the month but it rained all day on the 3rd producing 12.0 mm. The variable, mostly unsettled weather, continued with rain every day, being particularly heavy during the evening and early hours of the 8th / 9th (16.1 mm) and the evening of the 9th (14.1 mm). The weather turned milder from the 13th feeling quite pleasant when the sun shone. However, during the middle of this spell, an Atlantic front crossed Scotland during the morning of the 14th depositing 16.5 mm of rain. Barometric pressure then rose rapidly from the 16th to a high of 1035 mb (18th). The weekend of the 17th and 18th was sunny but colder than of late. The latter was exacerbated by an easterly airflow which was due to the centre of the 'blocking' high pressure

system being to the north of Scotland and a low over France. This easterly / north-easterly airflow persisted until the 29th with some rain every day from the 19th until the month end, this mostly in the form of showers coming in off the North Sea. However, a heavier band of rain during the morning of the 21st produced 18.4 mm while storm 'Diana' produced 30.5 mm of rain in the 24 hours from 14.30 on the 28th. The winds changed to a south-westerly direction on the 29th thus ending 12 days of easterly winds.

December was milder and drier than average with the mean temperature of 3.47°C being 1.27°C above the LTA while the total precipitation of 76.0 mm was only 67 % of the norm. The highest daily temperature was 10.6 mm (29th & 30th) while the lowest night temperature was -5.4°C (24th) There were 12 air frosts (mean 14). Measurable precipitation occurred on 18 days (mean 19) while snow lay on the ground at 09.00 on one occasion (mean 5). The mean temperature in Scotland of 4.2°C was 1.5°C above the average with a low of -8.8°C at Braemar (5th). Scotland wide, precipitation was 86 % of average with the highest 24 hour total being 64.6 mm at Cluanie Inn, Inverness-shire (8th).

A fine, if cold start to the month with a few sunny and calm days. Another 'blocking' high over Scandinavia (1025 mb, 10th) from the 9th kept Atlantic fronts at bay and introduced a mostly light easterly airflow. The majority of the days were fine and dry but although nice to see, the low midwinter sun gave little warmth. An aforementioned Atlantic front eventually prevailed in the form of storm 'Deidre' which on the 15th, deposited 25.5 mm of precipitation, mostly in the form of rain but with a little snow in the evening. There was a thin covering of snow by the following morning - the first of the winter.

A southerly airflow on the 18th introduced milder conditions with temperatures reaching a high of 10.1°C during the night of the 17th/18th. A period of very quiet weather for December then followed with very little wind, spells of low midwinter sun and only a little rain. Barometric pressure slowly increased from a low of 989 mb (16th) to a high of 1032 mb (24th), remaining high till the year end.

Kirkton Farm (Met Office Automatic Weather Station), near Tyndrum, Strathfillan

Summary

The total rainfall recorded at the Met Office automatic station at Kirkton in 2018 was 2475.6 mm (97.5 inches). This was 138.2 mm less than the 1991-2015 twenty five year average (2613.8 mm). The

wettest month was November when a total of 351.2 mm (13.83 inches) of rainfall was recorded. The rainfall was above average in June, July, September, October and November. The driest month was May with 67.6 mm of rainfall (only 48% of the 25 year average). February was also particularly dry with only 123.8 mm of precipitation (49% of the 25 year average). The highest rainfall over a calendar Week (Monday to Sunday) was 181.2 mm between the 22nd and the 28th January. There were four calendar weeks when the total rainfall exceeded 100 mm. The highest rainfall in a single 24 hour period (09:00 GMT to 09:00 GMT) was 72.8 mm on the 8th October. There were 5 days in 2018 when more than 50 mm of rainfall was recorded (22nd January, 17th September, 19th September, 7th October and 8th October). The highest rainfall in a single half-day 12 hour period (09:00 GMT to 21:00 GMT) was 54.8 mm on the 7th October. The total number of rain days was 269 (73.7 %). There were 25 days when there was more than 25 mm of rainfall recorded.

The lowest temperature recorded during 2018 was on the 21st January when the temperature fell to -11.3°C. This was the lowest temperature since January 2011. The lowest maximum temperature was recorded on the 28th February (-1.2°C). There were three days in 2018 when the temperature failed to rise above freezing (7th January, 28th February and 1st March). An air frost was recorded on a total of 86 days. There were no air frosts recorded in June, July or August.

The highest temperature recorded was on the 28th June (31.6°C). This was the highest temperature ever recorded at Kirkton and the first time a temperature of over 30°C had been recorded. June and July were the warmest months with mean temperatures of 14.46°C and 15.20°C respectively, and mean maximum temperatures of 20.45°C and 20.26°C respectively. Temperatures of 25°C or above were recorded on 12 days (two days in May, seven days in June and three days in July), while temperatures above 20°C (but less than 25° C) were recorded on a further 26 days (5 days in May, 8 days in June, 12 days in July and one day in August). Sleet or snow was recorded falling at the weather station on 36 days during 2018. A snow depth of 24 cm was recorded on 22nd January. There was no snow recorded in November and only two days of snow in December. There were four days in 2018 when sustained gale force winds were recorded at the farm (19th September, 28th and 29th November, 15th and 18th December); and there were 6 days when thunder and lightning were recorded (3rd, 7th, 8th and 9th June, 27th July and 19th September).

The Weather through the Year

January was a rather cold and snowy month, with sleet or snow falling on 12 days and temperatures down to -9.5°C on the 8th and 9th and -11.3°C on 21st. The 327.6 mm of precipitation recorded was slightly below the 1991-2015, 25-year average. Snow covered the ground completely from the 16th to 22nd. The maximum snow depth was 24 cm (measured on the morning of the 22nd). February remained relatively cold with further spells of snow. However it was a dry month with only 123.8 mm of precipitation (less than half the 25-year average) and only 19 precipitation days. Sleet or snow was recorded on 11 days; with a maximum snow depth of 8 cm recorded on the morning of the 12th. The cold, snowy and relatively dry conditions continued into March. The 156.2 mm of precipitation in March was well below the 25-year average. There were 8 days of sleet or snow during March. The ground was completely covered in snow at the beginning of the month (with a maximum snow depth of 3 cm on the 2nd).

Although the total precipitation in April (134.2 mm) was below average, precipitation was recorded on 27 of the 30 days. Snow was recorded on the 2nd, 3rd and 4th of April. The relatively dry start to the year continued into May. May was the driest month of the year with only 12 rainfall days and a total of 67.6 mm of rainfall, which was well below the 1991-2015, 25-year average of 140.9 mm. There were a number of warm days in May particularly at the end of the month, with a maximum temperature of 25.8°C recorded on 30th. Since 1991 the maximum temperature recorded in May has only exceeded this value twice (both times in May 2012).

June and July of 2018 were hot and sunny. The average maximum temperature in June was 20.45°C the highest ever recorded. The highest temperature of the summer (31.6°C) was recorded on the 28th June. This was the highest temperature ever recorded at Kirkton and was some 2.5°C higher than the previous highest temperature recorded in June 1995. There were 15 days in both June and July when the temperature exceeded 20°C. Rainfall over the summer was close to average although most of the rainfall in June and July was associated with thunderstorms or other heavy rainfall events. Thunder and lightning were recorded on the 3rd, 7th, 8th and 9th of June and on the 27th July. The thunderstorm on the 3rd June produced 23.8 mm of rainfall in a relatively short period of time and another heavy rainfall event on the 13th June produced 38.2 mm of rainfall. No rainfall was recorded between 21st June and 6th July a period of 16 days. August was not as hot with only one day above 20°C (21.4°C on the 2nd). August was also damper with only five dry days; however the total rainfall (133.6 mm) was less than the 25-year average and was less than that recorded in June. Over the summer there were 57 days when more than 0.2 mm of

rainfall was recorded and 35 dry days when no rainfall was recorded.

After the warm and sunny summer, September was wet and relatively cool. The 341.8 mm of rainfall in September was 150.5 mm more than the 25-year average. There were only three dry days in September and there were 2 days when more than 50 mm of rainfall was recorded (17th and 19th). There were only 2 days of frost in September (-1.2°C on the 23rd and -1.3°C on the 28th). The rainfall in October was also above average (308.2 mm compared to a 25-year average of 269.8 mm) and rainfall was recorded on 28 of the 31 days. Nearly three inches of rain (72.8 mm) was recorded on 8th October and this followed 69.6 mm of rainfall the previous day. The wet autumn continued into November. November was the wettest month of the year with 351.2 mm of rainfall and 27 rainfall days. There were 6 days when more than 25 mm of rainfall was recorded with the wettest day being the 28th when 40.2 mm of rainfall was recorded. This was also a very windy period with gale force winds recorded on the 28th and 29th. There were only 4 days of frost in November and no snow days. December was also relatively mild with only eight frost days and 2 days of snow. A minimum temperature of -6.6°C was recorded on Christmas Day. Gale force winds were recorded on the 15th and 18th of December. The year ended on a relatively mild note with a maximum temperature of 10.6°C and a minimum temperature of 8.3°C on the 31st.

Killin

The total rainfall recorded in Killin in 2018 was 1688 mm (66.46 inches); this was 210.5 mm less than the 2002-2016 fifteen-year average (1898.5 mm). May was the driest month with only 37.5 mm of rain, while November was the wettest month with 300.5 mm. During 2018 Killin received 68.2 % of the rainfall recorded at Kirkton (i.e. some 787.6 mm less). The rainfall was higher at Kirkton in all months.

Thanks to the Met Office for supplying the data from the automatic weather station at Kirkton.

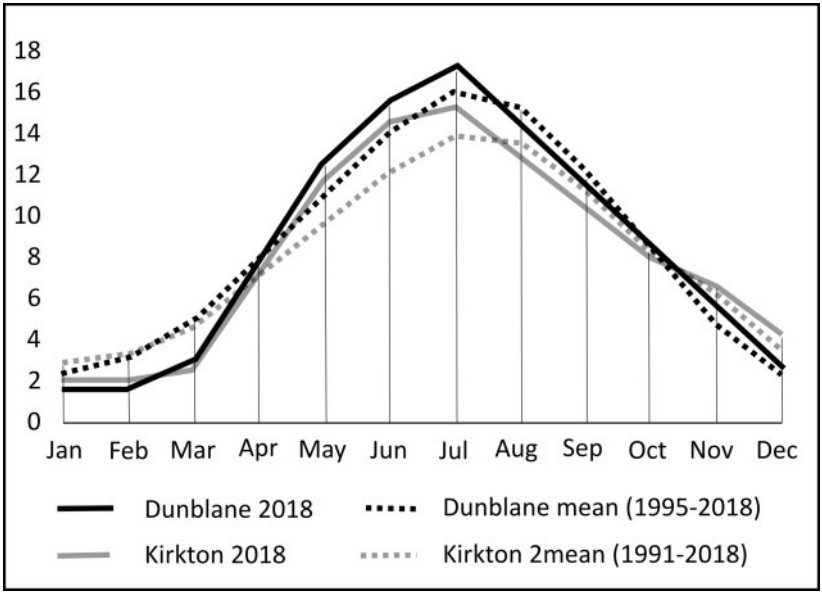


Figure 1. Dunblane and Kirkton—Monthly Mean Temps (°C)

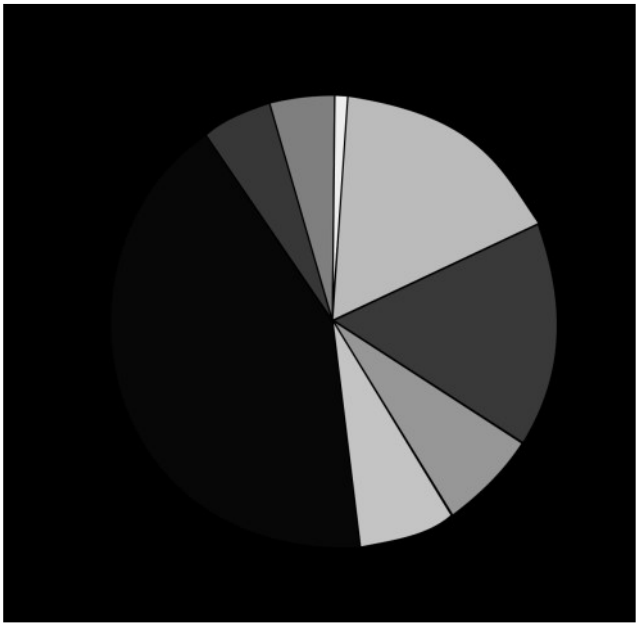


Figure 2. Wind Direction, Dunblane, 2018

Table 1. Temperature and precipitation 2018. Climatological Stations 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	0.5 / -1.1 (0.1)	3.4 / 4.8 (4.4)	14 / 16 (14)	161.1 / 327.6 (123.5 / 362.2)	25.0 / 52.4	24 / 25 (20)
February	-1.2 / -1.3 (0.2)	4.4 / 5.3 (5.8)	17 / 18 (13)	56.1 / 123.8 (95.5 / 251.5)	7.2 / 20.2	16 / 19 (17)
March	0.1 / -0.7 (1.3)	5.8 / 5.7 (8.6)	18 / 19 (11)	97.2 / 156.2 (76.6 / 231.3)	12.0 / 39.2	15 / 22 (16)
April	3.5 / 3.0 / (3.3)	10.9 / 10.8 (12.3)	5 / 6 (5)	83.1 / 134.2 (61.8 / 153.0)	24.0 / 22.2	19 / 27 (15)
May	6.8 / 6.0 (5.9)	18.4 / 17.0 (16.3)	1 / 2 (2)	27.9 / 67.6 (67.0 / 140.9)	6.7 / 20.2	8 / 12 (16)
June	9.5 / 8.5 (9.0)	21.7 / 20.4 (19.0)	0 / 0 (0)	50.9 / 160.2 (74.3 / 116.7)	15.4 / 38.2	11 / 14 (15)
July	11.8 / 10.1 (10.8)	22.5 / 20.3 (20.9)	0 / 0 (0)	35.5 / 130.0 (86.7 / 127.5)	8.0 / 19.8	10 / 17 (16)
August	10.2 / 9.6 (10.4)	18.6 / 16.9 (19.8)	0 / 0 (0)	73.0 / 133.6 (87.3 / 149.0)	8.4 / 19.8	22 / 26 (16)
September	7.4 / 6.3 (8.4)	15.0 / 14.5 (16.1)	1 / 2 (0)	84.0 / 341.8 (83.6 / 191.3)	17.6 / 54.6	21 / 27 (16)
October	4.6 / 3.9 (5.4)	11.8 / 11.9 (11.8)	6 / 8 (3)	68.7 / 308.2 (124.1 / 269.8)	15.1 / 72.8	17 / 28 (21)
November	4.1 / 3.6 (2.0)	8.1 / 9.2 (7.3)	2 / 16 (8)	156.9 / 351.2 (112.1 / 286.8)	19.5 / 40.2	26 / 27 (20)
December	1.6 / 1.3 (0.1)	5.4 / 7.1 (4.4)	12 / 10 (14)	76.0 / 241.2 (112.6 / 339.9)	25.5 / 35.6	18 / 25 (19)
Year	4.8 / 4.1 (4.8)	12.1 / 12.0 (12.2)	76 / 86 (70)	970.4 / 2475.6 (1105.7 / 2613.8)	25.0 / 72.8	207 / 269 (208)

The single climatological means in ( ) relate to Dunblane. Where either two 2018 values or climatological means are given, the first relates to Dunblane and the second to Kirkton. Temperatures are in degrees Celsius.

THE STIRLING FIELD AND ARCHAEOLOGICAL SOCIETY

John G. Harrison

Introduction

Between 1879 and 1939 the Stirling Field and Archaeological Society (originally The Stirling Field Club) issued 61 volumes of *Transactions*, mainly written by members, Most are on local topics presented at the regular meetings; they range from short notes through descriptions of exhibits and outings, to formal papers. The *Transactions* also record the running of the society and how it adapted to a rapidly changing world. This paper examines the Society and its context.

The Sources

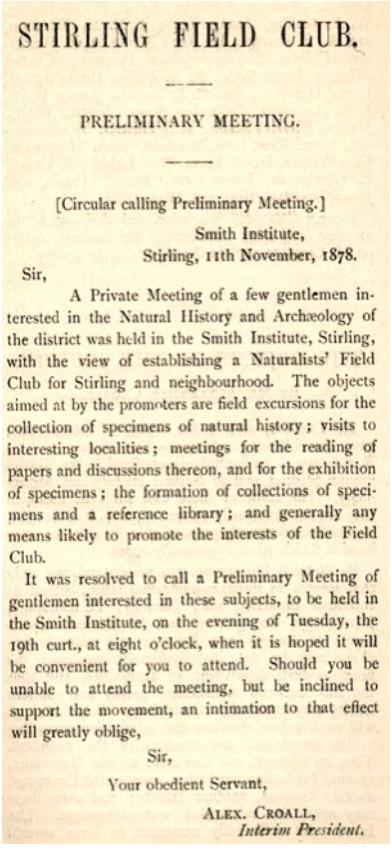
Each volume of The *Transactions of the Stirling Natural History and* Archaeological Society (hereafter *Transactions*) outlines aspects of current administration and other relevant events, such as the deaths or departures of key members with a brief appreciation. A short composite volume (*Transactions* 37-41) covers the years 1914-1919, when the regular meetings were suspended. Mackay (1978) outlines some key achievements.

Events such as microscopic presentations and exhibitions of biological specimens and archaeological drawings (all early favourites) were briefly described as are excursions and additions to the society's own scientific collections. Most meetings included formal papers and most of these (particularly those of local interest and involving recent research) were published in full in the *Transactions.* Other talks were merely noted or perhaps summarised whilst meteorological reports were published in tabular form with a brief commentary (*Transactions* 15 to 61).

The *Transactions* were printed by the *Stirling Journal* press and papers sometimes appeared, *verbatim*, in the newspaper itself, sometimes with new information and reports of discussion, an excellent publicity strategy. Other papers, as published, were far too long to have been presented as talks, whilst yet others were published only as short abstracts. All volumes are available at Stirling Central Library, Stirling University Library and National Library of Scotland. An index-to-date was published in 1897 (*Transactions,* 20). A later index extends to *Transactions* 57 and includes authors and illustrations with a collation of volumes/ dates (McNaughton, 1936). This subject index and the contents pages of all 61 volumes are now available at http://www.fnh.stir.ac.uk/journal/back_issues/index.php.

A few randomly-selected volumes are available online. The manuscript minutes of committee and annual meetings (SCA PD193/1-5) include some important unpublished material.

The Society and its Members



STIRLING FIELD CLUB.

PRELIMINARY MEETING.

[Circular calling Preliminary Meeting.]

Smith Institute,
Stirling, 11th November, 1878.

Sir,

A Private Meeting of a few gentlemen interested in the Natural History and Archæology of the district was held in the Smith Institute, Stirling, with the view of establishing a Naturalists' Field Club for Stirling and neighbourhood. The objects aimed at by the promoters are field excursions for the collection of specimens of natural history; visits to interesting localities; meetings for the reading of papers and discussions thereon, and for the exhibition of specimens; the formation of collections of specimens and a reference library; and generally any means likely to promote the interests of the Field Club.

It was resolved to call a Preliminary Meeting of gentlemen interested in these subjects, to be held in the Smith Institute, on the evening of Tuesday, the 19th curt., at eight o'clock, when it is hoped it will be convenient for you to attend. Should you be unable to attend the meeting, but be inclined to support the movement, an intimation to that effect will greatly oblige,

Sir,

Your obedient Servant,

ALEX. CROALL,
Interim President.

Figure 1. Circular announcing the formation of the Society; the name Field Club was quickly abandoned (*Transactions*, 1, p. 1) (Author's Collection).

In November 1878 a Circular announced that *'a few gentlemen had determined to establish a Field Club for the area, with the objectives of holding excursions for the collection of specimens of natural history; visits to interesting localities; meetings for the reading of papers and discussion thereon, and for the exhibition of specimens; the formation of collections of specimens and a reference library.'*

A further meeting was attended by 38 people with 44 more expressing interest so the society was established (*Transactions* 1,. 1-7; *Transactions,* 54, 5-6; SCA PD193/1). By the end of the first year, it was estimated that 93 men had joined, with 36 'lady associates' (*Transactions* 21, 13). This initial membership included a general, a colonel, 13 ministers, four medical doctors and at least eight teachers (including Miss Swan, of Allan's School). Gilbert M'Dougal, gardener, a regular contributor on local molluscs, is the one exception to this upper and middle-class dominance (PD193/1 1 April 1879; *Transactions,* 2-21 *passim*). It was 'the classes that form ... societies such as our own, and ... higher' who ate skylarks, groaned ornithologist James Sword (1894, 160) . In 1935 the profile of members (5 ladies and 92 men) was much the same, the exception being David Abercromby, a store overseer, living in municipal housing in St Ninians (*Transactions,* 57, 224-225; SCA, VR/SBC/ 36).

In 1882 it was decided to charge the ladies (formerly free) 1s (5p) per year, compared with the men's 5s; the subsequent sharp fall in female membership may have been as much due to the reported laughter at the value of their contribution as to the extra cost (see below). Thereafter the numbers and proportion of men and women fluctuated, men down to the 60s in the mid 1890s and up to 94 in 1911-12, women at 21 in 1897-8 but as low as three in the inter-war years. A steep rises in subscriptions in 1922-3 to 7s 6d (37.5p) for men and to 3s 6d (17.5p) for women to cover the extra costs of supplying the *Transactions* to all members, had no obvious impact on numbers.

Most regular contributors lived locally and were members. Alexander Croall (see below) was the first President but, after his death, there were often two Presidents, many local landowners, often holding office till their deaths. Some were figureheads but others, like Colonel Stirling of Gargunnock, were active contributors. The vice-presidents (usually two together) were generally closer to the general membership.

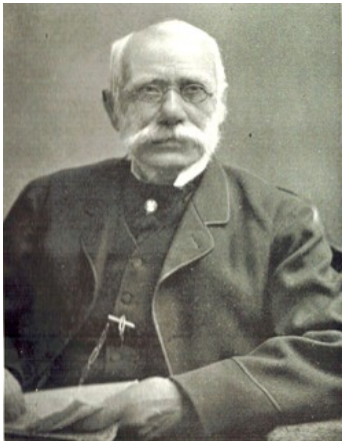


Figure 2. Dr G. Galbraith, founder member and author of several papers (Graham, 1900) (Author's Collection).

Retired army doctor, G T Galbraith was a founder member, who gave six papers between 1879 and 1892 (*Transactions,* 23, 20); Dr. George Lowson was a teacher, later rector at Stirling High School (Hutchison, 1904. 226) . Joseph McNaughton was the third director of the Smith Institute (from 1921) and a regular contributor to the *Transactions.*

The prime mover in 1878 was Alexander Croall (1809-1885) recently-appointed first director of the Smith Institute in Stirling. Largely self-taught, he was a correspondent of Hooker and Darwin and co-author of a major work on British seaweeds (*Transactions,* 7, 71-72). Co-founder Robert Kidston (1852-1924) had an independent fortune, lived in Stirling and 'arguably became the best and most influential palaeobotanist of his day' (Thomson & Wilkinson, 2009; Edwards, 1984). Another founder was landowner, J.A. Harvie-Brown (1844-1916) a leading naturalists specialising in birds and migration (*Oxford DNB*, J. A Harvie-Brown).

Sir John Murray (1841-1914) a man with strong local connections and the founding figure of modern oceanography (*Oxford DNB*, Sir John Murray; Sexton et al, 2008) joined in 1881 (*Transactions* 4, 100) and was closely involved in a significant refocusing of the aims in 1882 beside giving substantial collections to the Society and to the Smith Institute (*Transactions*, 5, 7-9; Mackay, 1978, 6; SCA PD193/1 7 Nov 1882) though he later took only a minor role, even after becoming president from 1902-14.

These men all had national or even international reputations. Kidston and Harvie-Brown were gentleman-amateurs, largely funding their own researches (Harvie-Brown had a private yacht). Murray was also a wealthy man, attending classes at Edinburgh University for 17 years without taking a degree. Christian Maclagan was another wealthy member who funded her own publications and travels, which extended to Sardinia and perhaps Egypt (*Oxford DNB*, Christian Maclagan; Elsdon, 2004). Theologian Professor Henry Drummond was another early entrant; his popular publications aimed to reconcile religious belief with the growing body of scientific evidence (*Oxford DNB*, Henry Drummond). In the early 1880s, Croall, Kidston, Harvie-Brown, Murray, Maclagan and Drummond may all have been present together.

Croall, was followed as president by other active members. But other office-holders were not always so engaged. In 1912-4 none of the three honorary presidents (Murray, Harvie-Brown and the legal historian Sir Archibald Lawrie) were actively involved. But they (and local landowners such as the Stirlings of Gargunnock or Sir James Maitland of Sauchie), underlined the society's respectability and prestige. Routine administration was in the hands of a small council, mainly Stirling residents and particularly likely to give talks.

Croall insisted that the society was not a private club but a public body, its members to be active, critical participants, not a passive audience. The collections were to be 'inalienable public property', endorsing their importance (*Transactions* 1, 10; *Transactions*, 3, 33). Croall encouraged members to make short presentations of their own observations, perhaps to bring in an unusual biological specimen or archaeological find; questioning and discussion was encouraged (eg *Transactions*, 5, 1-10) . Early meetings seem sometimes to have been *ad hoc,* organised in the expectation that something would turn up; one was a *conversazione* with microscope demonstrations and other exhibits (*Transactions,* 1, 1; *Transactions*, 4, 33). But, from 1881-2 there was an annual syllabus of talks and (for a few years) of excursions with more long talks

given by specialists and a limited number of 'regulars'. But 23 of the 92 men named in 1935 contributed at least one paper in the period 1930-9, and at least 6 of the 92 published books at some stage in their career. In all, 42 people gave presentations during the decade, many, as Croall had enjoined, very short, sometimes with two or even four presentations at a meeting.

Women as a group

By the 1870s women were widely involved in field work, mountaineering and intellectual life. The Stirling society had the highest percentage of women member of the groups surveyed by Finnegan (2009, p. 111-112). and, as with other groups, they played an active though not uncontroversial role. Some were daughters or otherwise related to the men; only two were ever on the committee - both in the immediate wake of WWI and neither of these presented a paper.

Other women did contribute. Miss Christian McLagan and Mrs Jane Hogg, stand out. Maclagan (1809-1901) is the subject of modern biographers (*Oxford DNB* 'Christian Maclagan'; Elsdon, 2004). She had a substantial private income and wide interests; she published several books about archaeology and contributed 10 reports to the *Transactions*, mainly on prehistoric and medieval stone monuments in Scotland. Her understanding of the monuments was constrained by her belief in the Biblical Creation - and she sometimes 'massaged' her results to support her theories, such as the eccentric idea that stone circles are the remains of large buildings. But she did insist that the Scots had a sophisticated culture before the Romans arrived, she recognised, surveyed (and so helped to save) several important sites (Elsdon, 2004).

Jane Hogg (c. 1856-1900) and her husband were teachers but he became proprietor and editor of the *Stirling Journal* newspaper, roles she took over on his death in 1876. In 1888 she joined the School Board, the first woman on any public body in Stirling. A founder member of the society she collected the subscriptions of the lady associates herself to save the treasurer extra work (*Transactions*, 5, 10). Between 1884 and 1895 she contributed several historical items to the Transactions. After her death, Morris, in a short appreciation, noted that "She may fairly be said, for many years, to have edited our *Transactions* ... though never officially appointed to do so", noting that her reports of the meetings in the *Stirling Journal* were always 'accurate and bright' and that she had always paid the full subscription of 5s, rather than the 1s for a lady associate (*Transactions*, 22, 63-64). Maclagan, on the other hand, in a lively debate, symptomatic of deep divisions, rejected calls for

women to help with fund raising (as they did in many other societies) saying 'until lady members of the society were placed upon the same footing as gentlemen, they had no right to be appealed to for assistance' (*Transactions,* 6, 35).

Other women contributed occasional, single items, such as Elizabeth Henry's paper on the Falkland Islands (where she had been a schoolteacher) (Henry, 1912, 16-40; *Falkland Islands Gazette,* 1910, 35). The society was aware that women's role was a significant issue. Croall emphasised that 'the study of nature' was 'suitable for all, old or young, male or female.' (*Transactions,* 51, 14). During extended discussion of women's role in 1882-3 Croall noted that 'we have been mostly indebted to the ladies' for the new species added to the local plant list, more contributions would be welcome and 'perhaps the council have been remiss' as there was only one paper by a lady.

His comment(*Transactions,*3, 1) that 'it behoves us as wise and intelligent men and women' to review the year's progress, was fairly typical of his 'inclusive language' but equally typical. was his patronising comment that 'the better half' of the membership had been urging their claim 'to be permitted, more substantially, to contribute to its support', an idea he opposed. During this extended discussion of women's role and subscriptions there were interjections and laughter at slighting remarks about the value of women members (*Transactions,* 5, ' 1-10). In 1913-14 it was still noted that a 'cordial invitation' was issued to new members 'and [we] should especially welcome lady members, of whom we have too few'. By this time, there were (even) fewer female contributions and few pretend to original research on local topics, though some were reviews, diffusing specialised knowledge to a general audience. So, Miss Jessie Lowson described the geography of the Alloa to Auchterarder area (Transactions, 34, 10-13) and Mrs Drummond (1937, 112-128) the antiquities and archaeology of Alva and the Hillfoots, both largely based on others' work.

The Aims

The society (like many others) joined an interest in natural history with archaeology, local history and geology, doubtless (as today) since very specialised groups cannot attract enough members to be viable. The aims were formalised into the second clause of the Rules. In 1888 this stated;

The objects of the Society shall be to explore the District for the purpose of enquiring into its Geology, Botany, Natural History, and Archaeology, also to collect and take the custody of Specimens, and to form a reference Library (SCA PD193/1). Croall was insistent (Transactions 1, 2-7)

that the aims were to be confined to the district around Stirling. In practice, that was never observed. Morris (1894, 92-107) talked about the action of glaciers in moulding the local landscapes. But five years later, a talk about the glaciers of the Alps, was illustrated by lantern slides taken by a man who had climbed Mont Blanc (Drummond, 1899, 42), surely a crucial argument against exclusively local topics.

Initially, the record-makers and collectors fixed on the area within 20 miles of Stirling as 'local', an area which extended across Clackmannanshire and into Perthshire. This, with lack of early records of specific locations, made comparisons impossible. Consequently, from about 1890, national standards within boundaries such as the vice-counties were used; new lists of flowering plants, molluscs and mosses were created (Croall, 1881, 92-4; Stirling & Kidston, 1899b, 68; Stirling & Kidston, *Transactions*, 12-22, passim; McDougall, *Transactions*, 2 -21 passim; McLellan, *Transactions*, 9-19. passim; McLellan & McDougal, *Transactions*, 20).

It was all 'work in progress' and Stirling and Kidston's list of mosses (238 species and 15 varieties in Stirlingshire) acknowledged to be 'very incomplete' was the basis for further work. In 1894, despite seven years of work, Sword thought that the time was not yet ripe to publish a local bird list, basing his article, instead, on those in the museum collections, not all recorded locally (Sword, 1894, 139-204). But, by 1901, he thought (Sword, 1901, 99) that the birds had been 'pretty well worked out'. This and subsequent articles discuss a wider area, rarities and aspects of bird behaviour, such as migration (Sword, 1902, 130-143).

Reviewing the situation in 1901 the president noted gaps (on insects and mammals, for example) as well as progress. Even on topics where local detail had been researched, such as geology, there was a need for synthesis, recognised as a task for professionals, not a small, local society. When a geological synthesis did appear (Dinham and Haldane, 1932) the inclusion of the *Transactions* amongst the sources was noted with justified pride (*Transactions*, 55, 5). Historical and archaeological studies depended heavily on personal interests and chance finds. In the first volume, for example, is a short report on a cist and skeleton found at Coneypark, which then provoked some discussion (*Transactions*, 1, 13-21, 21-22; RCAHMS, 1963, p. 62). But such finds were spasmodic, made almost by chance in the course of work which often destroyed the evidence; finds might be preserved, some details recorded, but the society had neither the opportunity, the resources or the skills for more and there were few attempts at excavation or survey (but see Old Bridge and Blackfriars below).

The Society in a Changing World

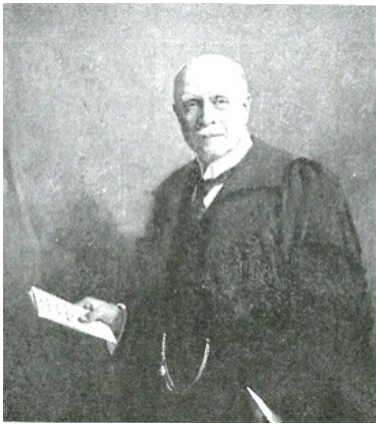


Figure 3. David Buchan Morris, pivotal member and contributor to the *Transactions* (Stirling Observer, Xmas Number, 1939) (Stirling Council Archives).

Similar societies were abundant though few have been studied and the major general study covers only those with interests in natural history (Muir, 2006; Finnegan, 2009; Murdoch, 2013). The Stirling society lasted longer than many but struggled with many of the same issues. There were personal factors at play, at every stage. Collecting and botanical rambles certainly declined after Croall's death. Morris arguably played too large a role from the late 1890s, not only as secretary and president but contributing around 76 papers, on botany, geology and local history (Mackay, 1978). But there were also wider issues affecting these societies, including professionalisation, the changing role of science and of local studies in national culture, the place of women in local society and the rapidly changing world of entertainment, popular literature and education, issues all still relevant to modern societies (Finnegan, 2009; Murdoch, 2013, 165 & 170).

In the early days, some members must have rejected Darwin's Theory of Evolution outright but Maitland was a categorical supporter (1887) whilst Croall was equivocal, saying it was 'a good working hypothesis' requiring more evidence (*Transactions*, 7, 71-2). Prof. Henry Drummond (who accepted the general idea of evolution) sought to reconcile scientific conclusions with Christian faith. For many early members, scientific research had a moral or religious dimension. In 1886 the President opined that 'science without Christianity is dangerous' (*Transactions*, 8, 90-93). Mr. Buchanan thought that if the young ('and may I not also add our young ladies') were to study geology or botany they would be less drawn to 'vicious pleasure or frivolous amusement' (*Transactions*, 2, 18). Local researches, for such people, did not just add to local knowledge but 'improved' the researchers and society, views less often expressed after about 1900. Wealthy men such as Kidston, Harvie-Brown and Stirling of Gargunnock, working to a professional standard, partly financed their own researches and had contacts with the universities, government agencies and so on.

So, Stirling and Kidston (1897, 134) spent a week at Killearn to study the flora as it was ' at rather too great a distance to be worked conveniently from Stirling'. But for most members, historical or scientific studies were a hobby, albeit sometimes pursued with great enthusiasm or in parallel with their career - as when teachers of classics researched the Antonine Wall.

In 1900 the Scotch Education Department was encouraging teachers (increasingly often from urban backgrounds) to gain 'nature knowledge' and the society offered guidance and use of the collections, in support (*Transactions*, 23, 7-9). In his presidential address in 1901 Lowson, whilst emphasising that 'some of our members are acknowledged experts in their field', embraced the amateur label sometimes 'scornfully' used (*Transactions*, 24, 9). But, as Croall had known, the tension between amateur and professional was increasing in all the society's main areas of study, from the outset.

Specialisation was particularly obvious in science -the word 'scientist' was coined in 1840; increasingly, university science departments had specialist staff, students and equipment (which was increasingly expensive). At first, the society tried to bridge this gap, for example by creating a library because 'science and natural history in particular is becoming daily more important as an element in the curriculum of the school'. It was especially needful to have, 'those [books] which, from their high prices, are placed beyond the means of ordinary readers' (*Transactions,* 4, 4-5).

In 1893-4 the Society used a grant to procure 67 historical volumes published by the Public Record Office for the members' library (*Transactions*,16,79-84; *Transactions,* 17, 2). In 1906 this library (scientific and historical) was deposited in the new, free public library where they remain a useful resource today (*Transactions,* 27, 79-88; *Transactions,* 28, 6). In 1880, 12 members (Miss Morrison as well as Kidston) set up their microscopes at a meeting, so others could see 'nature's wonders' in new detail (SCA GD193/1 2nd March 1880; *Transactions,* 4,. 33). Croall had warned against 'leaving it to the professors'; rather, members should train themselves and each other and so gain expertise and confidence as that classic auto-didact Hugh Miller (1802-1856) had done (*Transactions* 1, 1).

Indeed, in the early years, national experts were dependent on local researchers for the details of plant distribution, for example. Dr James Rae, via his microscope, introduced the members to diatoms; but he also contributed data to Murray's *Challenger* project and left an important collection of diatoms (Drysdale, 1899, 145-7;

Glasgow Herald, 16 May 1899, p. 4 column 1). But, methods, such as biochemistry or histology, were inaccessible to 'amateurs'. After publication of Stirling and Kidston's paper on mosses in 1900, regular, systematic biological recording was effectively abandoned (*Transactions,* 22, 68; *Transactions,* 23, 5-6). Most later papers on local plants covered small areas (Menstrie, King's Park) (Couper, 1901, 80 -90, Moyes, 1908, 152-175) or a single species (yellow star of Bethlehem, Labrador tea) (Morris, 1920, 85-7; Morris, 1931(b), 129-139) whilst others noted new locations for old species (though locations were now described with sufficient detail to allow integration into national records) (Moyes, 1913, 61-64; Morris, 1931 (a), 140-145). Articles on insects, mammals, fungi, ferns, butterflies and moths made no pretence at completeness, nor, in most cases, to originality (Jolly, 1903, 134-142; *Transactions*, 47-41 passim; Taylor, 1910, 9-11; Chapman, 1920, 45-56; M'Laurin & M'Laurin, 1929, 9-12). For example, a note on shells reports data, published elsewhere, updating local lists (Morris, 1923, 116-7)

In later years, geology was a frequent subject, with Morris, in particular, noting and explaining local features, some already well-known, some revealed as construction work created opportunities. Kidston (1891, 114-5) encouraged interested members to visit the glacial striae, transiently exposed during quarrying work at Ballengeich; Morris described a section exposed during construction of the North Third Reservoir (Morris, 1907, 82-4). But, by the time of World War I, primary scientific reports were rare, often just short notes.

Archaeology and history were also professionalised and, by the late 19th century, academic historians were primarily concerned with political history, the story of the nation, so consigning local studies to the margins - very much as happened in England (Beckett, 2009; Anderson, 2012). The President, Rev Mr Goldie emphasised the scientific nature of archaeology, no longer only concerned with finding artefacts but 'it is unwritten history; it tells us what sort of men lived long ago' (*Transactions,* 8, 92). In his presidential address of 1898, Todd said that archaeology was no longer an occupation for cranks (he was clearly thinking of Scott's *The Antiquary*) but a scientific discipline between geology and history (*Transactions*, 21, 11).

Amongst the documentary historical investigations, Morris's papers on the Stirling Trades Incorporations (*Transactions* 41, 43, 44, 45, 47, 49, 51) are particularly notable whilst Ballantine (1927, 1928) trawled maps and Valuation Rolls for his study of Stirling's modern development and Muirhead (1926) drew on records and memories for his paper on local Volunteering since 1859. Studies (physical

and documentary) of ancient monuments, contributed to wider views as protective legislation (from 1882) and The Royal Commission on the Ancient and Historical Monuments of Scotland (from 1908), were introduced. The monuments, many private property, were increasingly seen as national treasures though the national bodies were ill-placed to investigate their local context. Members published studies of (amongst others) the Holy Rude Kirk, Mar's Wark and Argyll's Lodging, they excavated the Blackfriars monastery and searched for remains of the Old Bridge.

Figure 4. Photos record facades but the society did not record the interiors of old Stirling houses before demolition (Author's Collection).

Lists of old houses thought worthy of preservation in the town and locality were prepared, influencing contemporary work on conservation and were eventually integrated into the Royal Commission's publication (Ronald, 1889, 2-60; Ronald, 1904, 125-130 & Appendix; Ronald, 1906, 36-9;Cook, 1905, 33-34, Cook, 1910, 57-66; Stirlingshire Sub-committee, *Transactions,* 35, 85-89; RCAHMS, 1963).

Some of the society's earliest work on ancient monuments anticipated official action. In 1896 the society arranged removal of the ogham-inscribed Greenloaning Stone to the Smith Institute for protection. (*Transactions*, 20, 2; Cook, 1907b, 5-25). Efforts to recover the Tron weight from Glasgow succeeded though they failed to gain any of the artefacts from Ardoch Roman Fort (*Transactions,* 21, 2 & 6). But it is sad that no record was made of such remains as the Gray Friars' convent, merely noted as destroyed during extension of the High School (Hutchison, 1904, 181).

Many houses in the Top of the Town were destroyed in the 1920s with minimal recording (Harrison, 1995, 25-6). The committee were arguably too discrete regarding a "hog backed stone" and "medieval chapel", allegedly identified by Fleming at St Thomas's Well (1898, 95-104). Five members who visited the site thought there was 'insufficient evidence' that the stones were 'worthy of

preservation', a sceptical decision recorded only in the manuscript minutes, leaving Fleming's published claims effectively unchallenged (SCA, PD193/4 6 Dec and 8 Dec 1898, 11 April 1899).

A flurry of 'Extracts' from Stirling's burgh records (Renwick, 1884; Renwick, 1887; Renwick, 1889) facilitated further studies of the church and schools (Ronald, 1889, 2-61; Hutchison, 1904, p iii). Later came Cook and Morris's Guildry Extracts (1916), Morris's extensive studies of the Trades (noted above) and his *Merchant Gild and the Life of John Cowane* (Morris, 1919). The church was one of Stirling's most important monuments but repeated alterations had destroyed its integrity. Two campaigns of restoration (1911-14 and 1936) both relied on studies by the members and were supported by the society as well as national funding appeals (RCAHMS, 1963, p. 130-1). In 1911 the society hosted a public lecture on the building (Cooper, 1911, 147-162; *Transactions*, 34, 6). In 1914 there was a lecture by Dr Ross and in 1937 one by James Miller, architects for the contemporary projects (Ross, 1914, 115-136; Miller, 1937, 9-12; *Transactions*, 60, 6).

As the ancient trades incorporations entered terminal decline, the society encouraged deposit of their records in the Smith Institute (*Transactions* 47, 6). There were masses of burgh, kirk and other records, often unsorted and dating back centuries (*Transactions*, 24, 86-7). Researching such material is a daunting task, even when the officials are welcoming and can provide suitable facilities. Apart from Renwick's team (editing the burgh records) the main consulters included Morris (himself the town clerk, the burgh records being in his office), Ronald (one-time burgh councillor), Hutchison (rector of the High School) and Cook (journalist, member and well-connected local). Others might well have had significant access issues.

Ronald's work on the monuments (noted above) is of particular importance since, as well as presenting documentary evidence, he recorded the locations of places named in the documents, the sources of local building stone and other knowledge, on the verge of being irretrievably lost (Ronald, 1899). Miller (1921, 1923) used manuscripts (some in private hands) for his work on the location of the New Park and the Battle of Bannockburn. Young's later work is based on manuscripts, some in private hands, others in the National Archives in Edinburgh (Young, 1931; Young, 1932; Young, 1938). Gibson, concentrated on the growing body of published, primary source material such as the registers of the great and privy seals though also using manuscripts and personal recollections (eg Gibson, 1928 (a) & (b); Gibson, 1934). There were several papers on

the local connections of past literary figures, including Mrs Grant of Laggan and Dr John Moore (*Transactions,* 43 & 47).

An increasingly important role was in diffusing research findings to their non-specialist members. The potential and dangers were apparent in 1885 when the society hosted the Gilchrist lectures, an annual series held in different UK towns and targeted at 'the working class' though others clearly attended. The Stirling series (organised in conjunction with Greenock and Paisley) involved six lectures with seats from 6d to 1s for the series (the higher prices for reserved seats). Topics ranged across electrical engineering, astronomy and the 'Lower forms of Animal and Plant Life', all illustrated by lantern slides. Astronomer Professor Robert Ball (1840-1913) a researcher well-known on the international lecture circuit, showed views of the surface of the moon, of a comet and of distant star clusters to an audience credibly claimed as 900.

The secretary noted the good attendance 'by those they were intended to benefit' and that 'their educational value cannot ... be overestimated'. But men like Ball charged substantial fees and the council, feeling that it was not fair to burden the society with the loss made, covered the deficit from their own pockets (*Stirling Journal*, 2 Oct 1885, p 1c; 9 Oct p. 1c, p. 4e; p. 6a; 16th Oct, p. 4b; *Transactions,* 9, 97). Even a modest loss would make future committees cautious and no such 'lions' appeared in the future.

In 1888, the society changed the meeting night to avoid a clash with the University Extension lectures on Physiography and English Literature. These were 'as nearly as possible' like university lectures but intended for people who had not had an opportunity to attend university, the fees for apprentices and artisans being only half the full rate, another reminder of the 'self-help' ethos.. The involvement of a number of members (including Mrs Hogg, Maclagan and her friend Miss Colvin) is indicative of wider interests in education. Despite complaints that the project offered only 'homeopathic doses' of University Education, over 100 people expressed an interest (*Transactions,* 10, 60; *Stirling Journal*, 1888, 27 Jan, p. 6 a-b: ibid, 3 Feb p. 5d; ibid, 7 Sept p. 4b). Again, the experiment was not repeated in Stirling. In science, as with archaeology, the role of the Society and its *Transactions* was changing from gathering to diffusing information. Morris's lecture on glaciation (mentioned above) was not uncontroversial - perhaps particularly when he said that there had been many 'ice ages' in the past and there would be more in the future (Morris, 1894, 92-107). Though he only touched on the causes, he did outline the evidence from Greenland, the Alps and the US;. Locally, he highlighted observable examples, glacial erratics (rocks marked by moving ice),

and moraines: features which many of his audience would be familiar with. But he was mainly summarising work by others.

'Outreach' also included 'public lectures' open to all (if for a fee). This was, expressly, to encourage interest in the society and its aims. Cooper's 1911 public lecture aimed at stimulating restoration of the Holy Rude kirk, drew 'a large audience' (*Transactions* 34, 6-7).

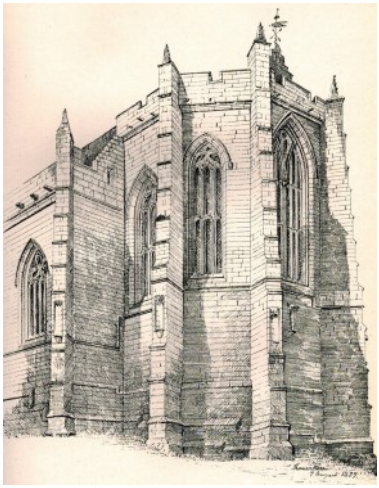


Figure 5. Technology and cost limited use of illustrations; this drawing accompanied Ross's paper on restoration of the Holy Rude Kirk (*Transactions,* 34, App) (Author's Collection).

In the early years, most talks were by members or local gentlemen. But these had often consulted outside specialists; the members were not working in a vacuum, isolated from and ignored by the scholarly world. Stirling and Kidston consulted authorities on mosses, willows, roses and other groups (*Transactions* 18, 138).

Questions about the authorship of a book mentioned in the early burgh records were resolved after consulting Professor Hastie, at Glasgow University (*Transactions,* 23, 21-3). But there was an increasing reliance on external speakers, even where local topics were concerned. Joseph Anderson, who described the discovery of two cists at Doune in 1903, was the first staff member of a national institution to address the society(Anderson, 1903, 89-92). In 1912 there was a paper about Tullibody Bridge by staff from the newly-established Royal Commission (RCAHMS, 1912, p. 86-90).

Amongst many later professionals (in 1938) was ogham expert Professor MacAlister of Dublin University on the Greenloaning Stone (*Transactions,* 20, 2; Cook, 1907 b, 5-25; MacAlister, 1938,114-5). A talk by a curator from the Kelvingrove Museum, Glasgow, was illustrated by objects from the Smith Institute collections (Bryden, 1922, 9; PD193/2 p. 93) The following season the Director of the Royal Scottish Museum, spoke on the development of common household requisites, using numerous lantern slides (*Transactions,* 46, 43; SCA PD193/2 p. 98). For such speakers, the local examples were mainly illustrations of wider patterns.

Initially, meetings were held at the Smith Institute and, though practical matters forced moves to other venues, the close

relationship continued. All three directors of the Institute were on the committee and gave papers (*Transactions,* 12, 98; *Transactions,* 27, 5). As collecting lapsed, the society's collections were formally handed over to the Institute (*Transactions* 21 p. 79). whilst members also made private donations; Leon Platt (member and contributor to the *Transactions*) made substantial bequests of paintings, artefacts and books to the Institute and library, albeit not all could be accepted due to the disruption of the war (Stirling Libraries, 2002, 50; Dolman, 2004, 9). Meanwhile, several members published books drawing on work which had first appeared in the *Transactions* whilst the *Transactions* themselves formed a growing body of local evidence. One such book (Ronald, 1899) had a print run of 500 and a subscription list including many members of the society but also people from Scotland (some very well-known), England, the US and Canada.

Other members had similarly resonant publications (eg Small, 1897; Miller, 1931) negating any image of the society as narrowly parochial. There were also links with other groups such as a joint outing to North Queensferry with the Kirkcaldy society (*Transactions,* 12, 90). Conversely, the Stirling society hosted visits by groups from elsewhere (*Transactions,* 5, 100-107). In 1892-3, they raised the conservation of Stirling Castle with the local MP, the War Department, the Society of Antiquaries of Scotland and the Glasgow Archaeological Society (*Transactions*, 15, 2) . In 1900 they consulted eight analogous societies about printing costs (SCA, PD193/4, 9th May 1900). Reliant though they were on 'snail mail' these groups were able to maintain links.

Excursions

Excursions provided opportunities to collect, record and learn in an informal, sociable setting; reports on them were amongst the formal purposes of the group, as conceived by Croall. In the early years, destinations and travel arrangements were announced at the meetings, interested parties (mixed) met at the railway station or tram stop. In 1880 a group visited the Roman Camp at Ardoch and other sites around Braco; later that year, the Society heard a lecture about the Camp by the day's guide, Rev Mr McIntyre (*Transactions*, 2, 91-3). Excursions were sometimes surprisingly energetic; in 1883 the party took the train to Alva, had a long walk in Alva Glen, 'botanising' and then walked via Menstrie, to Causewayhead station for the return (*Transactions*, 5, 98-107). After Croall's death - with the loss of his personal impetus, logistical issues and the weather all as possible reasons - outings were more often more private ventures, individual or small groups. In 1898, the president noted the lessened activity in collection and natural history whilst

recognising that the collections were now an important resource, the basis for future work (*Transactions*, 21, 8-27).

In 1906 Moyes recalled the early botanical rambles as events of the past (*Transactions,* 28, 7). When Alexander Gentleman died in 1931-2, he was noted as 'one of the now diminished band of enthusiastic botanists who kept the Natural History side of our work going for so many years' (*Transactions,* 54, 5-6). By that time, the outings were sparse, 'rambles' with no formal recording role, albeit sites of interest were visited.

Discussion

The society faced many issues familiar to comparable groups today: inactive members, being dominated by middle-class men, parochialism, a descent towards genteel entertainment. But Kidston's last lecture in 1922 was on the fossil plants of the Rhynie cherts, the work which sealed his reputation. He used slides prepared for his Report to the Royal Society. This was serious, contemporary science. and Kidston clearly did not think it a waste of time (Kidston, 1922, 10-11). That said, Croall's idea of widespread active participation was probably never realistic - finance, time, aptitude and self-confidence would always limit members' contributions.

Paradoxically, the better-informed would be the more aware of the challenge of professionalisation. New forms of entertainment and new methods of learning also posed a challenge. Even before the advent of cinema (later of radio) there was a wide diversity of popular science publications. Here, the society scored well, often with topics which had nothing to do with local studies. The first of the Gilchrist lectures (on Electricity in October 1885) was the first event to be illustrated by lantern slides (*Stirling Journal*, 9 Oct 1885, p. 4e); but soon this technology was common, if not routine. Prof. Aikman was a member, a professional microbiologist and author of several popular science books; he used lantern slides for his 1897 talk on bacteriology (Aikman, *1897,* 51-55; *Transactions,* 26, 6). S

Speakers such as Ball were serious researchers but also celebrity popularisers of science in a tradition which goes back to Humphrey Davy and forward to Attenborough and Cox. In the case of the archaeologists and historians from the major institutions, the Society performed a vital mediating role in providing a platform. Nor would it be fair to see Croall's vision being replaced entirely by passive audiences, dazzled by 'new technology' and charismatic external speakers, though perhaps the former mode - the *conversazione,* specimens on the table or drawings pinned to the walls - was more conducive to discussion? And local researches

continued throughout. For example, the society as a group researched the history and natural history of the Kings Park, the papers continuing to be cited by modern authors (*Transactions,* 26, 6; Cook, 1907a, 110-136; Sword, 1908, 123-152; Moyes, 1908, 152-176; Sexton, 2014; Digney and Jones, 2013). Much of the research was conducted independently but the *Transactions* made (and still make) the work available to others.

In some areas, the society undertook something of the role of a Civic Trust, arguing for recording and preservation of historical remains. Occasionally, too, either the society or individual members argued for conservation of wild life. .As the members became less active in research, speakers were more often outside specialists or presented general overviews of work by others, surely an entirely valid exercise whether the topic was scientific or historical. Occasionally, speakers were directly challenged for lack of rigour. When Shirra argued in favour of the tradition that the Old Bridge of Stirling had been at Kildean, Cook told him sharply that history 'was not founded upon tradition but upon record and, in this case, record contradicted tradition' (*Transactions,* 30, 63). Later Morris came close to telling Rev Frederick Smith that he was talking nonsense in claiming stones as Palaeolithic solely on the evidence of their distribution (*Transactions*, 21, 75-6).

Inevitably, there were gaps with nothing about farming, for example, though the 1920s saw several papers on more modern changes, including Muirhead's papers on Volunteering and on the town's gas supply and others on the changing patterns of local businesses, perhaps representing a gentle rejection of Campbell's mourning of the superseding of the family carriages of landed families by the 'democratical' motor car (Campbell, 1924; Muirhead, 1924; Muirhead, 1926 Ballantine, 1927 & 1928). Galbraith's 'Recollections' of life in Stirling over the previous 60 years or so (Galbraith, 1893-4) make one wish there were more such retrospects. The failure to record Stirling's archaeological sites and ancient houses before they were demolished has already been regretted but is, clearly, a reflection of the times and of the interests of the members. The great success was the creation of a body of published work still available today, illustrative not just of the history, wild life and geology of the area at the time but also of the running of a small local group of enthusiasts, over a period of some 60 years.

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PATHFOOT: THE LOST VILLAGE OF SHOEMAKERS

Steven Black

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Summary

During July and August 2016, Northlight Heritage undertook archaeological works on behalf of Cala Homes (West) Ltd. in response to a planning condition by Stirling Council, in advance of a housing development at Sheriffmuir Road, Bridge of Allan. It was thought the site could lie on or near the former and now lost village of Pathfoot. Immediately north of the new housing sits an upstanding building named Blawlowan, which once formed part of Pathfoot. It had variously been used as an inn as well as being involved directly in the tanning of leather and shoe making. The archaeological remains uncovered included a possible stable or pathway associated with the inn at Blawlowan along with a circular stone and clay lined pit that would have been located to the rear of a row of houses within the former village. This pit was associated with leather working, however, rather than being part of the tanning process it seems more probable it related to one of the tasks undertaken by the currier e.g. dressing, finishing, colouring or, perhaps, most likely, liming. Through examination of documentary records it was also possible to gain an insight into the expansion of Airthrey Estate and the subsequent demise of Pathfoot village.

Introduction

Pathfoot village, once a small but busy community on the eastern edge of Bridge of Allan, had become lost other than one surviving building called 'Blawlowan' (Figure 1) and a few historical references. An archaeological excavation, undertaken in July and August 2016 as part of a new housing development, revealed the remains of a stone lined pit along with a series of field boundaries, a dry stone wall and a cobbled surface (Black 2016). Several artefacts were also recovered including glass, pottery, iron tools, wood and leather. This, along with historical research, has helped confirm the location of Pathfoot village and has suggested that the inhabitants were primarily involved in the production of leather required to make shoes.

Figure 1: Blawlowan House with development site in the foreground.

The area of new housing was located at approximately NGR: NS 8048 9695 (Figure 2) on the eastern side of Bridge of Allan, Stirling immediately to the north-west of the University of Stirling campus. It comprised a small relatively flat green field previously used as a pasture for horses (Figure 1). Roy's 1747-55 Military Survey of Scotland (Figure 3), Stobie's map of 1783 (Figure 4) and Grassom's map of 1817 (Figure 5) suggest the village of Pathfoot sat partially within the area of new housing although the majority of it was slightly further to the East beneath what is now Pendrich Way and the University of Stirling Campus (Figure 2).

The Village of Pathfoot

The earliest maps depicting the village are General William Roy's Military Survey of Scotland (1747-1752) (Figure 3) and Stobie's map (1775-1804). The latter shows Pathfoot located on the crossroads between Sheriffmuir Road and New Road (Figure 4).

Figure 2: Location Map.

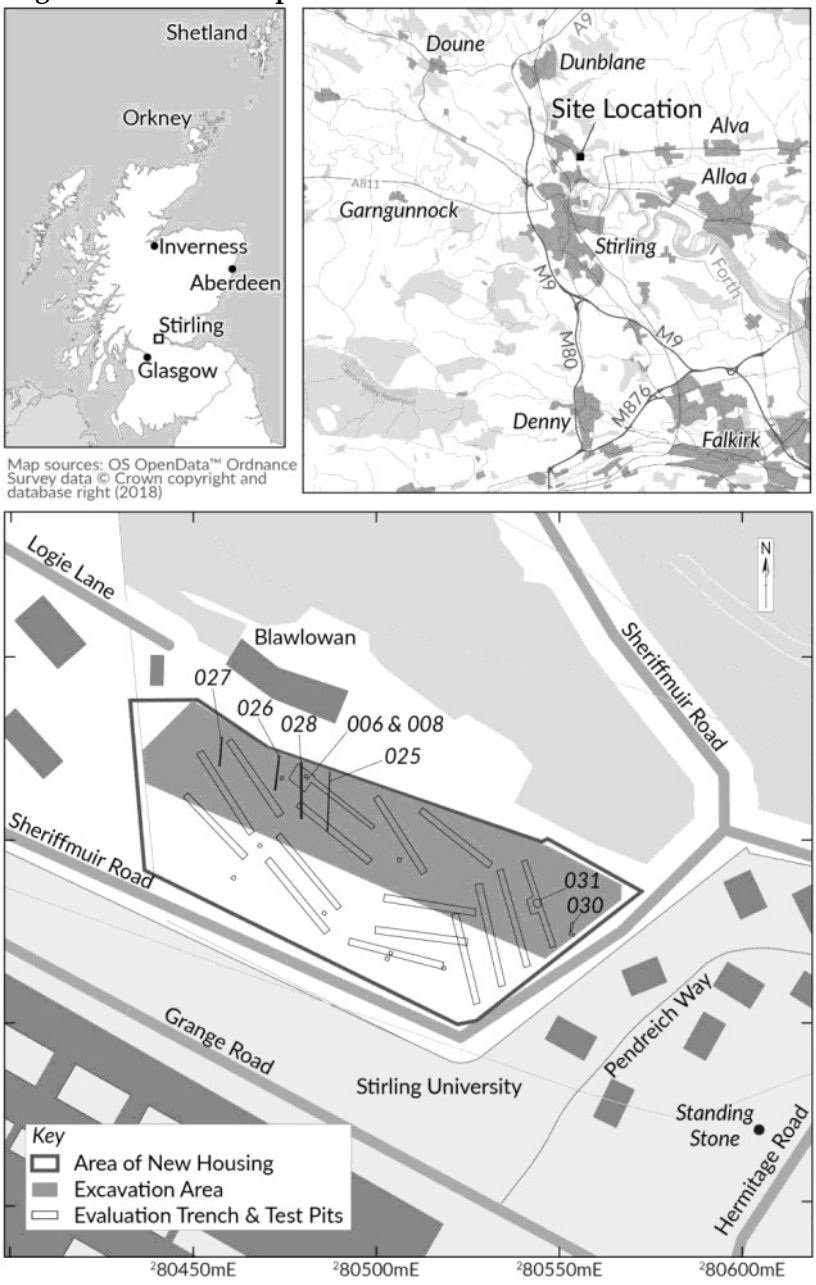

Figure 3: William Roy's Military Survey of Scotland (1747-55) showing the village of Pathfoot,

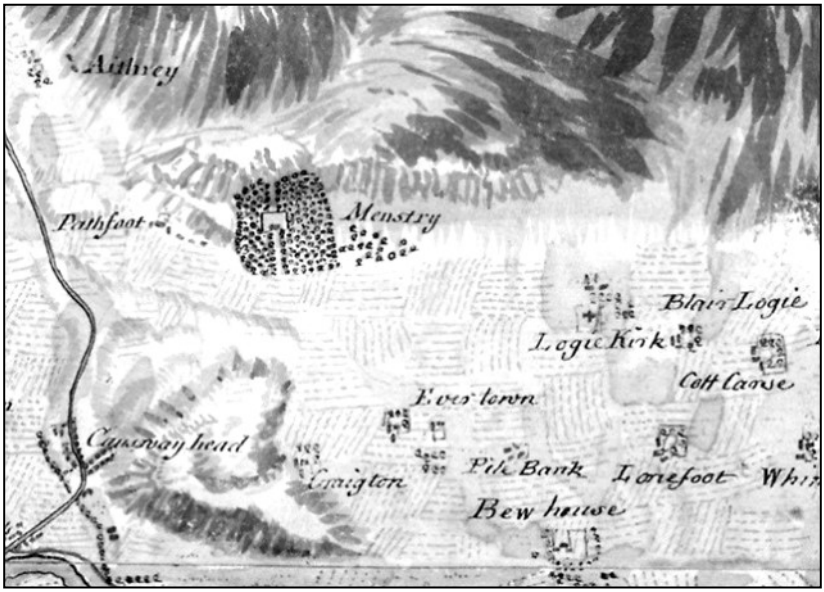

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Figure 4: Map of 'The County of Perth & Clackmannan', SW section (1775-1804) by James Stobie showing Pathfoot

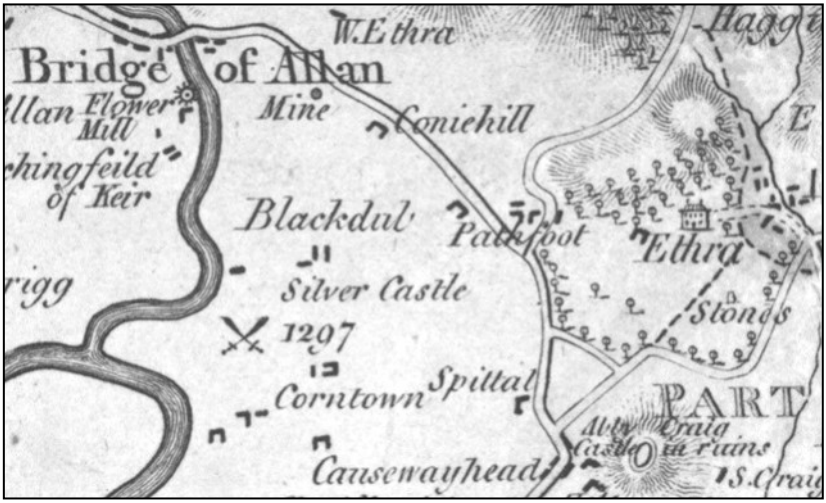

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Figure 5: Map 'To the Noblemen & Gentlemen of the County of Stirling' (1817-1819) by John Grassom showing the village of Pathfoot and surrounding area.

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However, it is clear that Pathfoot (or Pathfoot of Airthrey as it was sometimes known) existed some time prior to the mid 18th century as it appears in parish records from 1663, where the marriage of *'Jeonet Hendersone spouse to Walter Tower in Pathfoot'* is noted (Steven Robb pers. comm).

The only current upstanding remains associated with the village are that of Blawlowan, a listed category B building (LB22622), which would have been located on the very north-western edge of the village, separated from it by a small burn. Although this building has undergone a number of renovations and alterations the original part contains a lintel embossed with the 1731. Prior to this date the house was a small thatched one storey building but it was extended and renovated in 1731, including the introduction of window glass. The name Blawlowan appears to originate roughly from this time, appearing within historical documents in 1753 as '*Blaloun*' (*Bryce Family Manuscripts 1888*).

The Bryce family were associated with Pathfoot, particular Blawlowan, for over 200 years, initially being tenants at Blawlowan and latterly being portioners or feuars:

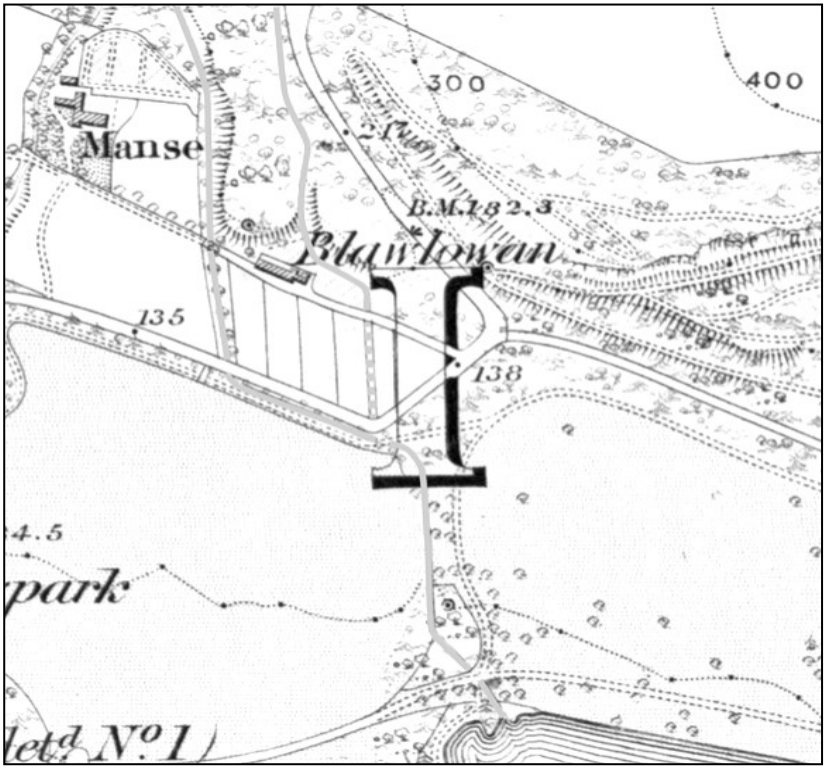
> *'James Bryce, the first portioner, who obtained a Fen Charter from John Dundas of Manor, on 1730, was a cordiner, or shoemaker and tanner at Pathfoot, and a tenant of certain lands there.'* (Ferguson 1905)

Figure 6: Gravestone of Margaret Clasone, spouse of James Bryce (courtesy of Joe Young)

The elaborate gravestone of Margaret Clasone, spouse of James Bryce, dated 1717, shows testimony to the wealth and importance of the Bryce family. Adorned with the detail of an open Bible with the text '*Blessed are the pure in heart*', this gravestone reportedly took over a year to produce.

Immediately East of Blawlowan the 20th century walled garden was subject to an archaeological evaluation in 2012 (Paton 2012). This uncovered a probable post-medieval linear feature which was broadly in the position of a burn noted on Ordnance Survey 6 inch to the mile map, surveyed in 1861 and published in 1865 (Figure 7), where it is shown feeding the man-made loch on Airthrey Estate.

Figure 7: Extract of 1st Edition Ordnance Survey 6 inch to the mile map, Sheet X, Surveyed 1861, Published 1865 highlighting the local burns feeding Airthrey Estate Loch.



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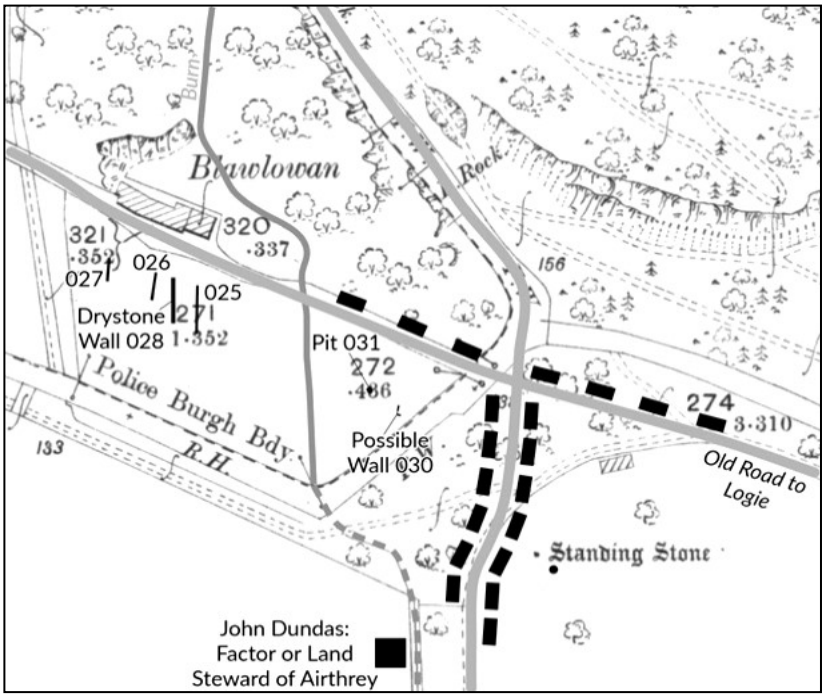
The Bryce Family Manuscripts describe the layout of Pathfoot village in the 19th century, although the specific date is not known. Figure eight shows the location of the houses within the village as interpreted from the description on page three of the manuscript. This is notably different to that shown on the 1769 'Plan of Airthrey Roads' (Figure 9) which only depicts ten houses. If there is any accuracy to these layouts it suggests the village increased in size over a period of time.

Figure 8: Layout of village as interpreted from the Bryce Family Manuscripts text, including location of linear stone feature (025, 026 & 027), overlain on an extract of the Ordnance Survey 2nd edition 25 inch to the mile map, Sheet X.12, Revised 1896, Published 1898.4



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The Bryce Family Manuscripts (*1888*) describes a village consisting of approximately 20 cottages, one larger house to the south-west (the only one in the village other than Blawlowan to have window glass) and Blawlowan itself. Seventeen of the houses are inhabited by shoemakers while other inhabitants include:

Walter Toward, or Towar, and his wife Janet Henderson, whose

testament was recorded in 1663. His son Walter Toward was Church Officer for Logie Kirk. He was married to Isobel Rob.

Alexander Henderson a carpenter in the latter 18th century.

Patrick Ogilvie (1722-1784), blacksmith.

Daniel Ross, an exciseman who married Mary Blackstock (d.1765) in 1753 at Edinburgh's Canongate.

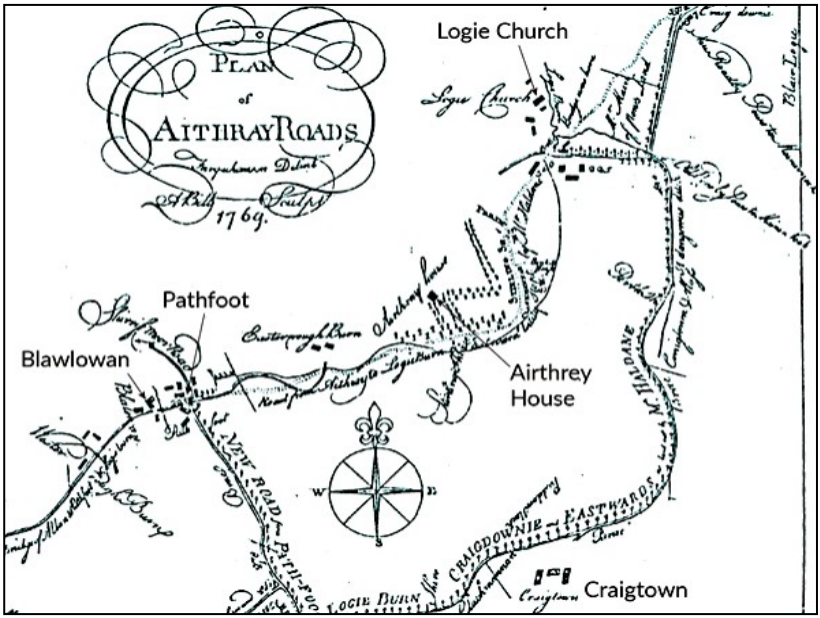
Rev. Hugh James Cheyne, 1759-1785, Stirling's Episcopal minister.

John Dundas of Manour (1701-1788), Laird of Airthrey, afterwards the Factor or Land Steward of Airthrey Estates.

Croall family, cart and plough weights, latter Coach Proprietors and Mail Coach Contractors in Edinburgh.

(Steven Robb pers. comm & *Bryce Family Manuscripts 1888*)

Figure 9: Extract of Farquharson's Plan of Airthrey Roads 1769 as printed in Mackay KJH & Angus D, 1984-85, p82.



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Demise of the Village

Pathfoot of Airthrey formed part of Airthrey Estate which was purchased by Robert Haldane in 1759 from John Dundas of Manor, the Laird of Airthrey (Ferguson, 1905). Initially, the Airthrey Policies were relatively small but Haldane soon set about expanding them. By repositioning existing roads, creating a man made loch and constructing an enclosure for the annual Fair on the East side of the village (which contained the Great Standing Stone) he vastly improved the estate's size and prowess. This did not go down well with the local inhabitants and, in 1760, Pathfoot was at the centre of a local dispute. The principal objection was the closure of the eastern route out of the village which took the residents to and from Logie Kirk. Haldane did not appreciate the locals passing directly through his estate on the way to the Kirk and had set about creating a new route to the south. By 1767 the old route through the estate had been 'officially' closed and a new route was established, forcing the locals south through Craigtoun. The Pathfoot residents were furious and continued to use the old route through the grounds of Airthrey House (Craig Mair pers. comm).

A burn supplying the estate loch flowed through the village of Pathfoot (see above and Figures 7 & 8) and served as their main supply of water for both household needs and work. Haldane often felt that the flow of water into the loch was too inadequate and so began collecting water from the hills and channelling it into the burn. This resulted in the frequent flooding of and damage to the village, with Haldane footing the repair bill (*Bryce Family Manuscripts 1888*). In addition, when the flow of water was too slow, the villagers argued that, rather than feed the loch, the priority should be to feed the village. Without a constant supply of water their businesses and, more importantly, their health would suffer (Craig Mair pers. comm). Robert Haldane died at the end of 1767, perhaps not helped by the stress of the aforementioned events.

Ownership of the estate was handed to Roberts's nephew, Captain James Haldane, who died the following year. The estate was then inherited by his son, Robert Haldane, who quickly set about furthering estate improvements. Once again, this included the construction of a large boundary wall. He demolished the existing Airthrey House and built a new mansion, designed by Robert Adam, one of the leading architects of the time. In 1798, having been overtaken by religious fervour, Haldane sold his estate to a distant relation, Sir Robert Abercromby, and became a missionary in Bengal

(*http://landedfamilies.blogspot.com/2013/02/abercromby-of-tullibody-and-airthrey.html*).

General Sir Robert Abercromby (1740-1827) held a number of high ranking positions during his lifetime; being a respected General in the British Army, commander-in-chief in India (1793), Governor of Edinburgh Castle and MP for Clackmannanshire between 1798 and 1802 (ibid). In line with previous estate owners he immediately began 'improving' the estate. He expanded by buying neighbouring farms but also sought to suppress the villages of Logie, Pathfoot and Pendreich. He succeeded in removing the majority of Logie around the Kirk as well as nearly all of Pathfoot and Pendreich, with many of the families resettling in Blairlogie and Causewayhead. One exception was an old lady in Logie who could not be persuaded to move.

At last it seemed as if she had become amenable to reason, and, on the promise of a site wherever she wished on any other part of the estate, Sir Robert was rather surprised to hear her demand that her new cottage should be in front of Airthrey Castle. Such an arrangement being impossible, she was allowed to live out her days in the old house.' (Menzies 1905).

Thus the village of Pathfoot ceased to be. A once busy village had vanished. The mixture of turf-built, pre-improvement structures and, latterly, those of stone and lime (Steven Robb pers. comm) were all demolished. The annual Horse and Cattle Fair of Pathfoot was cancelled and moved to Stenhousemuir (Craig Mair pers. comm). All that survived were the two larger houses: that which stood beside Darey's Gate, at the West end of the road leading to Logie, which was kept and turned into a gate-keepers house and Blawlowan, the house owned by the Bryce family (*Bryce Manuscripts 1888*). No matter what Abercromby offered for possession of Blawlowan, the Bryce family refused to sell (ibid: 5).

The Archaeological Excavation

The archaeological work, undertaken during 2016 in advance of the new housing development, provided an opportunity to ascertain if any sub-surface remains existed on the site, particularly those that related to the former village. In the following paragraphs numbers in round brackets represent unique contexts issued to deposits while those in square brackets relate to features or structures. Interpretation of the features uncovered is provided in the discussion. In addition to the topsoil, the vast majority of archaeological features across the site were covered in some 0.2 m to 0.3 m of silt/sand subsoil (002).

Wall 028 & Stone layers 006 & 008

Running north to south, 15.5 m from the northern edge of the excavation area, were the lower courses of a relatively well constructed dry stone wall [028]. It existed to approximately 0.6 m in width, 0.4 m in depth and was constructed from flat angular stones (Figures 10 & 11). No clear construction cut was visible although the wall sat within firmly compacted silty clay (009).

Figure 10: Dry stone wall [028], see Figure 2 for location.

Immediately to the East of this lay an 0.3 m deep deposit of cobbles (006) covering an irregularly shaped area 6.2 m North to South by up to 3 m East to West (Figure 11). Despite the western edge being ill defined, there was a clear 0.1 m to 0.2 m gap between the stone layer and adjacent wall. Subsoil (002) formed the matrix between the cobbles while it also lay above and to the side of them. This stone layer (006) lay partially on top of a tightly compacted cobbled surface up to 0.14 m in depth (008, Figure 11) which in turn lay on top of grey brown silty clay subsoil (009). The northern extent of the cobbled surface was not traced although the southern end was partially located (Figure 11). Where excavated, the cobbled surface existed to 1.6 m in width and appeared to run parallel with wall [028].

Linear Stone Features 025, 026 & 027

To both the East and West of stone deposit (006), and running north to south for approximately 16.5 m and 9.5 m respectively, were two other linear stone features (025 & 028, Figures 2 & 8). The one to the East (025) consisted of a single row of large rounded stones up to 0.4 m in size while that to the West (026) was similarly composed of relatively loose rounded stone up to 0.3 m in size (Figure 12). Like the majority of other archaeological features uncovered they did not sit immediately below the topsoil but sat deeper, within and beneath approximately 0.2 m of subsoil (002).

Figure 11: Plan of dry stone wall [028] & stone layers (006 & 008), see Figure 2 for location.

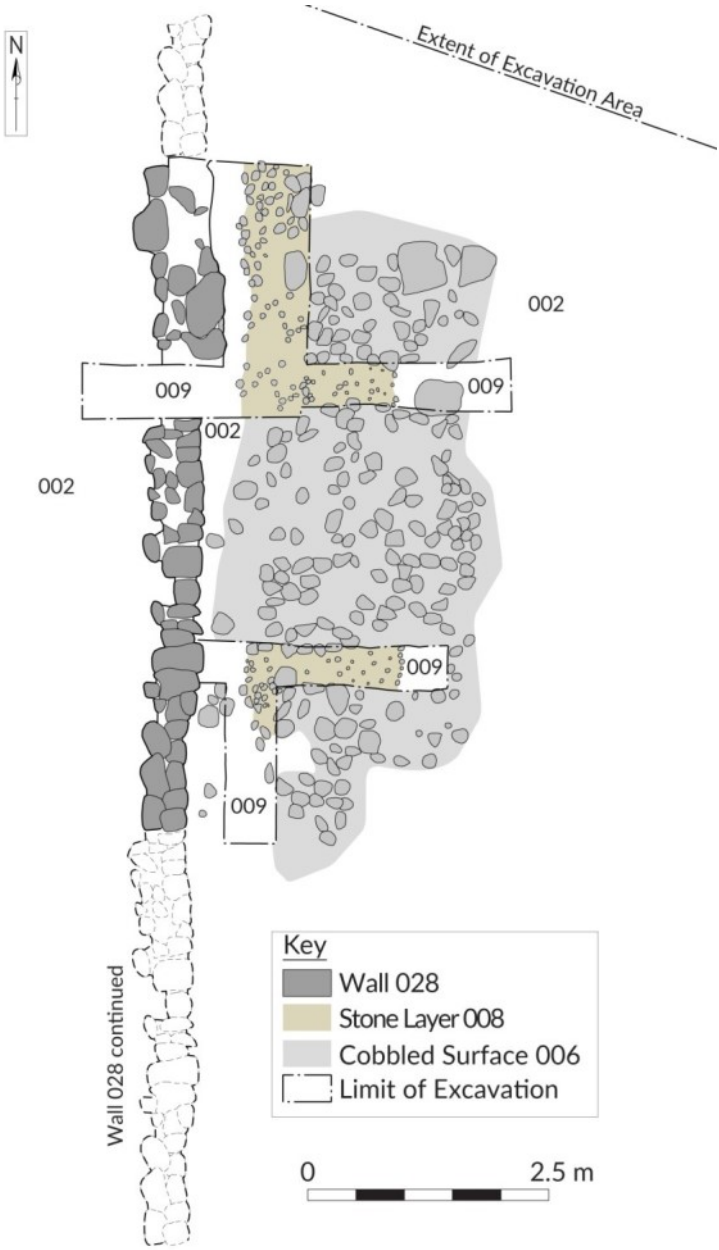


Figure 12: Linear stone feature (026), see Figure 2 for location.

An additional, although more ephemeral, linear feature (027) on the same orientation was traced for some 8 m to the west of (026), however, it appeared to have been heavily truncated and was not continuous. Within two small areas where there was better preservation it comprised loose rounded stones up to 0.1 m in size. Far more roots were present within the subsoil here when compared to that lying around the linear features to the east.

Stone Lined Pit 033]

A roughly circular shaped stone defined feature [033] was found in the north-eastern corner of the site (Figures 2 & 8). Excavation showed it to be a well preserved stone and clay lined pit with a slabbed base (Figure 13).

The construction cut for pit [031] measured 2.55 m in diameter at the top, had very steep, slightly uneven but relatively straight sides down to a flat, 1.3 m wide, base (Figure 14). Overall it measured 1.44 m in depth. The sides and base had initially been lined with firmly compacted dark brown/grey clay (032). A layer of large sub-angular stones [033], up to 0.2 m in size and within dark brown/grey clay matrix (034), had then formed the sides of the pit while the base comprised a secondary deposit of clay (036) on top of which sat a layer of large flagstones [037] which did not appear to be incorporated into the walls.

On the south-eastern side of the pit two large flat stones protruded from the upper edge of stone lining [033] which appeared to form steps (Figure 13). The cut [031] had been widened for the upper-most step allowing a greater volume of stone to be placed on top of it, securing it in place.

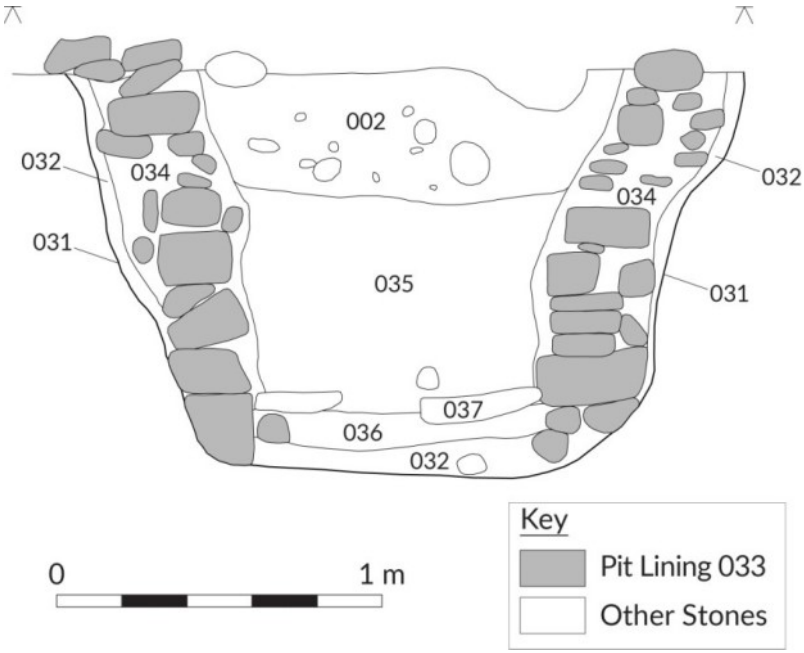
Figure 13: Stone lined pit [031] during excavation, see Figure 2 for location.

Despite its depth, the pit only contained two fills. The lower fill comprised a dark brown clay (035) up to 0.75 m deep (Figure 14) which contained a variety of artefacts including glass, pottery, fragments of leather, wood, a nail and a possible iron blade or scraper (see below). The upper portions of the pit were filled with the subsoil (002) that covered the majority of the archaeology in the area.

Possible Wall 030

On the south-eastern edge of the site a very ephemeral wall [030] was uncovered (Figure 2 & 8). In contrast to the other archaeology it lay beneath the topsoil and comprised a linear arrangement of loose stones one course in depth and 0.40 m in width. It ran for 4 m in a north-north-east to south-south-west direction before turning at 90 degrees and continuing to the east-south-east for a further 1 m to the edge of the trench. The stones lay on top of dark clay (029) which covered an area 4 m by 0.40 m, was up to 0.50 m deep and lay on top of subsoil (002).

Figure 14: Section through stone lined pit [031].



The Artefacts

Glass, Robin Murdoch

A total of 50 shards were recovered of which 32 were window glass. The window glass was divided into nine different types based on physical appearance, colour etc. (Table 1). One sample of each type was selected for analysis by pXRF. From these results the glass type for each shard was established which allowed an approximate date to be assigned using the dating model in Dungworth & Girbal (2011). This model does not include the H/K variety simply because they found no provenanced examples on which to suggest a date range. The H/K type (a high lime, low alkali with at least some kelp in it) turns up regularly on Scottish sites and there are also in-situ examples at Traquair House, by Innerleithen, in wings constructed during the 1690s. This has led to the current apportioning of a date range c1650-1700. The date range for the kelp fluxed glass is quite wide at 1700-1835, however, the examples reported on here, particularly the pale blue shards (type H) which were the most numerous, are most likely 18th century, . This colour is common on mid to late 18th century sites.

Table 1: Window Glass Interpretation. Note: In the case of more than one shard the context listed relates to the tested sample. H/K, glass made using a mix of land based plant ash and seaweed ash. Kelp, glass made using only seaweed ash as the fluxing alkali.

Sample	Context	Description	Total No.	Type	Date
A	002	Central bullseye, pale bluish green	2	Kelp	c1700-1835
B	002	Crown edge, pale blue green	4	Kelp	c1700-1835
C	002	Pale dull green	2	H/K	c1650-1700
D	005	Dark green	1	H/K	c1650-1700
E	035	Pale dull green	5	H/K	c1650-1700
F	007	Pale green	1	H/K	c1650-1700
G	007	Pale green, crown edge	1	Kelp	c1700-1835
H	019	Pale blue, firebright	15	Kelp	c1700-1835
I	016	Pale greenish blue	1	Kelp	c1700-1835

Given that historical records suggest that none of the standard village houses had any window glass (*Bryce Family Manuscripts 1888*) the majority recovered will have related to one of two buildings: either that of Blawlowan or a house on the southern edge of the village once occupied by John Dundas of Manour (Figure 8). As noted above, window glass appears to have been introduced to Blawlowan during renovations in 1731, suggesting any earlier glass, dated to 1650 – 1700, is unlikely to have originated from Blawlowan but could have either belonged to the house later owned by John Dundas or an earlier house of some status of which nothing is currently known. The later glass, which dated to the 18th century, is likely to be associated with Blawlowan or John Dundas' residence. There was nothing unusual about the bottle glass other than perhaps the lack of it, given more would be expected close to the site of a former inn.

The remainder of the assemblage largely comprised fragments of wine or ale bottles, the two being very similar and almost impossible to differentiate. One possible exception was a badly fire-distorted grey shard from subsoil (002) which could be from a drinking glass. However, this was too badly distorted to be certain.

Only one sizeable bottle base survived which was also recovered from subsoil (002). It seemed to have come from a squat cylindrical or mallet shaped bottle although the formation of the kick was very unusual. It was very deep and would have appeared normal were it not for it terminating in a recess of rounded square profile. There is every chance that this represents a low countries' import, possibly French or Belgian, dating to the middle of the 18th century. Two body shards, similarly from (002), are also from the mid 18th century.

The condition of the glass differed to some extent suggesting a variety of buried conditions. Alkaline (i.e. the presence of lime mortar) is the most corrosive of environments for glass while neutral or acidic conditions will have little effect. Evidence of corrosion may indicate local lime mortared structures or possibly limestone geology.

Pottery, George Haggarty

The pottery recovered comprised a relatively standard Scottish post-medieval and industrial ceramic assemblage, where most of the contexts contained shards of post-medieval oxidised or reduced ware. Unfortunately, this industry has a long date range with evidence now suggesting it started sometime in the late 15th and continued, at least in the Forth littoral, into the third quarter of the 18th century or possibly later. This late date comes from a large assemblage of similar pottery excavated at Wester Steading, Dalmeny (Mudie 2013).

Reduced ware shards are generally from large green glazed jugs, with multiple wavy grooving on the shoulder, while oxidised shards are normally from a range of much smaller vessels including jugs, skillets, flanged bowls, drug pots, etc., although these forms can be extremely hard to identify from single body shards.

The majority of the assemblage dated from the second half of the 18th or the very early years of the 19th century, however, a single shard from an abraded medieval rod handle was recovered from (002) which possibly dates to the late 14th century. There were also a few residual late 17th century imported shards, such as one from a common Frechen stoneware bottle and a basal angle from a three handled Staffordshire tyg, both being recovered from (002). Some late 17th century Scottish post-medieval oxidised shards were recovered from the topsoil, (014) and (035) while the latest material is likely to be three shards from (002) which almost certainly date from the second quarter of the 19th century.

Two shards from a scratch blue cup and saucer (one being from subsoil (002) and the other being unstratified); a single shard of unstratified Chinese Imari porcelain and the previously mentioned very rare (in Scotland) shard from a Staffordshire three handled tyg, might suggest a bit of status, although none of the creamware, pearlware or late redware shards aided interpretation as these wares were produced by most potteries.

All of the pottery is what one would expect from a small rural community. Slightly surprising was the relatively small quantity found given the size and duration of the village. The Staffordshire three handled tyg (a large English ceramic mug with three or more handles) presumably belonged to one of the wealthier households in the village, that of Blawlowan or John Dundas (or whomever lived here prior to him).

The evidence for earlier occupation is very slight but the presence of the late 14th century shard could indicate activity on the site prior to the village of Pathfoot.

Wood, Susan Ramsay

A series of preserved wood fragments were indentified from samples of the lower fill (035) of the stone lined pit [033]. These small fragments comprised *Pinus sylvestris* type (Scots pine type), *Corylus cf avellana* (hazel), *Salix* sp (willow) and *Quercus* sp (oak). Some of the Scots Pine type were 'lath-like' thin pieces.

Although this material came from a pit possibly associated with the production of leather from hides, it is unlikely that this wood was being used for the tanning process itself as little or no bark was present. Bark, particularly from oak, contained the tannins used in the tanning process. If related to the use of the pit, the wood is more likely to have formed a structure or lining for one of the many other processes involved in the treatment of the hides.

Leather, Clare Thomas

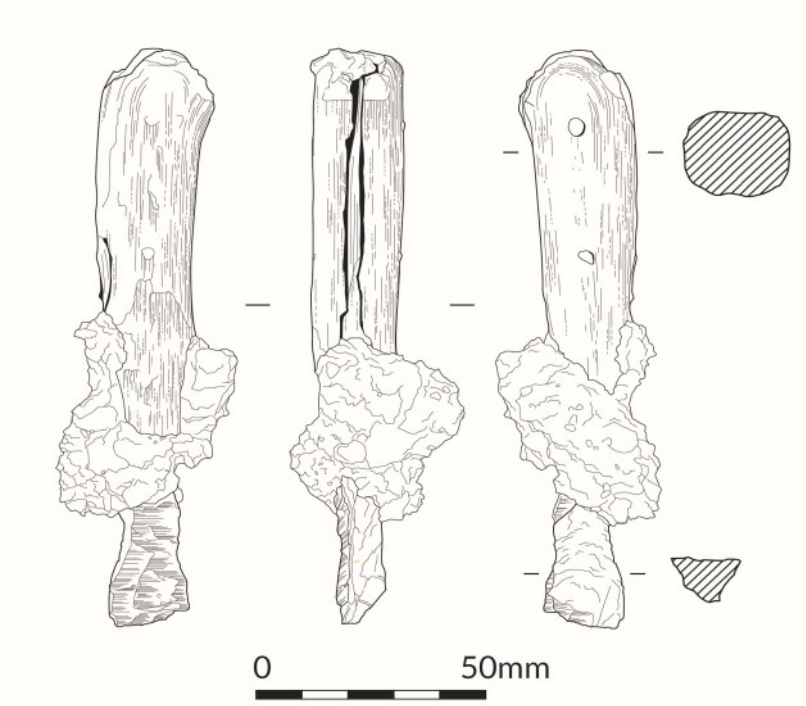
In total five fragments of leather were recovered from the clay fill (035) of the stone lined pit. These ranged in size from 0.16 m to 0.95 m in size and were in relatively poor condition. Only one of these fragments was possibly identifiable. The larger fragment appears to show signs of possible stitching and, given its location and the historical background of the site, may be the remains of an upper part of a leather shoe.

Metal, Steven Black & Margrethe Felter

In total, ten metal objects were recovered. These included six iron nails, two pieces of thin iron sheet as well as two knifes/tools (one with bone handle intact). The remains of a metal tool with a bone handle (Figure 15) was recovered from the general subsoil which covered the entire site (002). Although in relatively good condition and tentatively resembling the handle of a rounding knife (Bennett 1920) the metal end had been broken off making it impossible to be certain whether this was a broken off blade or a blunt tool. It has a scale tang where the handle (or scale) is in two separate parts held together by two rivets (Figure 15).

The blade of a knife with no remaining handle was recovered from within the clay fill (035) of the stone lined pit [031]. This blade was a whittle tang, where the blade has a spike like portion hidden inside the handle. The precise function of both these tools is not clear as a large variety of tools and blades were used throughout the leather working process such as an unhairing knife, scudding knife, flashing knife and rounding knife to name a few (ibid).

Figure 15: Bone handled tool from (002).



Button, Margrethe Felter

A probable bone button was recovered from the subsoil which covered the entire site (002). This button was stained green by contact with copper alloy and is likely to be the inlay from a composite button originally of copper alloy with the bone inlaid into the upper surface. This would explain the thinness of the bone and the lip running around the edge (Felter 2017: 4).

The Leatherworking process

To further our understanding of what activities might have been undertaken in Pathfoot as part of leatherworking and shoe making, the general leatherworking process is considered below. Leatherworking and shoemaking was well regulated in the 17th and 18th centuries with everybody involved having their individual role. Early guild regulations meant that butchers were not allowed to be tanners, tanners could not be curriers and curriers were not allowed to make shoes (Cameron 1998). Furthermore, there was also a distinction between shoe makers and cobblers; the shoe makers (or cordwainers) having had a separate guild since the 1100's. The main distinction between a cordwainer and a cobbler is that cordwainers were only permitted to use new leather to create shoes while cobblers could only use scraps of leather to either repair or refurbish existing shoes (http://www.thehcc.org/backgrnd.htm).

Once the animal had been skinned by a butcher, the initial stage of the leather making process was to remove the appendages still attached, such as hooves and horns. The hide would then be washed to free it any blood and dung, something normally undertaken in a nearby river or burn. The putrification of the leather followed where the hides were either folded hair inwards and soaked with urine. Alternatively, they would be immersed in a suspension of lime, although this latter process was not commonly employed until the beginning of the 19th century (Thomson 1981). This liming of the hides quite often involved soaking in a wooden tub or, in the 18th century, within circular pits ranging from 4 feet to 10 feet (1.2m to 1.8m) diameter or rectangular ones from 6 feet to 10 feet (1.8m to 3m) long by 4 to 6 feet (1.2m to 1.8m) wide. These pits were often lined with timber, stone, brick or slat along with clay to keep them watertight. (ibid: 163).

After being soaked in the solution and rinsed off in the local river or stream the final process before tanning could begin was to cleanse the hide of any excess solution. The bating of the hides was one process used for this where hides were immersed in an alkaline solution converting any remaining residue into a soluble

compound, thus separating it from the skin (Watt 1906). This alkaline solution was made by mixing the dung of pigeons and fowl in water and the hides were variously left to soak for between 1 day in warmer weather (Thomson 1981) and 12 days in cooler weather (Watt 1906).

Another method for removing excess material from the hides was the raising or drenching process (or bating with barley) which was, up until the 19th century, the more common method in England (Thomson 1981). This most frequently used barley, but also rye or ash bark, soaked overnight in warm water to create something sour and mildly acidic. Tanning liquids, waste vegetables, stale beer, urine and rotting pieces of hide were added to the solution to start fermentation which created:

> *'a complex mixture of organic acids and enzymes which, again, cleaned up the hide structure and removed excess lime'* (ibid).

After washing the hide tanning could begin. This involved the hides being immersed in a solution, normally of crushed oak bark and water (Steane 1985). The hides had to be continuously moved around in the pits to ensure an even spread of colour (Cherry 1991). Once the hides had been soaked and stirred for the necessary length of time, they would be layered alternatively with ground bark, again normally oak, then the pit would be filled with a weak tanning solution (Burns 2012).

It has been suggested that it was not unusual for the hides to be left in the weak tannin solution for up to 18 months (Thomson 1981). Dare (1928-29) recalls an oath taken by tanners from Leicester stating that hides should be tanned in a pit for no less than 12 months and 1 day before being sold while discussions relating to the Leather Act of 1593 note that outer sole leather should be in the tannin pit for 12 months and slightly longer for upper sole leather (Cherry 1991).

The final process before the leather was ready to be used was undertaken by the currier. This converted the rough, uneven piece of leather produced by the tanners into something more uniform and attractive. The first task was to dampen the leather by placing it in either a tub of water or a weak solution of tannin.

> *'Sumac became an increasingly popular tanning material for this purpose during the mid-18th century and sumac tubs are mentioned in curriers wills of this period'* (Thomson 1981).

The leather was softened, often by pummelling it with large heavy wooden mallets or simply by trampling underfoot. It was then scrubbed clean using stone blocks, stiff brushes or metal tools called slickers (ibid).The curriers then trimmed down the leather to its required thickness using a peculiarly shaped shaving knife before washing the product overnight in a weak tannin solution. The hide was stretched out and dried before finally being impregnated with warm dubbing commonly made from fish oils (ibid). Depending on what the leather was to be used for, it was either hung to dry, softened or, in some cases, dyed various colours and polished.

Discussion

The area investigated in advance of the housing development lay in front of the surviving Blawlowan House to the West and South of where the other buildings of Pathfoot were located (Figure 8). It is perhaps not surprising that no evidence of the village houses were uncovered, although the archaeological remains indicate this area, in front of Blawlowan and to the rear of some smaller houses, was being used. It is well recorded that Blawlowan was used for tanwork and shoemaking whilst also being kept as an inn or public house:

> *'The village was the seat of a large shoemaking trade and besides a large number of workers at the trade who were lodgers there were seventeen houses in the village which were occupied by shoemakers, and James Bryce and his son Alexander Bryce in succession carried on a Tanwork and Shoemaking establishment at Blawlowan, besides keeping an Inn or Public house there'* (*Bryce Family Manuscripts 1888*).

Exactly when Blawlowan was an inn remains unclear although we know it was owned by James Bryce in the mid-18th century:

> *'The name Bla'lowan, spelled at first "Blaloun", first occurs in 1753 in the time of James Bryce, the great grandfather of the writer of these notes. The family tradition is that it was given to the house by a lady who, with her attendants, arrived at the Inn on a cold stormy day....because as she said it was sheltered from the cold wind.'* (ibid).

From the limited details we have it appears James Bryce married three times and had ten children, his first marriage being to Margaret Clauson in 1708. This could suggest that the inn was established sometime in the early 18th century. It would not be surprising if an Inn offering lodgings at this time also had stables and outbuildings. It seems most likely that dry stone wall [028],

cobbled surface (008) and stone pile (006) uncovered in front of Blawlowan (Figures 2 & 11) are broadly contemporary with the house and could represent some form of outbuilding. It is also possible that the gap between the cobbled surface and the wall represents some form of drainage channel, something that would not be unexpected alongside a stable block.

However, no cartographic sources prior to 1st edition OS 6 inch and 25 inch to the mile series, published in the early to mid 1860s, depict buildings accurately enough to know if stables and/or outbuildings were present to the South of the Inn. Although the 1769 estate map (Figure 9) might be expected to contain this level of detail it was heavily criticised at the time for being inaccurate. The map was produced by a surveyor, named Farquharson, who was employed to map out the estate during the dispute surrounding the closure of the old route to Logie Kirk. The resulting map was poor and skewed so much that Farquharson was taken to court where several local Pathfoot residents e.g. James Bryce Jnr. gave evidence against him (Steven Robb pers. comm).

It is also possible that the dry stone wall and cobbled surface represent a path running south from the house connecting it to the main road skirting Airthrey Estate. Similarly this does not appear on any historical maps while it did not appear in the southern half of the development area, although it could feasibly have been truncated away. The three linear stone alignments (025, 026 & 027), also uncovered in front of Blawlowan, appear to broadly correspond to the position of field boundaries on the 1st Edition OS 6 inch (Figure 7) and 25 inch to the mile map series published in the mid 1860s. There was no evidence of walls being here, it perhaps being more likely that the boundaries were hedgerows with the rough stone alignments being clearance from the narrow plots that had accumulated along the hedge bases. Although their depiction on the early OS maps shows the plots existed in the mid 19th century they may have earlier origins.

The stone lined pit [031] uncovered in the eastern part of the site was the most definitive piece of archaeological evidence uncovered for leatherworking and shoemaking at Pathfoot. The lack of oak bark within the pit suggests it did not relate to the tanning process, at least some of which is known to have taken place to the rear of Blawlowan:

> *'All and Haill that house, barn and byre, and little yard and planting about the same, at the back thereof, ane tanning poole, all presently possest by the said James Bryce himself.....'* (Ferguson 1905: 239)

In rural communities there was often crossover between activities (Cameron 1998) so it is not surprising that shoemaking (see above) and tanning was undertaken at Blawlowan alongside the Inn. The stone lined pit would have sat some distance behind the Pathfoot houses that ran North to South on the western side of current day Sheriffmuir Road (Figure 8), of which 17 of the 20 at one point belonged to shoe makers. Given the pungent nature of some liquids involved in leather making a good distance between the dwellings and the pit would have been desirable. Although distant, the pit it was close enough not to sacrifice easy access to water from the nearby stream.

Evidence of rural leatherworking is generally scarce with much more being known from an urban context (Cameron 1998). Only a few possible tannery sites have been excavated, although their function has been debated. It has been suggested that tanning pits excavated at St. Peters Street, Northampton (Cherry 1991) were misinterpreted and are more likely to be the remains of a tawing establishment, where the leather is treated by soaking in alum (Steane 1985). In addition, the tanning pits excavated at High Ousegate and Coppergate in York by George Benson in 1902/03 were widely accepted as such by modern scholars (e.g. Cherry 1991 & Steane 1985). However, more recent excavations by Hall (Mould et al 2003) has re-interpreted the features as sunken floors of 10th century buildings not related to the tanning of leather.

On balance it seems probable that that the stone lined pit excavated at the former village of Pathfoot was not used in the tanning process, this being undertaken by the Bryce family to the rear of Blawlowan. It more likely represents another process involved in the production of leather undertaken by the currier between tanning and shoemaking e.g. the liming of the hides. Overall the excavation and research undertaken during this project has provided tantalising evidence of a now lost lowland Scottish village primarily built around the leatherworking and shoe making industry and ultimately how forced change within the estate led to its demise. Local knowledge has been invaluable as a means of interpreting the archaeological evidence which would otherwise exist in relative isolation and research into their family background has enabled the identification of individuals who lived and worked in the village.

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THE COTTER IN THE KING'S PARK: OBSERVATIONS ON STIRLING'S ROYAL PARK DYKE

Murray Cook

Introduction

Examination of a section of Stirling's Royal Park dyke has revealed a change in construction and potentially an older structure built into the wall. This structure could be the 'Cotters House' as depicted on an early 19th century map, known as Bryce's 1806 Plan of Stirling Castle and Kings Land'. A second copy of this map, which appears to have gone unnoticed and which has different details to the better known copy has been located on public display in the Smith Museum. The second copy features a more accurate plan of the Kings Knott, the elaborate 17th century garden in the Royal Park.

Background

The history of the Stirling's Royal Park has been covered elsewhere (Harrison undated; Digney et al 2011; Digney and Jones 2016; Digney 2016; Brown 2017, 139-40), and it is sufficient to say that a large proportion of the park boundary follows the original 12th century boundary (Harrison, J pers comm), although clearly there will have been changes (Gilbert 1979, 82-3). This paper concerns the section of the park dyke running from Park Place to St Thomas' Well, which survives to a maximum 2.6m high (at the Douglas Terrace passage) and is the tallest of any section of the wall in Stirling. The form of the dyke is very specific and contains no formal coping, merely very substantial stones at the top. Finally, the dyke changes its scale at St Thomas' Well and shrinks to 1.5m to the west of the Homesteads.

Harrison (undated 46-7) notes that significant sums of money were spent in the 17th and late 19th century on masons and wall repairs. Although it is unclear what and where was being repaired, the current physical extent of the wall is first recorded on Adair's 1685 map. The walls around the King's Knott, the majority of which are 19th century (Cook, M pers obs) are of a uniform size with coping stones which are sometimes dressed and thus of very different character to the wall under discussion here. The earliest and most accurate record of the boundary is Bryce's 1806 map 'Plan of the Stirling Castle and Kings Lands', a copy of which is in the National Archives at Kew (MF1/22: C; hereafter referred to as Copy A).

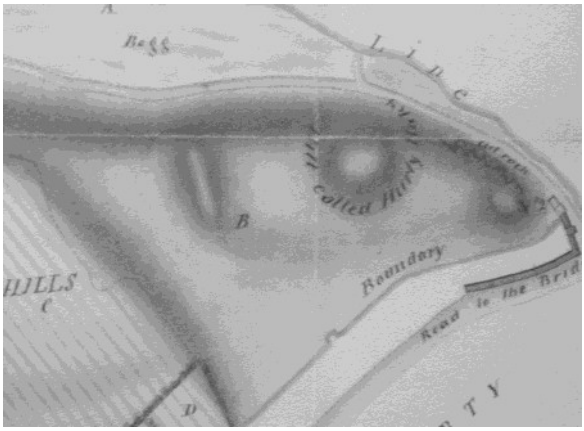


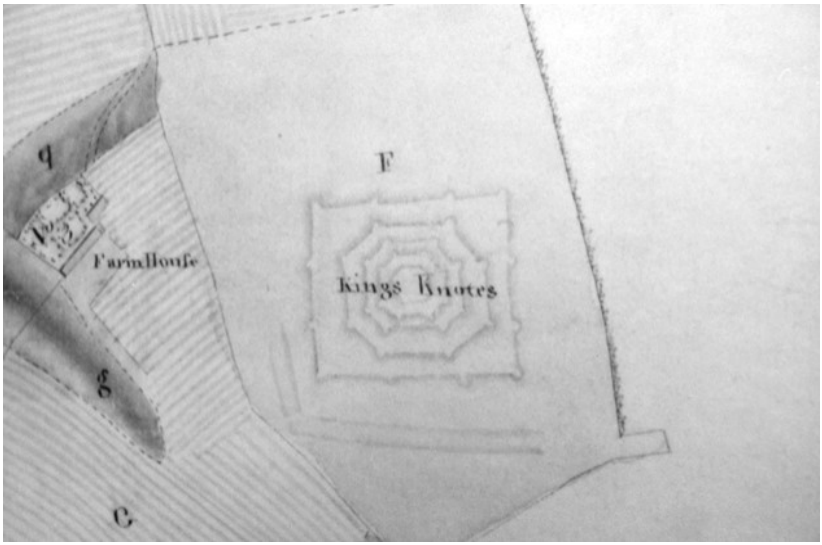
Figure 1: Extract of Copy A without building outside dyke at Gowan Hill.

The map appears to have been created to capture the economic returns from the royal park. The map illustrates the boundary as a red line, but it is not clear if its dyke or a fence, however, elsewhere on the map internal boundary hedges are clearly marked, so it may safe to assume that the red line is a wall. The Smith Museum and Art Gallery has on public display a reproduction of a smaller version of the same map, which is untitled, unsigned, undated and described by them as 'A Late 18th century Board of Ordnance Map' (hereafter referred to as Copy B).

Figure 2: Extract of Copy B with building outside dyke at Gowan Hill.

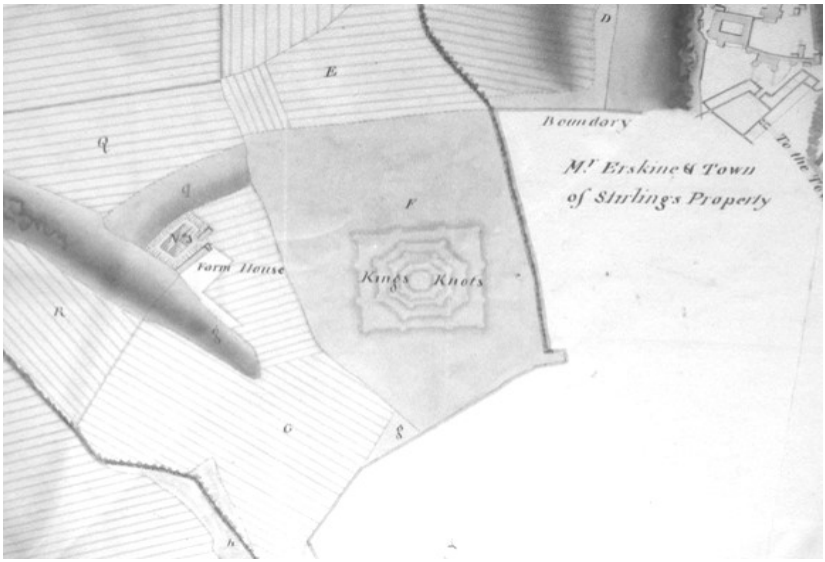
The precise origin of Copy B and the location of the original is currently unknown. However, close examination of the two maps reveal several minor differences: colours, fonts, wording and cartographic details. So for example Copy B records a building outside the park wall on its south-east face of Gowan Hill which is not on Copy A (Figures 1 and 2). Equally, and more interestingly the plan of the Kings Knott on Copy B has more details than Copy A and maps a boundary ditch, a section of which now lies under the modern road (Figures 3 and 4), and which remained unnoticed until more recent comprehensive surveys (eg Digney et al 2011).

Figure 3: Extract of Copy A showing Kings Knott.



The alternative rendering of the Kings Knott does not appear to have been recorded by any other commentator on the garden (eg Digney et al 2011 or Brown 2017). On balance it is clear that there are more details on Copy B than Copy A,

Figure 4: Extract of Copy B showing Kings Knott with additional ditch.



Quite what this means is unclear, Copy B may be the original from which Copy A was made or perhaps two different clerks drew up two different versions from the same raw data; or perhaps the different maps record change over time?

The Cotters House

A feature of both maps in the south-west section of the park dyke is a single oblong building with an extension on its north-west end, which is surrounded by rig and furrow and associated with a small formal garden (Figure 5).

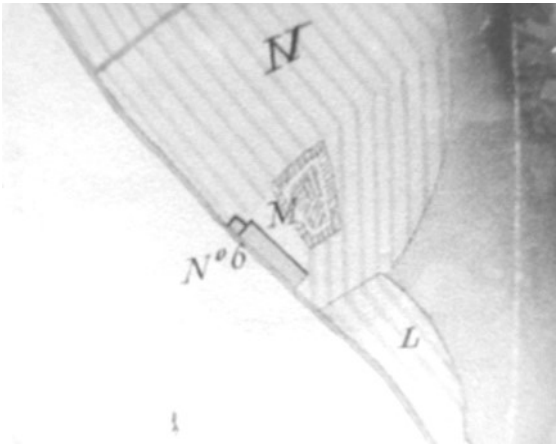


Figure5: Extract of Copy A showing Cotters House.

The line of the park boundary and the wall of the building are indistinguishable. This group of features is described in three ways by both copies: 'No 6 Cotters House', a 'house' and 'Arable includes yard'. 'Cotter' is a generic term for subtenant in Scotland (Devine 2006) and in the late 18th century and early 19th century may have been perceived as a slightly derogatory term. Copies A and B of the map give two different measurements for the cotters house: Copy A indicates that the main building is 95 feet long (c 28m), while Copy B records it at c 129 feet (39m).

There are four other properties in the park: the first two are to the west of the castle and both of which are also surrounded by rig and furrow and associated with a formal garden but are described as 'Farm House' on the map. The larger of the two (the current King's Park Farm) is described as 'No 3 Farmers House and Barn' and the smaller (commonly known as the 'Herd's Hoose' and which is no longer extant (King 2011, 83)) as a 'No 5 House and barn for subtennant'.

The third property is at the eastern of Gowan Hill, (in what is now a former quarry) is known as 'No 2 A farm east of the Castle built by James Shearer'. The final property is near the main gate to the current park on the south-east corner and is described as 'No 4 A work house built by Mr John Rae'.

All these structures are different sizes and shapes and do not appear to be mere generic representations of buildings. It is also clear that while all of these buildings were owned by the crown, they all had different origins and perhaps tenants. The Cotters House does not appear on the either Roy's mid 18th century map nor the mid- 19th century 1st Edition Ordnance Survey, which perhaps, in combination with its title, gives the impression that it was a short lived structure.

9 St Thomas' Well

In December 2017 an opportunity arose to examine in detail a section of the park wall at 9 St Thomas' Well which roughly corresponded with the location of the Cotters House. The primary aim of the project was to investigate to possibility of an early boundary or ditch to the south of the wall, which ultimately proved negative. However, it became clear on initial inspection that the park dyke here comprised three different sections of wall (Figures 6, 7 and 8).

Figure 6: General view of wall showing different sections.

Figure 7: eastern test-pit showing wall foundations.

The eastern section was typical of the park dyke on the majority of the south-west section, c 2m high with no formal coping but substantial stones near the top (Figure 7). The middle section (10m) was also c 2m high but contained smaller stones and no massive stones near the top, there were also no features in the wall (Figure 6). The western section was also 2m high but the stones to the top were smaller (although still large) and also the foundation course of the wall was visible above ground (Figure 8).

Figure 8: western test-pit showing wall foundations.

This section of wall had also been capped by a lean to on the side face. To the internal side of the dyke the wall was a further 0.3m higher, implying that the park dyke was built against an existing break of slope. In addition, there was a lean to on the internal side preventing inspection of this side of the wall.

Two 1m by 1m test-pits were excavated against the eastern and western sections of the dyke and revealed two different scales of foundations: to the east the foundations comprised two courses and were 0.6m deep, while to the west the foundations were one course deep and measured a maximum of 0.2m (Figures 7 and 8).

To be explicit, the wall to the West used less stone than that to the East and this change is associated with a middle section of wall which was in turn different to the walls to the east and west. Standardly one would assume that a change of character in a wall was a repair or associated with an intrusive later building. However, if this was a repair it seems strange that there is no trace of the larger stones present to either side, would they not have been included in the wall, albeit at a different location? In addition it is also strange that the putative repair coincides with a change in the scale of the wall.

Alternatively, if we accept that the Cotters House was late 18th or early 19th century in origin then this building would have been inserted into the dyke and changed its character. However, why would the Cotters House's construction have necessitated dismantling the dyke and reconstructing it as the wall of a house, why would they not simply have built a lean to? In addition, the 10m of the middle section of the dyke is not the 30m or 40m of the structure depicted in the maps.

There is another possibility: that the park dyke was constructed around an existing building (which may not even be the Cotters House) and that this point may also have coincided with either a change in budgets or teams constructing the park dyke, getting progressively smaller to the west. This of course implies that the structure was there before the dyke, if we accept that the current wall is 17th century or older in origin, albeit perhaps on a 12th century boundary, then it must be pre 17th century.

However, it is also possible that this section of wall relates to later 19th century repairs and that a late 18th century structure was partially dismantled and included in the wall repair. While the author thinks this less likely, on the basis that the section of dyke here looks nothing like the other stretches of 19th century dyke elsewhere in the park, it would explain both the map evidence and the fact that only 10m of wall survive of a structure between 30 and 40m long.

Perhaps the description of the structure as the 'Cotters House' may reflect a value judgment by the surveyor of an older, possibly dilapidated structure (certainly it was demolished within a generation). Regardless, this evidence raises the possibility that the Cotters House or something else at this location is in fact the oldest surviving building in the park. While its function remains uncertain, presumably it relates to accommodation for the various royal servants and tenants who worked within the park.

Conclusion

This small note has revealed two new 'discoveries', the alternative version of Bryce's map in the Smith Museum and the potentialy older more significant nature of the Cotters House. The additional detail on Copy B has revealed a previously unknown depiction of the Kings Kott. If the reported upon section of wall is the Cotters House and if it is indeed the oldest structure in the Royal Park, then it is an important, if small observation into the nature and function of the park**.** Clearly more fieldwork on and in the park is the required and the author is looking forward to the challenge!

Acknowledgments

Thanks are due to the owners of 9 St Thomas' Well for their patience and hospitality in letting us excavate in their garden; the Smith Museum and Art Gallery and their wonderful staff for their permission to reproduce their copy of the Bryce Map; the National Archives in Kew for their permission to reproduce their copy of Bryce's map. However, my greatest thanks must of course go the volunteers who braved a cold December in Stirling to help uncover a mini-mystery: Archie Dick, Penny Ellis, Eric Gardner, Ronald Swanson, Billy Esplin and Hilary Fawcett and Niall Manning.

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National Archives (Kew) MF1/22:C *Plan of Stirling Castle and Kings Land, 1806.*

THE DEVELOPMENT AND DECLINE OF THE CRAIGRIE LADE

Murray Dickie

Background:

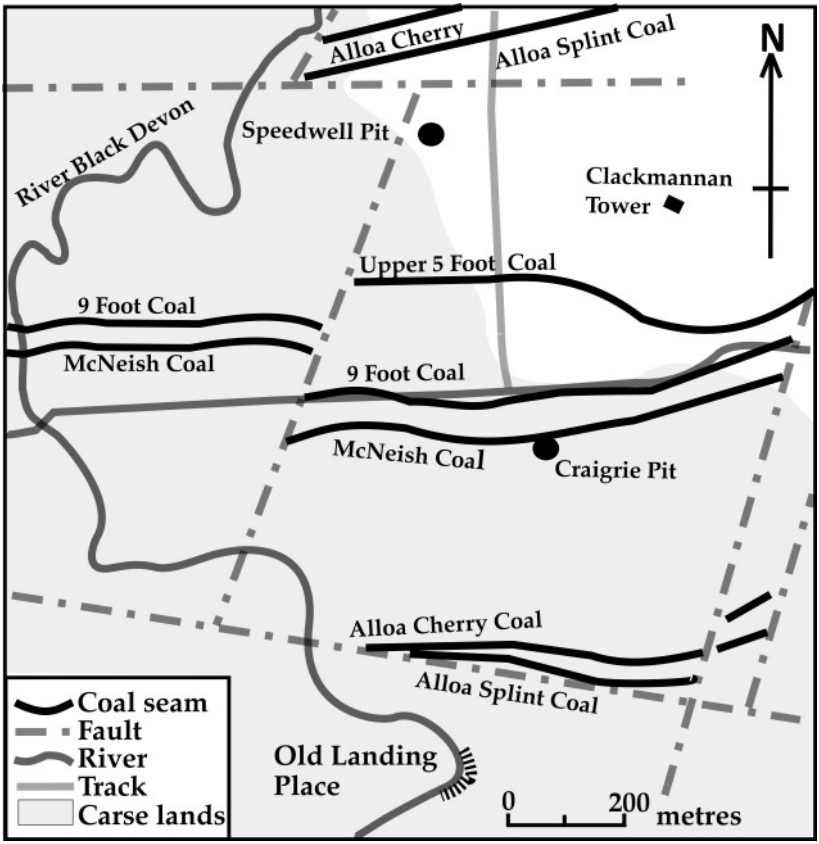
In 2014 the Clackmannanshire Field Studies Society obtained a grant from the National Lottery Heritage Fund through the Inner Forth Landscape Initiative for a four-year research project. The grant enabled a group of volunteers to be trained and undertake field and desk-based research into aspects of the development of the two estates of Alloa and Clackmannan from the late 17th to the early 20th centuries. This paper reports on the work undertaken on the Clackmannan estate's construction and development of the Craigrie lade, initially taking water from the river Black Devon to provide a source of power to drain the estate's coal pits. The lade subsequently provided water to other industries and, finally, a public water supply to the town of Clackmannan.

There were five workable coal seams under the Clackmannan estate, varying in thickness from two feet to five and a half feet (Moodie, 1795). The entire Clackmannanshire coalfield was greatly influenced by earth movements associated with the large Ochil fault lying a few kilometres to the North. As a result of downward movement along this fault, the coalfield is in the form of an elliptical basin, lying to the South of the fault. The coalfield extends some eleven kilometres from the West of Alva to the East of Dollar and some seven kilometres from the Ochil hills in the North to the river Forth in the South.

Most of the coal seams dip to the North or North East at a slope of about 1 in 6 (Brodie, 1834). This dip was extremely significant for mine drainage, as any drainage system could only keep that part of the seam lying to the South drained. A pattern developed, with drainage shafts in the deeper northern part of a working and access shafts in the shallower southern part. The drainage issue was made more difficult as the southern half of the Clackmannan estate's coalfield lay under the carselands of the river Forth, close to or even below sea level. Only a small section of the Upper Five-Foot Coal seam lay above the Carse under the higher ground of Kings Seat hill. The displacement of the Ochil fault also impacted on the rocks of the coalfield, creating a number of major West to East faults and a number of smaller North to South faults (Geological Survey, 1926). This pattern of faulting, particularly in the Clackmannan area of the coalfield, created small blocks of workable coal. Once the

seams in a block had been worked out, a new pit had to be sunk in the next block. The "*Old Landing Place*" allowed coals to be exported by sea. The Craigrie pit drained the Alloa Cherry and Alloa Splint Coals between the pit and the "*Old Landing Place*". The Speedwell pit drained the areas of the Upper 5 Foot Coal, the 9 Foot Coal and the McNeish Coal lying to the South of the pit.

Figure 1. The geology of the coalfield at Clackmannan Tower.



Based upon OS Opendata and 19th century GS map, NLS.

Early coal mining in the area:

The earliest known record of a coal pit in Clackmannanshire was on the Alloa estate in 1519. (Carvel, 1944) and by the end of the 16th century there are records of coal being worked on the estates of Clackmannan (Gordon, 1936), Alloa and Sauchie (Carvel, 1944). By the early 17th century much of Scotland's trade was centred round the North Sea (Lynch, 2001) and the Clackmannan, Alloa and

Sauchie estates were transporting coal to the river Forth for export. In 1631 John, 2nd Earl of Mar, wrote a letter of support for Peter Breware, declaring that he "*trades in transporting coal to Flanderis [Vlaanderen, Belgium] and importing other wares to Scotland*" and a request to "*all and sundry to give him aid*" (National Records of Scotland, GD124/17/511, 1631).

Records show that, by the early 17th century, most of the coal mined in pits in the Forth estuary was mined as '*great*' or '*sea coal*' : large pieces of between one and one and a half cwts (51 to 102 kilogrammes) and exported by sea. These large sections of coal were carefully cut by the miners, dragged to the shaft bottom by children, carried by women bearers up stair pits to the surface, carted to the shore and packed carefully into ships to prevent breakage (Bald, 1812). Ships carried only small loads and any Great Coal damaged in transit lost a great deal of value and sometimes was not worth anything. In 1614 an agreement between Sir John Bruce of Airth and a London coal merchant stipulated that "*…all the dust or smaller coal be cast and not accepted ….*" and that each ship "*…should contain 40 tons of coals and no more.*" (Armstrong, 1889).

Mine drainage:

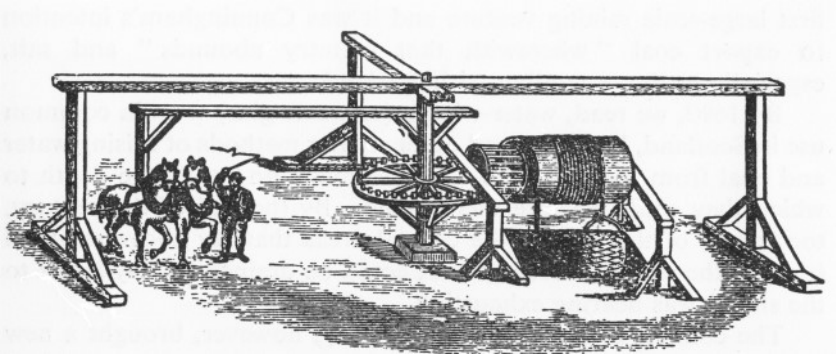
Coal pits in the 17th and early 18th centuries were small scale and shallow, often being no more than a hole in the ground or tunnelling into the side of a valley where a coal seam was exposed. The advantage of a working in the side of a valley was that the mine could be drained by cutting a very gently sloping tunnel or day level up from the valley bottom into the workings. This tunnel would keep the mine drained with no cost other than the initial outlay for its construction. At Clackmannan, this method of drainage was restricted to a very small area of the Upper Five Foot Coal under Kings Seat Hill.

Closer to the shore of the Forth estuary drainage was much more of a problem, with coal seams lying under the Carse lands of the River Forth, close to or below the level of the river. The first recorded, large scale use of powered drainage in the area around the Forth estuary was by Sir George Bruce of Carnock at his Moat Pit near Culross. Among those who visited Culross was John Taylor, "*the Water Poet*," and his description, dated 1618, states: "*The sea at certain places doth leake or soak into the mine, which by the industry of Sir George Bruce, is all conveyed to one well neere the land, where he hath a device like a horse-mill, that with three horses and a great chaine of iron, going downward many fadomes, with thirty-six buckets" fastened to the chaine, of the which eighteene goe downe still to be rilled, and eighteene ascend up to be emptied, which doe emptie themselves*

(without any man's labour) into a trough that conveys the water into the sea againe, by which means he saves his mine…." (Cunninghame, 1902).

Sir Robert Bruce of Clackmannan was granted a 19-year patent for a mine drainage engine in 1646 (The Records of the Parliaments of Scotland to 1707, 1646), so horse-powered mine draining technology was readily available to the Clackmannan estate. However, horse mills were expensive to run. There is an estimate in the Erskine Family Papers of the cost of operating a horse gin for winding coal in 1735 (National Records of Scotland, GD124/17/546, 1735). This put the cost of maintaining a horse for a year at £120 each, a man for a year at £95 with an additional cost of £300 "*To tear and wear of gins, horses, corves, horse shoes, etc.*".

Figure 2. Horsemill winding coal out of a pit.



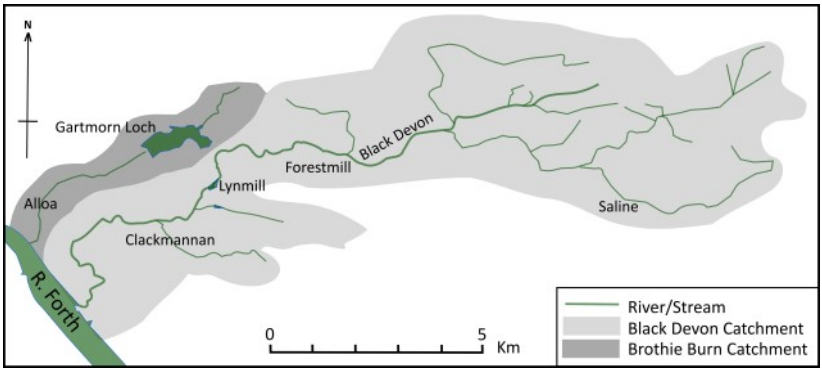
Barrowman, J. 1886 ,A Dictionary of Scotch Mining Terms

A horse gin driving a set of buckets and chains might need 16 or more horses to provide 24-hour drainage all year round, together with a team of men to support them. This could come to some £3,000 a year for each gin. Using water power was a much cheaper option. Once a reliable supply of water had been obtained and brought to the site of the gin, the cost of providing power to the gin would be very much lower than using horse power.

The potential for Water power:

The river Black Devon rises in the Saline hills and flows west-south-westwards to join the river Forth. In the late 17th century this course took it through the Clackmannan Estate from Forestmill to its junction with the river Forth. The neighbouring Alloa Estate owned land at Forestmill and a small area at Parkmill (National Records of Scotland, GD124/17/233) and the water rights on this section of the river were therefor shared between these two estates.

Figure 3. River Black Devon and Brothie Burn catchment areas.



Based on information from Ordnance Survey (OS) OpenData, 2018.

Over its lower course the river Black Devon flows across sedimentary rocks of Carboniferous age (Geological Survey Map, 1898). It has cut down a deep gorge section from just below the Mary Bridge at Clackmannan [NS 90695 92377] to just above Forestmill [NS 95436 93825]. This cutting down was related to changes in the relative level of land and sea since the last ice age (Francis, et al, 1970). As the land rose back up after being pushed down by the weight of ice sheets it gave the river more cutting power. This cutting action of the river has been held back in two places by encountering outcrops of more resistant sandstone.

These outcrops result in a sudden drop in level from the more open section of river above into a steeper gorge section below. The lower point is below the small settlement of Linn Mill [NS9253092872 to NS9259493012]. Here the river Black Devon drops in a series of waterfalls (plate 11) and by the 14th century this drop in water level had been utilised by the Clackmannan estate to power the corn mill of *Lynmill* (Gordon, 1936). The upper point is at Forestmill [NS954938]. By 1681 a map of Clackmannanshire shows corn mills at *Forrest* [NS 95262 93932] on the Alloa estate and *Lynmiln* [NS 92581 92991] on the Clackmannan estate together with a "*wake m*" (waulkmill - for processing flax) near the village of Clackmannan (Adair, 1681). The 1702 Kirk Session records of Clackmannan parish also noted that there was a "*waulkmill on the Dovan*" (Gordon, 1936).

The size of the catchment area of the river Black Devon generally provided a substantial flow of water, although historical records from the late 18th century point to issues with low levels of flow during some summer months. These records indicated that the water mills on the lower reaches of the Black Devon were

associated with dams to store water to maintain supplies during this drier period (Moodie, 1795).

Mine Drainage:

In the late 17th century, the Bruce family of Clackmannan were working coal seams in the Craigrie area to the South of the village of Clackmannan (Books of Council and Session, 6th, July, 1711). These workings were close to the estate harbour at Clackmannan Pow on the inter-tidal section of the river Black Devon where the coal was exported (National Records of Scotland, GD18/1042, 1713). There were several rich coal seams available but in most of the area they went down below sea level, so some form of powered drainage was needed to keep workings dry (Geological Survey, 1898). David Bruce, owner of the Clackmannan estate, undertook extensive improvements of his collieries at Clackmannan and Sauchie at the latter part of the 17th century (Carvel, 1944).

The Craigrie lade was constructed to take a supply of water from the river Black Devon to his colliery engine on the Clackmannan coalfield. The lade was fed directly from the River Black Devon [NS 255092898] at *Lynmill* (Linn Mill), It carried water down the eastern side of the river Black Devon and around the foot of Kings Seat Hill to a point South of Clackmannan Tower [NS 904914] where"*…a water mill driven by a canal of water from the upper reaches of the Little (Black) Devon kept the Clackmannan mine dry*". This "*water mill*" seems to have been in use in 1699 (Gordon, 1941).

The rough location of this first drainage engine at Clackmannan is shown on a "*course sketch*" dated 1713. This indicates that it was powered by a waterwheel fed by a lade running in a North to South direction. The water was carried from the lade to the waterwheel in a wooden trough (National Records of Scotland, GD18/1042, 1713). It is likely that the drainage engine was a bucket and chain gin, as records relating to a contemporaneous engine at Alloa recorded that there were no wrights at the time skilled enough to install pumps (Bald, R., 1815). At some time in the early 18th century, the Craigrie lade also had an additional supply of water from the variously named *Gartstank, Garrison* or *Tulligarth* dam [NS9310892576] (Roy. 1747-55; Stobie, 1783 and OS , 1861).

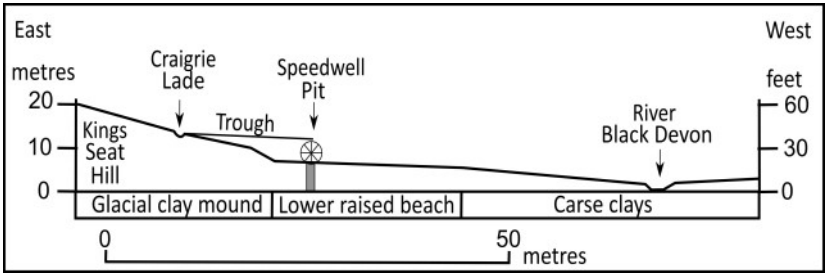
In the late 17th century, the neighbouring Erskine family of Alloa were working coals on their estate at Carsebridge usisng water from the local Brothie Burn to power a drainage engine to keep their workings dry. The size of the catchment area of the Brothie Burn was very much smaller than that of the river Black Devon and Gartmorn Dam had been built to provide a means of storing winter rainfall. In 1702 there was such a severe shortage of water at the

Alloa colliery that the drainage engine could not work and the mining of coal was stopped (National Records of Scotland, 1702, GD124/17/250). The availability of water rights on the river Black Devon at Forestmill, encouraged the owner of the Alloa estate, Sir John Erskine the 6th Earl of Mar, to seek to bring a supply of water from Forestmill to Gartmorn Dam. This would ensure a reliable, all-year-round supply of water to power his colliery drainage engine.

In 1704 David Bruce was declared bankrupt and the Clackmannan estate was taken over by Colonel William Dalrymple and a Mr. Inglis (Wallace, 1890). In 1712, an agreement on water rights to the Black Devon between Colonel Dalrymple and the 6th Earl of Mar allowed for the installation of a gauge plate in the Craigrie lade "*inserted in the spouts of the trows immediately below the cornmiln dam at Lynmiln*." This gauge plate allowed the flow of water into the Craigrie lade to be monitored, ensuring that a new weir, which the 6th Earl was planning to build at Forestmill to supply water to Gartmorn Dam, released sufficient water to meet the needs of the Clackmannan estate (Books of Council and Session, 6th July, 1736). Correspondence between the 6th Earl of Mar and Colonel Dalrymple indicates that Colonel Dalrymple was considering constructing a second drainage engine at his collieries and wanted to ensure that there was enough water going down the Craigrie lade to power two engines (National Records of Scotland, GD124/15/1047/11, 1712). The location of the second drainage engine is shown at Speedwell [NS9025892099] on an Alloa Estate plan drawn up for the 6th Earl of Mar about 1713 (National Records of Scotland, RHP13258/1, 1713). Despite an extended period of controversy about water rights and wayleaves, the Earl of Mar and Colonel Dalrymple finally reached an agreement and in 1713 the river Black Devon supplied water to power colliery drainage engines on both the Clackmannan and Alloa estates.

The Clackmannan estate required water at a level above that of their pits. The pit at Craigrie was located at about 7 metres above sea level and contemporary historical records suggest that an overshot water wheel of about 6 metres in diameter was needed to supply sufficient power to drive a bucket and chain gin (National Records of Scotland, 1735, GD124/17/546). This meant that the lade needed to be at a height of at least 13 metres above sea level for the water to go over the wheel and then be drained to the nearby tidal river Black Devon. The level of the lade was surveyed in 2016 at the site of the Craigrie farm at 15 metres. The Speedwell pit was located at 8 metres above sea level with the lade again at 15 metres.

Figure 4. Relative levels at the Speedwell site.



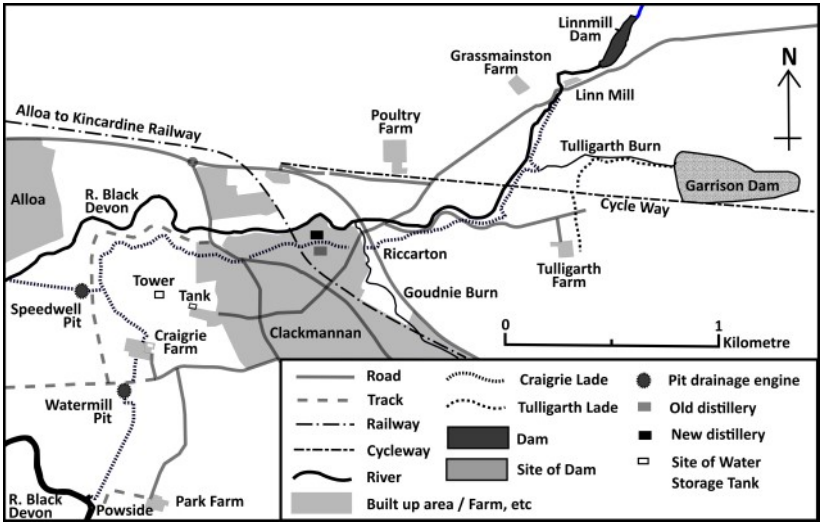
Based on field work and information from OS OpenData, 2018.

The O.S. First Edition 25-inch map of 1861 shows the course of the Craigrie lade from the river Black Devon at Linn Mill to a point just to the North of the Craigrie Farm at Clackmannan. The lade is shown as starting directly from the river above the site of a waterfall [NS 92547 92892]. The reference in the agreement between the 6th Earl of Mar and Colonel Dalrymple to the "*…trows immediately below the cornmiln dam at Lynmiln*" indicates that there was an early section of the lade which had to be carried along the side of the river in a wooden trough. The overall length of the lade from Linn Mill to the end of the lade at Craigrie was 3.27 kilometres.

Field research showed that the lade started as a rock cut ditch, taking water directly from the river. Very quickly the southern side of the gorge approaches close to the edge of the river and, as noted in the 1712 agreement, the lade would have needed to have been carried along this short section in a trough. Confirmation of the existence of this 60 links (12metre) long trough was found in a 19th century plan for the improvement of the lade (National Records of Scotland, RHP 80304). Fieldwork found postholes cut into the rock underlying the edge of the river bed at this point [NS 92540 92853].

The Tulligarth burn, a small tributary of the river Black Devon, had also been dammed in the late 17th century. It was recorded that heavy rains had caused a breach in the Gartstank dam in December, 1706 (Paton, V., 1893). This dam has been variously named the Gartstank, the Garrison and, later, the Tulligarth dam. Aerial photographs and fieldwork revealed the remains of the dam and a small lade on the South side of the Tulligarth burn leading eastwards. General Roy's map of 1747-52 shows the dam [NS 93111 92573] feeding in to the Craigrie lade and also indicates two "*mill*" settlements to the south of the Garrison dam; "*Oakmill*" and "*Sheilmills*".

Figure 5. Locations of the Craigrie and Tulligarth lades, 2016.



Based on Information from OS Opendata and 19th century OS Maps, NLS.

The Old Statistical Account of the parish of Clackmannan records that in 1795 the Garrison dam was covering 45 acres (Moodie, 1795). Stobies' map of the counties of Perth and Clackmannan, (Stobie, 1783, shows the Craigrie lade starting at Linn Mill and also being fed by water from the Garrison dam (Stobie, 1783). The O.S. First Edition 25-inch map of 1861 shows a lade heading from the dam towards the location of the present Tulligarth farm steading. It also shows the Tulligarth burn feeding into the Craigrie lade [NS 92514 92562]. It is possible that the dam on the Tulligarth burn was initially constructed to feed the smaller lade heading South and later the waters of the Tulligarth burn below the dam were directed into the Craigrie lade to give an additional supply of water to the mine drainage engines.

A water colour of Clackmannan Tower by John Clerk of Eldin in 1775 shows the waterwheel of the pit drainage engine in the background and indicates that by then water was carried from the lade by means of a syphon. The detail given in the water colour suggests that the wheel was about 9 metres in diameter and was driving a set of pumps (Clerk, J., 1775). The O.S. First Edition 25-inch map shows the lade being carried under the Goudnie Burn at Riccarton by a syphon [NS 91598 92174 to NS 91510 92183]. This map also shows the end of the Craigrie lade at the Craigrie farm terminating in a similar icon that at Riccarton (OS, 25-inch, 1898).

Despite the introduction of steam engines into many local collieries by the late 18th century, the water-powered drainage engines on the Craigrie lade continued to be used. (Moodie, 1795). In 1810, the Clackmannan estate leased the Clackmannan Collieries to the Clackmannan Coal Company, a partnership between George Taylor and John Brown. (Carvel, 1944). In 1814, the Clackmannan Coal Company sought relief from the rental for the lease of the Clackmannan colliery, suggesting that the collieries were not proving to be a commercial success. (National Records of Scotland, GD173/26, 1814). However, a plan of Alloa estate dated 1814 shows a working engine pit at Speedwell [NS 90258 92099] (Horne, 1814)

By 1830, pits in the vicinity of the village of Westfield (NS 902916), which had been working the Nine Foot, Five Foot, Alloa Cherry and Alloa Splint coals in the Craigrie area, were beginning to be abandoned (Mines Department, 1931) but a plan dated 1832 for a new distillery "*erecting by Mr Haig*" at Clackmannan still shows the lade and engine pits at Speedwell and Craigrie (National Records of Scotland, RHP13276, 1832). This plan is the last piece of evidence of the working of these drainage engines.

Water powered drainage engines are not mentioned in the New Statistical Account of Clackmannan Parish (Balfour, 1845) and while the Ordnance Survey First Edition 25-inch map of 1862 shows the lade as still being filled with water, the pits at Speedwell and Craigrie are marked as "*old shafts*"(OS, 25-inch, 1898). The foresight of David Bruce in establishing the Craigrie lade in the late 17th century provided a cheap and reliable source of water power to drive the drainage engines of the Craigrie and Speedwell pits for nearly a century and a half. During this time, it also provided the potential to supply power and water to other industries.

The use of the Craigrie lade for industrial power and supply.

A late 18th century map of "*Strathdevon*" shows two corn mills and a wake (waulk) mill on the banks of the river Black Devon near Clackmannan (Adair, J, 1681). The Clackmannan Parish Kirk Session Records indicate that, on the 29th July 1718, a distillery was operating in the town of Clackmannan and that there were two "*Gauger*s" employed there, as well as a "*customs officer at the harbour at Powside"* (Gordon, 1936). By the end of the 18th century there were still two corn mills and a lint mill in Clackmannan parish. (Moodie, 1796). The exact site of the first distillery is uncertain, but tax records of 1816-17 and 1825-26 indicate the owners and the production.

Date	Distillery Name	Owner	Gallons of Whiskey
1816/17	Clackmannan	**James** Mill & Co.	63,068
1825/26	Clackmannan	**John** Stein & Co.	110,310

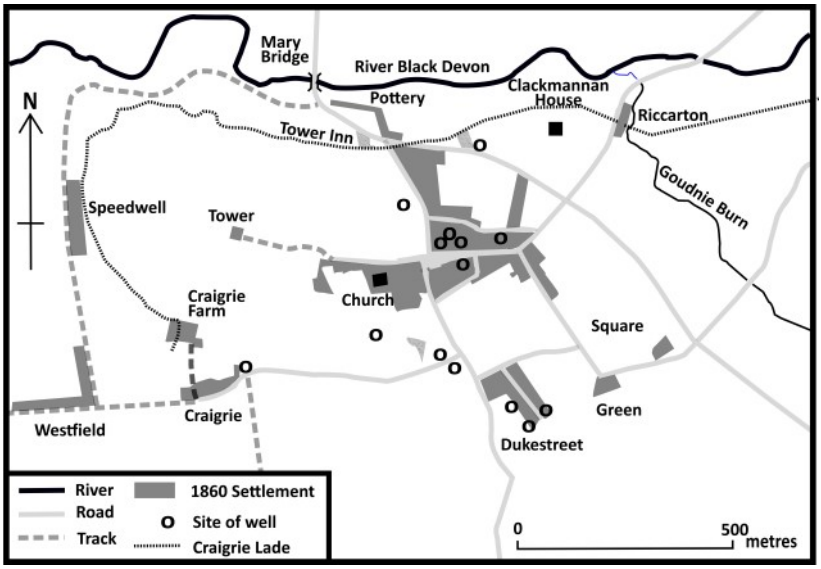
(Extract from Parliamentary Papers, 1817 and 1826).

The 1832 plan for a proposed new distillery shows it was located between the River Black Devon and the Craigrie lade ((National Records of Scotland, RHP13276, 1832*)*. The site of this new distillery was uncovered during house excavation work. It lay immediately to the North of the Craigrie lade, adjacent to a bridge over the lade (Russell, 2014). Part of the distillery building and bridge are shown on the OS First Edition 25-inch map of 1862. The proximity of the distillery to the lade suggests that they may have been connected, as the lade would have supplied water for production and a possible source of power to drive the distillery's millstones.

Domestic Water Supply:

Prior to 1860 the town of Clackmannan, the colliery villages and farms around were dependent on wells for the supply of water. These wells were fed by water coming through the underlying Carboniferous rocks. As a result, this water was "hard", with small amounts of dissolved calcium carbonate. In addition, the wells often dried up in the summer (Falkirk Herald, 1866 and OS, 1862).

Figure 6. Water available from wells circa 1860.



Based on Information from OS Opendata and 20th century OS Maps, NLS.

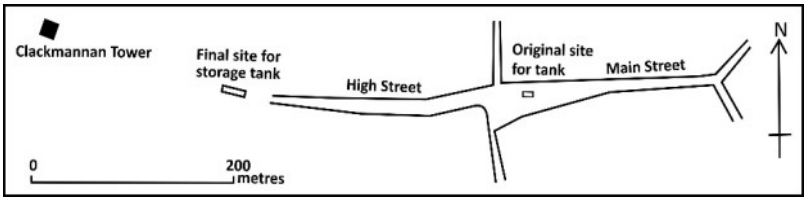
The lack of a local, reliable supply water from well sources proved extremely difficult for the occupants of many of the outlying mining settlements. In the case of Westfield – "*There is no regular water supply for the* village*, but Mr Allan, a neighbouring farmer, kindly allows the people to help 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*".

Some residents at the Pottery resorted to taking water from the river Black Devon but it was contaminated by sewage. The lack of an adequate, reliable source 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 (Public Ledger and Daily Advertiser, 1832). The number of people affected in Clackmannan Parish accounted for some 40% of the total cases in Scotland at that time. In February of 1849 there was another outbreak of cholera in Clackmannanshire and five deaths in Clackmannan and Westfield (Stirling Journal & Advertiser, 1849)

By 1866, as the Craigrie lade was no longer used to power mine drainage or supply industry, the Earl of Zetland, proprietor of the Clackmannan estate, used its waters to provide a new, clean water supply to the village of Clackmannan. This was designed to meet the needs of some 1,300 inhabitants. An original plan shows that a small dam was to be constructed below the road bridge at Linn Mill [NS 92562 92899], the course of the lade was to be "*scoured*" as far as the small mining settlement of Riccarton [NS 91563 92169], where the water was to be "*roughly filtered*". A small repair was also to be undertaken where the lade had collapsed [NS 92459 92677]. (National Records of Scotland, 1865, RHP 80304). A hydraulic ram would then pump water up to a water tank dug into the High Street, below the Tollbooth.

The plan was later modified to improve the quality of the supply by piping the water from Linn Mill to Riccarton in an 18 inch (46 cm), glazed, fired clay pipe and enlarging and moving the storage tank up to just below Clackmannan Tower (Falkirk Herald, 1866).

Figure 7. Proposed and final site of the storage tank.



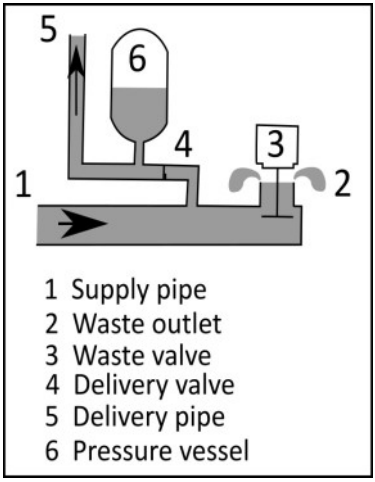
Based on Information from OS Opendata and National Records of Scotland Plans

The contract was supervised by Mr Sutter, C.E., of Edinburgh and the work undertaken by Wallace and Connell, plumbers in Glasgow (Falkirk Herald, 1866). The system was designed to deliver 14,000 gallons (63,645 litres) of roughly filtered water each day to a 20,000 gallon (90,922 litres) storage tank situated in Tower Park, just below Clackmannan Tower [NS 90842 91906]. A refurbished storage dam was constructed at Linn Mill [NS 92765 93040] above the old mill dam [NS 92626 93004)], providing a more reliable supply of water, especially in the summer when the flow of the river Black Devon was regularly low.

The lade from Linn Mill to Riccarton was refurbished and a glazed clay pipe was placed in the bottom to conduct water to the hamlet of Riccarton [NS 91591 92183]. Here a wall was built across the lade and the water was partially filtered before being fed down 15 feet (4.57 metres) through a four-inch (10.16 cm) supply pipe to a large hydraulic ram located in a brick housing. The ram house was located on the eastern side of the Goudnie burn [NS 91555 92161]. The 15-foot (4.57 metres) head of pressure enabled the ram to force a proportion of the water over 1,000 yards (930 metres) through a two inch (5.08 cms) pipe up to the storage tank 120 feet (36.58 metres) above in Tower Park [NS 90840 91905] constructed by Mr Robert Johnstone, Leith. The estate plan for the scheme shows this pipe running up the High Street,

A hydraulic ram is an extremely simple device. It operates by using a flow of pressurised water through a larger diameter supply pipe to force a smaller volume of the water up a smaller delivery pipe. Water under pressure enters the ram through the larger delivery pipe and the flow forces shut a waste valve on the outlet. The sudden closure of this valve creates a "hammer" effect (a sharp increase in pressure) within the supply pipe. This sudden increase in pressure forces open a delivery valve at the start of the smaller delivery pipe and drives water up it At the same time, it pressurises the air in a pressure vessel connected to the outlet pipe which acts as a shock absorber, reducing the effect of pressure on the ram.

Figure 8. Hydraulic ram.



Wikipedia, 2018

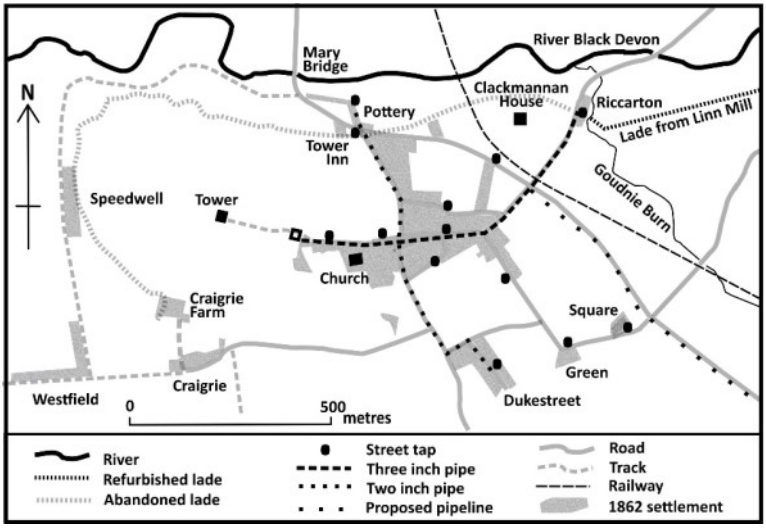
As the pressure in the larger supply pipe decreases, the delivery check valve closes, the compressed air in the pressure vessel forces a little more water up the delivery pipe, the waste valve opens and water flows again through the supply pipe of the ram. This increases the pressure in the supply pipe and the cycle starts again. As the only moving parts are the waste valve and the delivery check valve, the ram requires very little maintenance. As it is powered by the pressure of water in the supply pipe, it is very cheap to run.

The storage tank was sunk five feet (1.52 metres) under the ground, covered with Caithness flags and capable of holding 20,000 gallons (90,922 litres) when full. The water was discharged at about nine gallons (41 litres) per minute and was piped to spring-loaded water taps throughout the village (Falkirk Herald, 1866). The taps only supplied water when held down so that water was not wasted. The supply was officially opened on Thursday the 13th of December, 1866.

An estate plan showing the proposed improvements ot the Craigrie lade, the hydraulic ram and the supply pipeline to the town indicates that the supply pipeline was to run up the roadway from Riccarton to the Tolbooth (National Records of Scotland, 1865, RHP 80304). A hand coloured OS First Edition 25-inch map held in Alloa Library shows the location of the storage tank, with the track leading to Clackmannan Tower being diverted to the North around the site. This diversion is still in place today.

This map also shows the proposed lines of several three-inch (7.62 cms) delivery pipes and the two-inch (5.08 cms) supply pipe. A three-inch (7.62 cms) pipeline ran down the High Street to Riccarton, with two-inch (5.08 cms) pipes to Duke Street and the Pottery. A proposed pipe line is shown to Kennet, but there is no evidence to suggest that this was built. An extended distribution of taps is shown within the area of the village of Clackmannan on the OS 1920 Second Edition Revised 25-inch map (OS, 1920).

Figure 9. Water available from street taps in 1920.



Based on Information from OS Opendata; OS Second Edition Revised 25-Inch Map, NLS and a map from Alloa Library

The 20,000 gallons (90,922 litres) capacity of the tank is the equivalent of 3,211 cubic feet (91 cubic metres). A plan and section of the tank shows that it was 61 feet (18.6 metres) long, nine feet and six inches (2.9 metres) wide and set five feet (1.52 metres) into the ground (National Records of Scotland, RHP 80306, 1866), so its area would have to have been some 580 square feet (roughly 54 square metres). The site of the storage tank is shown on the hand written OS First Edition 25-inch map of 1861 and is 2,366 square feet (220 square metres), more than adequate to house the tank.

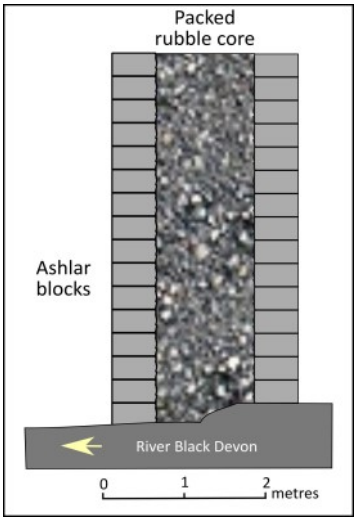
The river Black Devon had a long history of low flows in summer months and a storage dam had been constructed above the mill dam at Linn Mill as early as 1755 [NS 9276993036]. The extensive area of water behind this dam is shown on a number of maps, (Roy, W., 1747-55), (Stobie, J., 1783 and the First Edition OS 25-inch map, 1861). By 1898 the area of water shown had been very substantially reduced (Second Edition OS 25-inch map, 1898).

The extent of the area of water behind the dam indicated on this 1898 map persisted through the OS series until 1958 (OS 1:10,000 map revised: 1958). It is then shown as being reduced much further in 1960 (OS 1:25,000 map, 1960). This level is identical to that shown on the most recent map (OS/openstreetmap, 2016).

Figure 10. Present remains of the storage dam.

The partial remains of the most recent dam can still be seen [NS 9276993036]. This is in the same position as dams shown on all the earlier maps. The northern half of the dam is still nearly extant, while the southern half is completely missing.

Figure 11. Dam section.



The remains consist of two walls of machine cut, ashlar blocks of sandstone which are sawn on five sides. The inside face has been left unfinished and the outside face is decorated with a surrounding plain edge. The space between the two walls is filled with very closely packed rubble. The style of finishing on the outside face of the of the blocks suggests a mid-19th century date for its construction, possibly associated with the Zetland water scheme in 1866. The water area shown on the various maps suggest that a dam of similar height to the present remains stood from at least 1755 to sometime just before 1898. At a date close to 1898 the dam was no longer in use, but still holding back a substantial area of water. These dates tie in with water from Linn Mill being used until the abandonment of the lade in 1892, when the source of the Clackmannan supply was switched to Gartmorn Dam. The dam appears to have been reduced to its current state between 1958 and 1962, when the area of water behind it was reduced to its present extent.

The Earl of Zetland also provided Clackmannan with a new street drainage system (Falkirk Herald, 1866). The account of the opening of the water supply noted that "*the principal streets were drained after the most approved system, gratings with such traps and cesspool bends being placed at every 16 yards* (14.63 metres) *(and in some instances, closer), all being capable of being lifted and cleaned by a scavenger and trapping and preventing any bad smell coming up the*

drains, and equally preventing any matter tending to choke the drains getting into them. The whole of the above works have been executed in a most substantial manner at Earl Zetland's expense. The contractor for the drainage and tank was Mr Robert Johnstone, Leith."

A plan of the system was drawn up for the Zetland Estate (Unknown, RHP 80305, 1865). This shows the location of street traps, pipes and two outfalls, one at Riccarton and the other at the Pottery. The recognition of the value of this water and drainage system is expressed in the address given at a dinner which took place in the Royal Oak Hotel. *"We, the undersigned residents of Clackmannan, desire to avail ourselves of the opportunity now presented by the completion of the works for draining and supplying our town with water, to express our gratitude to the Earl of Zetland, through whose great liberality these works have been executed.*

We feel that he has thereby conferred a boon on us which we cannot too highly prize. For many years past we have been dependent to a large extent upon a single well for the supply of one of the first necessities of life, and in a dry summer this was found altogether inadequate. When we hear of the fearful ravages which cholera is now making among a population similar to our own in the neighbouring county of Fife, and as the medical men unhesitatingly attribute these to impure water and deficient drainage, we cannot be too thankful to the noble Earl who has done so much to remove these sources of pestilence from amongst ourselves. We now believe that there are few small towns in the country better provided with pure water or with a more efficient system of sewage, and we trust it may be some satisfaction to the Nobleman to whom we owe this, to be aware that his kindness is duly appreciated, and his name thankfully remembered, by those for whose comfort and health he has done so much." In 1878 the hydraulic ram was replaced with an even more efficient water turbine (Alloa Advertiser, 1904).

In 1891 to 1896 Alloa Burgh redeveloped the Forestmill lade and Gartmorn Dam as a water supply for the Town of Alloa. In order to service the higher parts of Alloa, a supply of unfiltered water was delivered by a clay pipe from the Forestmill lade [NS 93216 94117] to a service reservoir at a height of 178 feet (54 metres) at the South end of the dam. This reservoir supplied water to high-level filter beds above the level of the Gartmorn Dam. This extra height enabled water to be delivered to higher parts of Alloa (Alloa Water Act, 1891). The Clackmannan estate ceded their Black Devon water rights to Alloa Burgh in exchange for 25,000 gallons a day (113,652 litres) which was piped from the service reservoir at Gartmorn Dam across to new filter beds built on Tower Hill, immediately on the South side of the old Zetland storage tank.

Thirty years after the Craigrie lade first supplied the town of Clackmannan with a limited supply of clean water, the system was replaced with a supply from Gartmorn Dam and the Craigrie lade was abandoned. Unfortunately, the water supplied from the service reservoir at Gartmorn contained a high proportion of organic material which the new Clackmannan filters struggled to process. In addition, the volume supplied was not adequate for the growing population (Alloa Advertiser, 1904). Eventually, the Parish of Clackmannan became part of the Clackmannan County Special Water Supply District and in 1915 a supply of water was obtained from a reservoir built in the Ochil Hills to the North of Menstrie (Gordon, 1966).

The Remains of the Craigrie Lade, 2017:

A team of volunteers explored, surveyed, excavated and photographed the remains of the Craigrie lade, the Garrison dam and the parts of the Tulligarth lade which were still visible. Above the modern road bridge at Linn Mill there is an earlier stone-built road bridge, a waterfall, the remains of an old corn mill, its lade and the remains of a holding dam to ensure a reliable water supply. The OS First Edition 25-inch map of 1862 shows the start of the Craigrie lade just below the present bridge [NS 92517 92839].

Figure 12. Start of the Craigrie lade.

The plan of the proposed works in 1865 shows a small dam across the Black Devon at this point (Kerse Estate Paper, 1865, RHP 80304). There is a channel on the eastern side of the river where the OS First Edition map shows the lade starting. The white arrow on the photograph to the left points to the filled in bed of the lade.

Figure 13. Wrought iron bar.

A bent wrought iron bar has been secured into the rocks at the edge of the river. It is possible that this was used as an anchor point for a short trough, directing water to the start of a stone-cut lade.

Being in a gorge at its beginning, the lade is partially cut into the bedrock. A short distance from the start there is a brick-built feature in the line of the lade. It is made of red, fired, clay bricks and rectangular in shape; with internal measurements of three feet in width and four feet in length (0.91 x 1.22 metres). This construction was an access manhole related to the pipeline constructed at the behest of the 2nd Earl of Zetland in 1866 to supply the town of Clackmannan with a clean supply of drinking water. Below this point, a well preserved rock cut ditch continues.

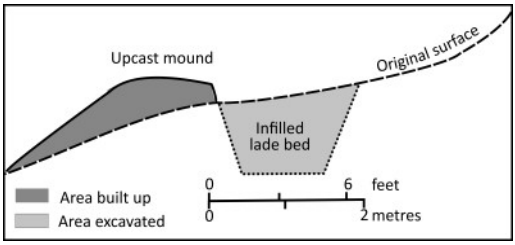
This ditch carries the lade down the side of the valley, maintaining a level course, while the river Black Devon drops away through a series of small waterfalls. Unfortunately, this section is covered in dense vegetation and was difficult to access. A local resident indicated that he had observed two vertical slots cut into the sides of the rock cut ditch. He suggested that these would have enabled a wooden gate to be dropped to cut off the supply of water to the lade (Madan, S., 2016).

Figure 14. Site of trough.

The 1865 estate map for the proposed water supply indicates a short wooden trough had been constructed beyond this point. Two individuals independently reported that they had observed post holes some four inches (10.16 cms) square in cross section in the rocks on the bed of the stream at this point. These indicated that the lade had been carried across this section in a trough supported on wooden posts (Madan, S., 2016 and Dickie, M., 2014).

Just below this point the valley of the river Black Devon broadens slightly and the cliff-edged sides move away from the river. The lade bed here has still been cut into the base of the sandstone cliff, forming a rock cut channel about three feet (91.44 cms) wide, The line of the channel is picked out by the layer of leaf litter lying on top of it (plate 12). The river Black Devon contin ues to drop slowly away from the level of the lade and, as the valley broadens still further, outcrops of sandstone are interspersed with deposits of clay on the slopes. The lade gradually ceases to be a rock cut ditch and becomes a ditch dug into the glacial clay cover on the valley slope and remains this way for the rest of its course, contouring along the side of the valley of the river Black Devon.

Figure 15. Lade formation along a slope.



The lade bed has now been created by digging into the slope on the upslope side, with the material excavated from this cutting, together with that from the digging of the lade bed, being used to create an upcast bank on the downslope side. This method of construction has been used for most of the rest of the lade. With the installation of a pipeline in 1866 to provide a water supply for Clackmannan, the open lade was back-filled. At this point [NS 924926] a small section of the lade has been reused as a field drain to remove water coming down from the slope above. This seems to be related to the recent planting of deciduous saplings in the bottom of the valley. This section of the valley has a large amount of water draining down the slope and a small section of the lade beyond this point has been washed away.

Another brick-built manhole was discovered [NS 92432 92640] **(**plate 13**)**. As the outside walls were undamaged and it was filled with dry material, it was partially excavated, measured and photographed. The surface dimensions are identical to that of the first manhole discovered. A glazed clay pipe of 18 inches (45.72 cm) internal diameter enters the manhole from the upstream end of the lade and another leaves from the downstream side. The manhole has been dug down below the level of the bottom of the pipes, creating a sump to trap any material coming down the pipe.

Figure 16. Drainage slot.

The manhole has a rectangular section on the river side. A smaller slot in the side of the manhole leads into a rectangular space which would once have held a wooden sluice gate. The brickwork is somewhat roughly laid and a substantial layer of lime and sand mortar has been used to create a seal between the brickwork and the wooden sluice gate. While the wooden gate has long since rotted away, the impression is still visible in the mortar, together with plant roots which had grown in the space between.

Figure 17. Drainage pipe.

There is a sump dug below the level of the pipeline, with a small diameter drain leading back down into the valley of the river Black Devon. This sluice mechanism would have allowed the manhole, including the sump, to be drained of water to allow cleaning and maintenance. A glazed clay pipe of 4 inches (10 cms) internal diameter leads from the bottom of the sluice gate through the upcast bank. This is a spigot and faucet pipe, with a plain end (spigot) and a belled-out end (faucet). A thread has been cut into the faucet (belled out) end of the pipe to allow a good mortar seal when the next spigot end was inserted into this faucet end.

At this point the river Black Devon is noticeably further away from the level of the lade. The natural slope is still quite steep and the cutting, lade bed top and upcast bank are clearly defined. From the start of the lade, it has travelled through an area of mixed deciduous woodland, with a small number of coniferous trees. The OS First Edition of the 25-inch map shows a mixture of deciduous and coniferous trees. (OS, 6-inch map, 1861). The precipitous nature of the route has helped to protect the course of the lade. Any damage has been related to excessive ground water and very recent deciduous tree planting.

The lade then enters an area where coniferous planting had been going on for some considerable time [NS 92422 92579 . By 1947 the area alongside and above the lade in this area is shown as being planted exclusively with coniferous trees (RAF Aerial Photographs, 1947). Fortunately, the tree planters had generally avoided the infilled course of the lade bed, perhaps concerned by the softness of the infill. In this section, the upslope cutting, infilled lade bed and upcast bank are well preserved. The lade then contours gently around the northern shoulder of the valley of the Tulligarth burn [NS 92439 92555]. The coniferous trees are now restricted to the slope above the lade while below is a mixture of different deciduous trees.

Figure 18. Sections of pipe.

There is a large washed out area [NS 92456 92553], which has removed the line of the lade. Just at the edge of this area, the broken end of a section of pipe from the 1866 Zetland water supply is visible. The line of the pipe at this point is very close to the surface, having only a thin covering of turf and was easily cleared. Several sections of a spigot and faucet pipes were revealed which showed that the pipeline had a slight curve to the left.

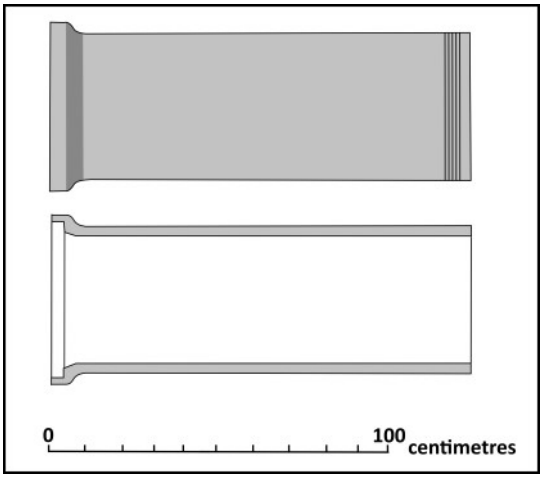
Figure 19. Pipe joint.

The bend in the line of the pipeline was achieved by laying each pipe with the downstream (spigot) end a little further to the left. The resultant small gaps in the joint were filled with extra mortar. As the pipe line was carrying running water and was not under any pressure (gravity fed) this method of sealing joints was effective.

Figure 20. End grooves.

The first two pipes had separated, creating a gap which allowed us to see a spigot end section in detail. The spigot (plain) end of the pipe had been shaped to create six small grooves (2 to 3 mms across) separated by ridges. This is likely to have been achieved by turning the pipe against a shaped former before the clay was fired. This pattern of ridges and grooves helped to secure the mortar in the joint with the next belled out (faucet) end.

Figure 21. Water pipe and section.



The exposure of this section enabled a series of detailed measurements to be made of the sections of pipe. The individual pipes are four feet long (1.22 metres and one inch (2.54 cms) thick with a belled-out faucet of two inches (5.08 cms).

Figure 22. View up pipeline.

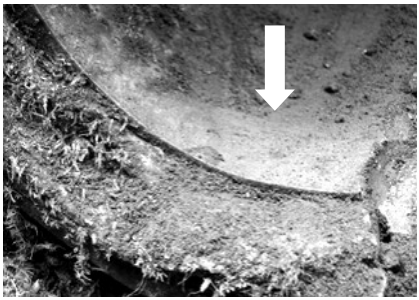
A view up the exposed end of the broken section of pipe revealed that there was a very small rim of the spigot (plain) end of the next pipe visible at each joint. This was puzzling, as the internal diameter of both ends appeared to be the same.

As the lade is washed out below this point it was difficult to see where it had crossed the Tulligarth burn. Fortunately, modern aerial photographs showed that the field boundary marked on the OS First Edition 25-inch map above the lade crossing was still present. Using measurements from the map, a line was surveyed from a clear change of direction in the fence to immediately above the point where the map showed that the lade had crossed the stream. The line at right angles to the fence was followed downslope and the remains of the next section of pipeline were found hidden in the undergrowth [NS 92453 92538]. When the section of pipe was cleared it was evident that the down valley side of the pipe had been torn away, suggesting that the crossing had been washed out at some time.

Figure 23. Faucet pipe end.

Despite the damage to the pipe, it provides good evidence as to the nature of a faucet end. It also provides details of the size and possible manufacture of the pipe sections. The internal diameter of the pipe is 18 inches (45.72 cms). The faucet joint consists of a two-inch (5.08 cms) face topped by a two-inch (5.08 cms) projection. There is also a very slight widening of the mouth of the internal end of the pipe. It is this widening which reveals the rim of next pipe edge as shown in figure 22 (previous page).

Figure 24. Faucet pipe section.

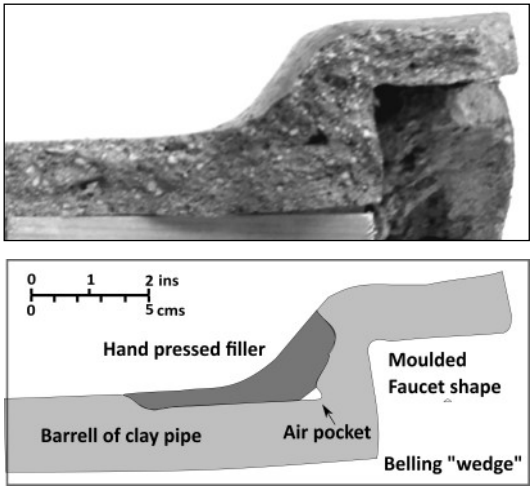


This slight widening shows up as a change in the reflection of light in the inner lip of the mouth of the pipe forming a light rim at the mouth of the pipe (marked with the arrow in the photograph to the right.) The lime and sand mortar had been caught between the spigot end of the next section of pipe upstream and the faucet face of this pipe. It had not completely filled the gap between the two sections. An examination of a broken section of pipe revealed that it is made from a mixture of clay and small particles of crushed material, perhaps old bricks or tiles, and was glazed on both sides.

Spigot and faucet pipes were developed to enable effective seals to be made between sections of pipe and are still in use today. The principle is very simple. Each pipe is made with a plain (spigot) end and a belled-out (faucet) end. The belling out of the faucet end is broad enough to accommodate the width of the spigot end and leave a space for a seal to be inserted. Putting together the information from all the exposed sections it is possible to say that these clay pipes are 18 inches (45.72 cms) in internal diameter and one inch (2.54 cms) thick, giving an external diameter of 20 inches (50.80 cms). The spigot end has a plain face and the faucet end has a two inch (5.08 cms) long, flanged section. This creates an internal end diameter of 22 inches (55.88 cms) which is two inches (5.08 cms) broader than the external section of the spigot end of the pipe.

This wider belled-out end section enables the spigot end of the next pipe to be inserted and still leave a one-inch (2.54 cms) space all round for a seal. The two inch (5.08 cms) long flange gives a degree of freedom to enable pipe sections to be angled to let the pipeline run around a bend. The grooves in the spigot end of the pipe helped the sand and lime mortar to grip and seal the gap.

Figure 25. Cross section of faucet "bell".



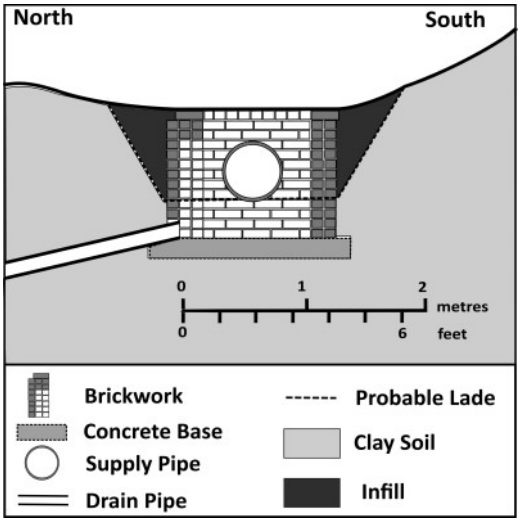
A small broken section of the pipe provided some evidence of the manufacturing process. The clay which forms the "bell shoulder" of the pipe is a slightly darker colour than that of the main pipe. There are small inclusions of air, particularly in the bend. The irregular shape of the faucet form suggests that it was created by forcing a mould into the mouth of a standard cylindrical pipe. The deformation of the shoulder was then pressed in by hand, using a slightly different clay mix. In addition, this process created a slight widening of the internal circumference of the pipe at its mouth; the belling "wedge". This slight increase in the width of the end of the mouth explains why a small "rim" is seen when looking up the line of the pipes.

Historical maps showed that the lade had contoured along the side of the Tulligarth burn and then crossed over to head down the other side. The water from the Tulligarth burn is shown as entering the lade at this point. This arrangement is shown on the "*The counties of Perth and Clackmannan*" (Stobie, 1783), on the First Edition of the OS map (OS 25-inch, 1862) and on the Zetland estate plan for the refurbishment of the lade (Unknown Author, 1865, Records of Kerse Estates, Stirlingshire, RHP80304). The easiest way to get the lade across the Tulligarth burn and capture the water from the burn would have been to build a simple dam across the burn. This would have taken the water from the upper section of the lade, together with the water coming down the Tulligarth burn and directed them into the lower lade.

Figure 26. Crossing the burn.

Exploring the bed of the Tulligarth burn, a bed of laid sandstone blocks was found close to the point where the OS map showed the lade had crossed. The course of the lade down the southern side of the Tulligarth burn is very clear. It continues contouring down the side of the valley, with an upslope cutting and a well-developed upcast bank.

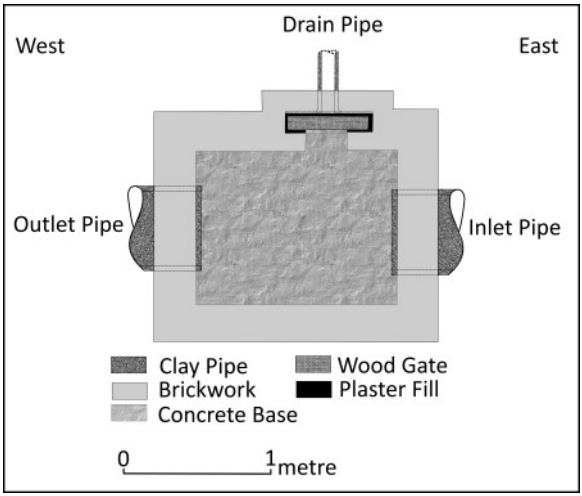
Figure 27. Manhole in the line of the lade.



The remains of another brick-built manhole were found in the line of the lade [NS 92422 92532]. (plate 14) These were partially excavated to reveal the main features. The walls are made of two rows of well-made red bricks, nine inches by four inches by three inches (22.86 x 10.16 x 7.62 cms) with a lime and sand mortar. The internal dimensions of the manhole are 3 feet wide by 4 feet long (0.91 x 1.22 metres). The bottom of the pipeline is three feet (0.91 metres) below the top of the infill level of the lade bed. The horizontal area of the top of the infill is consistently six feet (1.83 metres) wide. This suggests that the original lade bed was a three-foot deep by six-feet wide (0.91 metres x 1.83 metres) ditch. The brickwork is laid on top of a concrete base, of unknown thickness. Two glazed, fired clay pipes are located at either end of the manhole. On the upstream side a pipe of 18 inches (45.72 cms) internal diameter entered the manhole. A similar sized pipe continued out from the downstream side. The two pipes entering and leaving the manhole were different from pipes seen in the rest of the pipeline, in that they both had plain ends where they entered and left the manhole.

As with the previous manhole, the Tulligarth burn (downslope) side of the manhole has an entry into a vertical, brick-wide space. At the base of this is a four-inch (10.16 cms) diameter glazed clay drain pipe which leads through the upcast bank into the valley of the Tulligarth burn. Again, a wooden sluice gate would have been fitted into the space to seal off the drain. The standard of brickwork is again practical, but rough. In order to create a seal around the wooden sluice gate, the space between it and the brickwork has again been packed with lime and sand mortar.

Figure 28. Plan of manhole.



There are four courses of bricks creating a foot (30.48 cms) deep space below the level of the pipe. This would have acted as a sump to catch loose material which had been carried down the pipe. When excavating into this area, the material turned from loose debris to stiff, sticky clay.

The drain, being at the foot of the manhole, would have allowed the water to be removed to clean the sump. There was a large broken slab of sandstone in the manhole, suggesting that it might at one time have had a flagstone cover. On either side of the manhole the line of the lade had been back-filled to protect the pipeline. The pipe, manholes and drains uncovered are part of the improvements provided by the Earl of Zetland when he gifted a new water supply to the town of Clackmannan. The overall length of the lade from Linn Mill to Riccarton is about 1.3 kilometres. As each length of pipe is 4 feet (1.17 metres) the pipeline would have required the purchase and installation of over 1,100 sections of pipe.

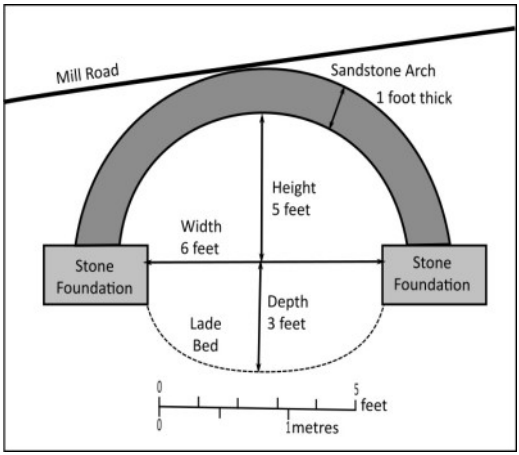
The lade continues along the shoulder of the valley of the Tulligarth burn and then down the eastern shoulder of the valley of the river Black Devon. The form of the lade is extremely well preserved at this point, with a steep upslope cutting, well developed lade bed and upcast bank. The Stirling to Dunfermline

railway reached Clackmannan in 1850 (Thomas, revised Paterson, 1984), A large stone-built viaduct [NS 92295 92482] carried the railway across the river Black Devon and the course of the lade. The lade, now a pathway, nestles under the eastern end of the arch of the viaduct. This section of the railway line has been developed as a cycle path and there is a set of access steps leading down from the sysle way on top of the viaduct to the pathway along the line of the lade. The lade once crossed a small stream and the crossing and pathway have been washed out. The pathway was moved upslope onto a new line, with a wooden bridge now crossing the stream. This modern pathway can be accessed from the roadway leading to the site of the old Cherryton brickworks [NS 92303 92298].

The line of the lade continues through the woodland until it reaches the roadway leading to the old brickworks. As it has been used as a pathway in the past, its form is altered, looking more like a roadway than a lade. Once out of the woodland and across the roadway to the site of the old brickworks [NS 92120 92306], the course of the lade to Riccarton has been lost to ploughing, the extension of a small quarry [NS 91941 92268 to NS 91866 92256] and, finally, the construction of the Clackmannan bypass road [NS 91675 92215 to NS 91574 92191].

The remainder of the central section of the lade through the village of Clackmannan has been lost to a series of residential developments. Fortunately, in constructing a driveway for his house, Ian Russell uncovered the remains of the old lade bridge and distillery building shown on the OS First Edition 25-inch map of 1862 and measured and drew sections of them [NS 91350 92218].

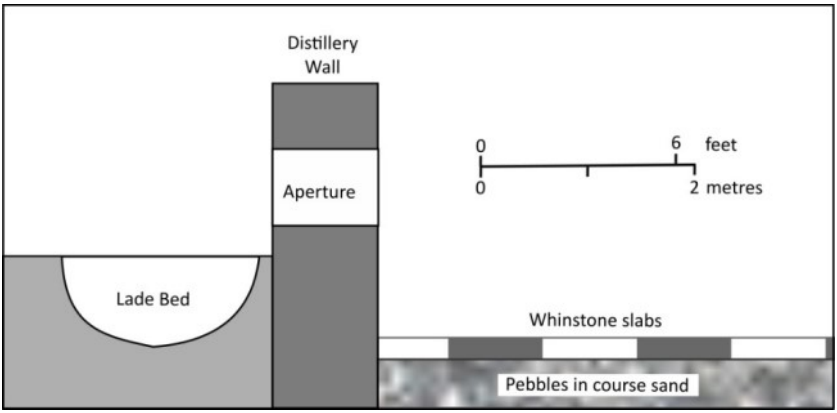
Figure 29. Remains of the lade bridge.



We are grateful for his permission to include his section of the bridge here. His measurements indicate that the open lade bed in this central section was a three foot (0.91 metres) deep by six foot (1.83 metres) wide ditch. The excavation of the distillery wall showed that it was floored with whinstone slabs on top of a mixture of course

sand and pebbles. The closeness of the lade with the distillery remains suggests that there was a relationship between the two, possibly in terms of water power, and/or water supply.

Figure 30. Remains of the lade, distillery wall and floor.



The Lower Craigrie Lade Remains:

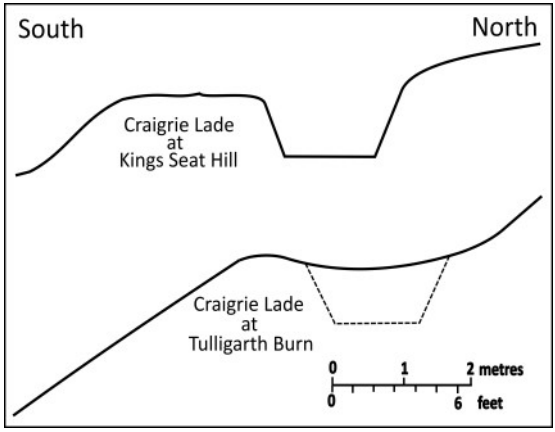
The remains of the lower section of the Craigrie lade were identified by walking up the fence line to the West of the modern blocks of flats at Backwood Court [NS908922]. The fence is on the same line as the one shown on the OS First Edition 25-inch map of 1862 and we were able to confirm the location of the lade [NS 90784 92176] by measuring down from the Tower Park to the edge of the lade. This whole area is underlain by glacial clay, into which the lade has been cut. The lade bed is still evident all the way through the Back Wood as a ditch, contouring the slope. The area has been planted with coniferous trees but, as in the case of the upper section of the lade, they have not been planted in the line of the lade.

A number of recently built pathways cut across the line of the lade. While some have caused minor damage to the lade bed, many of them have been bridged across the lade, leaving the line intact. The network of pathways offers easy access to the line of the lade from the public footpath along an old waggonway through the Back Wood from the B910 next to the Mary Bridge [NS 90852 92253] to the western edge of the Back Wood [NS 90375 92295].

Eventually, the line of the lade crosses over from the Back Wood into the fields of the Craigrie farm, running along the western slope of Kings Seat Hill [NS9039192251] (plate 15). The lade is again cut into the slope, with the material from the cutting being used to create an upcast bank on the downslope edge. This area is a large

grass park with a linear area of trees and bushes along the sides of the lade. In addition, there are still many trees and bushes along the former field boundaries.

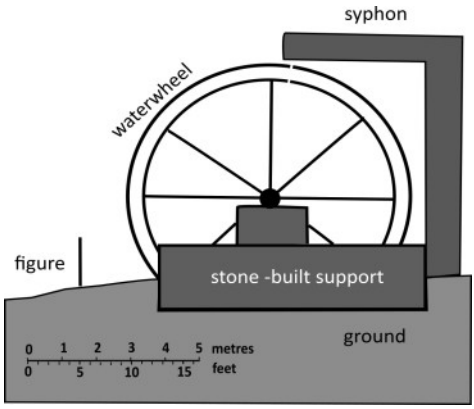
Figure 31. Craigrie lade profiles.



A survey of the lade at this point was compared to one undertaken on the side of the valley of the Tulligarth burn. These surveys reveal that the profiles of the lade were almost identical, with similar methods of construction and a similar sized lade bed, approximately six feet (1.83 metres) wide and some three feet (0.91 metres) deep. These measurements accord with those taken by Ian Russell during the excavation of the lade bridge.

Having finally arrived close to the site of the old Speedwell pit, it was clear that the line of the lade was considerably higher than the site of the pit. Surveying down from the lade to the old waggonway adjacent to the pit site showed a drop of 10 metres (32.81 feet).

Figure 32. 1775 Watermill waterwheel.



A painting of Clackmannan Tower dated 1775 shows a waterwheel at the neighbouring Watermill pit (later the site of the Craigrie pit). There are two figures shown, roughly the same size. Assuming they represent a person of about five feet in height, the diameter of the wheel would have been in the order of 30 feet (just over 9 metres) (Clerk, J., 1775).

The Watermill pit at the Alloa colliery had a wheel of this size. (Frame and Erskine, 1791) The syphon would have needed to be higher than the top of the wheel and the lade even higher still in order to get water to flow down the syphon at a reasonable rate. The use of a large waterwheel was the driver for the lade being constructed so high up the slope of Kings Seat Hill. In order to end up at this height, the lade had to be started as far upstream as Linn Mill.

The lade continues southwards beyond the site of the Speedwell pit for another 350 metres, with many mature trees and hawthorn bushes around it. (plate 16) About 159 metres before reaching the Craigrie farm steading the lade loses its tree cover and has been ploughed out. The extension of the Craigrie quarry and Craigrie pit in the 19th century removed all traces of the lade and syphon. However, the line of the tailrace taking water to the River Black Devon is still in use as a field drain [NS 90457 91457 to NS 90224 91991]. The OS First Edition of the 25-inch map gives indications of the locations of syphons. (OS First Edition 25-inch map, 1861) The lade is shown as entering into the ground at Riccarton and at the end of the lade at the northern edge of the Craigrie farm steading. In both cases the same graphic is used. Two instances of the lade emerging from below ground are shown; at Riccarton and at the site of the Craigrie pit. Again, in both cases, the same graphic is used. This suggests that the Craigrie lade finally entered a syphon at [NS 902523 911720] and ended somewhere in the area of the site of the Craigrie pit [NS 904915].

The Zetland storage tank

Figure 33. Water works and site of the tank.

Old Postcard of Clackmannan Tower, unknown provenance, courtesy of Andrew Wood.

The view in this old postcard was shot from the top of Clackmannan Church tower. It shows the Clackmannan County Council water works (with most of the walls painted white), the cottages at the top of the High Street and the road to Clackmannan Tower. The site of the Zetland storage tank was in the bottom right hand corner of the water works. The road from the

High Street to the Tower still retains its dog leg and the site of the tank is preserved, although much overgrown [NS 90828 91905].

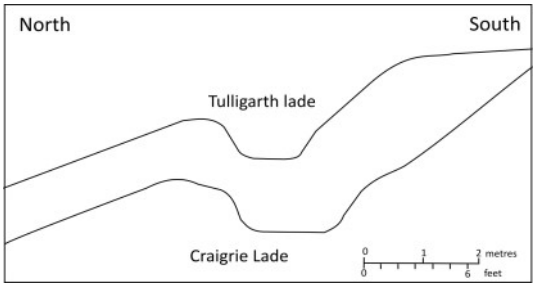
The Tulligarth dam and lade

Parts of the of the Tulligarth lade and the Tulligarth (or Garrison or Gartsank) dam are still visible [NS 931925]. The most northerly section of the dam is almost complete. An examination of the remaining sections revealed that it was an earthen dam (plate 17). Much of the centre section has been severely reduced in height or is missing. The line of the Tulligarth burn now cuts through the dam and stone piers have been built on either side of the cut, possibly to support a bridge. The area of the "*Garrison Dam*" is outlined on the OS Second Edition, 1898, Six inch map as a marshy hollow 16.8 hectares (46 acres) in extent. This is about 30 percent of the size of Gartmorn Dam. The remaining part of the dam head on the North side of the stream is some 15 feet (4.6 metres) above the level of the Tulligarth burn. The Geological Survey Six inch map and Ordnance Survey First Edition 25 inch maps show that by 1861 the area of the Garrison dam had two coal pits sunk into it. These pits were worked by the Clackmannan Coal Company with a connection to the Stirling to Dunfermline railway line.

Figure 34. The Tulligarth dam and lade.

The Tulligarth lade runs parallel with the Tulligarth burn as it exits the wood-covered remains of the dam. The lade continues to follow the valley for a short distance then turns southwards (plate 18). The first Edition OS maps show it reaching Tulligarth farm, but gives no indication that it was in use (OS First Edition 25-inch map, 1861) .

Figure 35. The Tulligarth and Craigrie lades.



The profile of the Tulligarth lade was surveyed and compared with that of the Craigrie lade at the foot of the Tulligarth burn and was found to be considerably smaller in size.

Conclusion

The Craigrie and Tulligarth lade systems were in use by the end of the 17th century as a supply for water mills. The Craigrie lade was created to supply water to one, then later, two waterwheels driving mine drainage engines. The Tulligarth lade might have been supplying water to one, or possibly two, corn mills.

Nearly all of the lengths of both lades were simple cuttings made in glacial clay. Where the lade was running along a slope, the material excavated was used to create an upcast bank on the downslope side. The glacial clay base and sides of the lade bed would have been practically waterproof, particularly where the boots of workmen would have "puddled" the clay (forcing out any air and making the clay more dense and waterproof).

The Garrison, Gartstank or Tulligarth dam appears to have been in use at the time of the construction of the Craigrie lade. The short, relatively narrow Tulligarth lade is out proportion to the very large size of the dam as it it recorded in all of the maps (Roy, Stobie and the First Edition of the Ordnance Survey). All these maps also show a connection between the Garrison dam and the Craigrie lade. It is possible that a smaller dam was originally related to a lade supplying a local mill and was extended when it became associated with the Craigrie lade. Further research would be required to settle this question.

The Craigrie lade appears to have been abandoned as a supply of water for power to the mines on the Clackmannan estate and a distillery in Clackmannan village between 1832 and 1862 when the First Edition 25-inch map shows the pit sites and distillery as abandoned but the open lade still water-filled. There is no historical information about the abandonment of the Tulligarth lade, other than the OS First Edition 25-inch map, which does not show it connected to a water-using site.

The refurbishment of the upper section of the Craigrie lade circa 1866 as a public water supply for the town of Clackmannan was a munificent gesture on the part of the landowner, the 2nd Earl of Zetland. Pumping a supply to the Tower Park was no mean feat at the time. However, the low level of the Craigrie lade at Riccarton was a severely limiting factor. The flow was not sufficient to supply individual houses, but fed a number of street wells or taps in the town. The low level of the Craigrie lade also constrained the development of water powered sites along its course, in contrast with the numerous sites which developed below the higher level Gartmorn Dam. (OS Six-inch map, 1863).

The Ordnance Survey Second Edition 25-inch map of 1896 shows practically no trace of the Craigrie lade, other than the remains of a shaft at the Riccarton where a syphon once started [NS9160892185] and a very small section of lade on the Craigrie farm adjacent to the Back Wood [NS9039792252 to NS9030992180]. However, a surprisingly large proportion of the lade system has survived. The remains have been protected by areas of woodland, steep slopes, poor drainage and chance burial. Areas across open ground to the East of and within the area of the present town of Clackmannan have been lost to ploughing and development. The survival of so many different elements and the existence of rich historical resources have enabled all of the different periods of use to be examined, surveyed and recorded.

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Robert Dingwall, Fiona Graham, Margaret Schofield, Marilyn Scott, David Seaton, Eddie Stewart, Jenni Stewart and Andrew Wood, who worked long and hard, sometimes under difficult conditions, to undertake the research, survey work and analysis;

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Google and Google Books who have made so much previously hard to access material freely available on the internet;
British Newspaper Archive for a source of articles and adverts;
Clackmannanshire Council for their support with library work

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STONE BLOCKS AND IRON RAILS

Andrew Wood and Robert Dingwall

Background

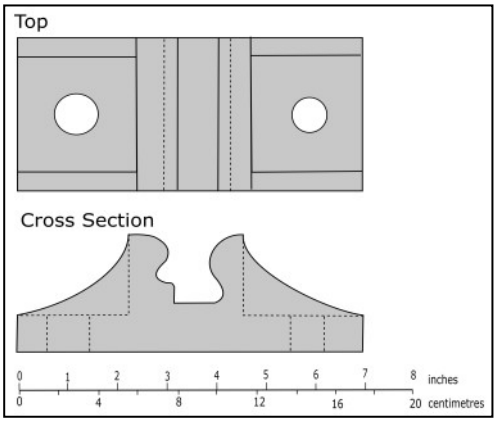
During research undertaken by members of the Clackmannanshire Field Studies Society on the development and decline of the colliery waggonway network associated with several Clackmannan harbours, many roughly finished, rectangular sandstone blocks were found.

Analysis of the finds

A large number had been used to provide strengthening for the wooden structures at Clackmannan Pier on the banks of the river Forth [NS 895903] (See Plate 19). Where both the flat surfaces of these blocks could be examined, all of them had two or more holes drilled into them. Cleaning one of these blocks revealed a pair of holes drilled into the top surface with a sharp-edged, shallow-cut depression around them (See Plate 20). The top of the block was roughly 44 cms x 48 cms and varied from 17 to 19 cms in depth. The drilled holes were 2 cms wide by some 12 cms deep and their centres were 11.5 cms apart. The shallow depression was rectangular in shape (17.7 cms x 8.0 cms). It is likely that this stone block was designed to carry a waggonway rail, with a cast iron chair laid on the block and fixed with metal nails inserted into wooden fillers in the holes. These measurements are very similar to blocks found at Powside [NS 902909] where a considerable number had been used to repair the embankment of Clackmannan Pow (See Plate 21). It is likely that these sandstone blocks were once used to support the rails of the Clackmannan waggonway.

A similar sandstone block was found on the foreshore at Kelliebank, Alloa [NS 877923] (See Plate 22). It is likely that this block was once used as part of the Alloa waggonway. The Second Statistical Account of the Parish of Alloa records that the Alloa Coal Company was formed in 1835 and in the next two years they reconstructed their colliery waggonway network with Bedlington patent edge rails of malleable iron on stone blocks fitted with cast iron chairs (Brodie, W. 1841). The Alloa waggonway at this time was an extensive network transporting coal from a number of pits in the Alloa, Sauchie, Fishcross and Coalsnaughton areas to Alloa harbour. (Carvell, J, 1944) The waggonway also connected to the Devon Iron Works [NS 898958] and carried iron and iron goods from the Iron Works to Alloa harbour (Baxter, B., 1966).

Figure 1. Waggonway chair .



A cast iron chair was found on the site of the former Carsebridge distillery [NS 896935] (plate 23). In 1835 the distillery was linked in to the Alloa Colliery waggonway. The dimensions of the chair (17.7 cms by 8 cms) match the rectangular depressions found on blocks at Clackmannan Pier and Kelliebank.

The Bedlington Patent rail was rolled from malleable iron into single, 15 foot long sections consisting of a number of three foot long "fish-bellied" parts. Cast iron chairs supported the thinnest part of the rail, which increased in depth between supports to provide additional strength (Adamson, J., 1826) The chair found at Carsebridge is designed to hold a T-shaped sectioned rail which has a slightly thicker base on one side to lock into the chair. It is likely that a wooden peg was inserted between the rail and the groove on the opposite side of the chair to lock the rail in place.

A number of stone blocks were found at the car park on the site of the former Tillicoultry station [NS 920966] (plate 24). The rectangular shape cut into the surface of the blocks is larger than those found at Alloa and Clackmannan, suggesting that the rail might have been a much more substantial, possibly supporting a standard gauge railway line. There was a waggonway linking directly into the Devon Valley railway at Tillicoultry station and connecting to coal pits at Devonside and Coalsnaughton (OS, 1861).

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Plate 1.

Columbine or Aquilegia plants growing on the cliffs besides the Back Walk between Mote Hill and the Ballengeich Pass. Inset: a flower **showing the ring of five doves from which the name Columbine is derived (columba latin dove).**

Plate 2.

Plants on the old wall beside Ballengeich Cemetery. The pink flowering plants are Fairy Foxgloves recent introductions and now covering many of the castle walls. The trailing plant between them is Pellitory of the Wall (flower inset) which has been growing on the mortar there since 1830.

Plate 3.

Top left: Wall Flowers growing on the rocks beneath the castle walls. Top right: Hare's-foot Clover on rocks next to the Gun Bastion. Bottom: Star of Bethlehem growing on Ladies Rock one of three sites round the castle.

Plate 6.

Part of a large colony of Tuberous Comfrey or Knitbone on the slopes beneath Cowane's Hospice. It was widely used as a poultice on sores and wounds.

Plate 7.

Cornflower (top left) found growing in the Haining. Right: Lords and Ladies now common in the woodland above the Haining. The purple spadix heats up and emits aromatic substances which attract flies which get trapped in the ensheathing modified leaf. Bottom left: An Orange Tip Butterfly nectaring on Cuckooflower or Ladies Smock in the King's Knot .

Plate 8. Summer 2018, Mean Maximum Temperature 1961-1991 Anomaly.

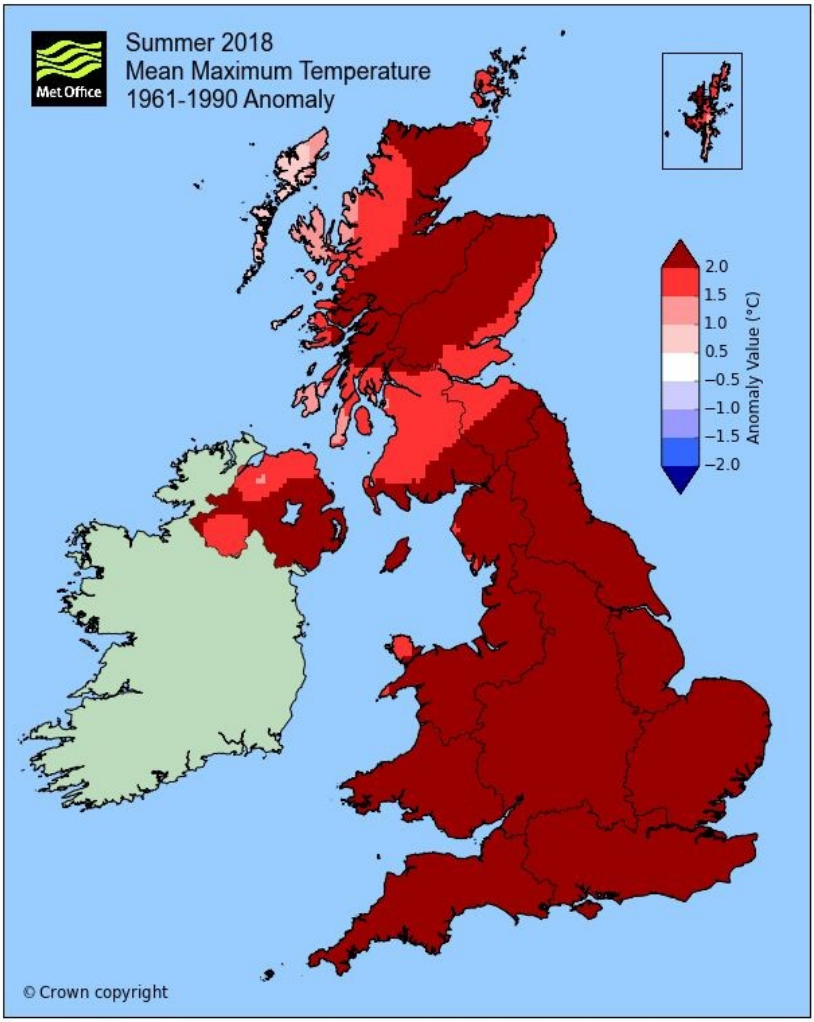

Plate 9. Summer 2018, Rainfall Amount % of 1961-1990 Average.

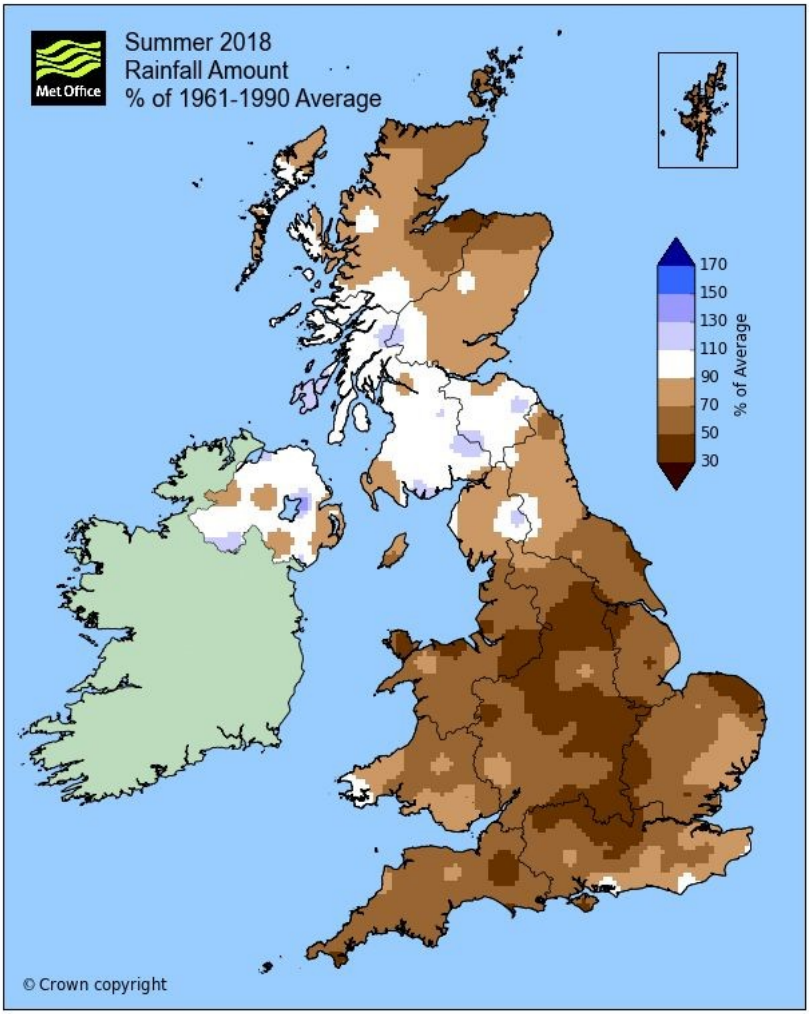

Plate 10. Dunblane and Kirkton Precipitation Totals 2018(mm)

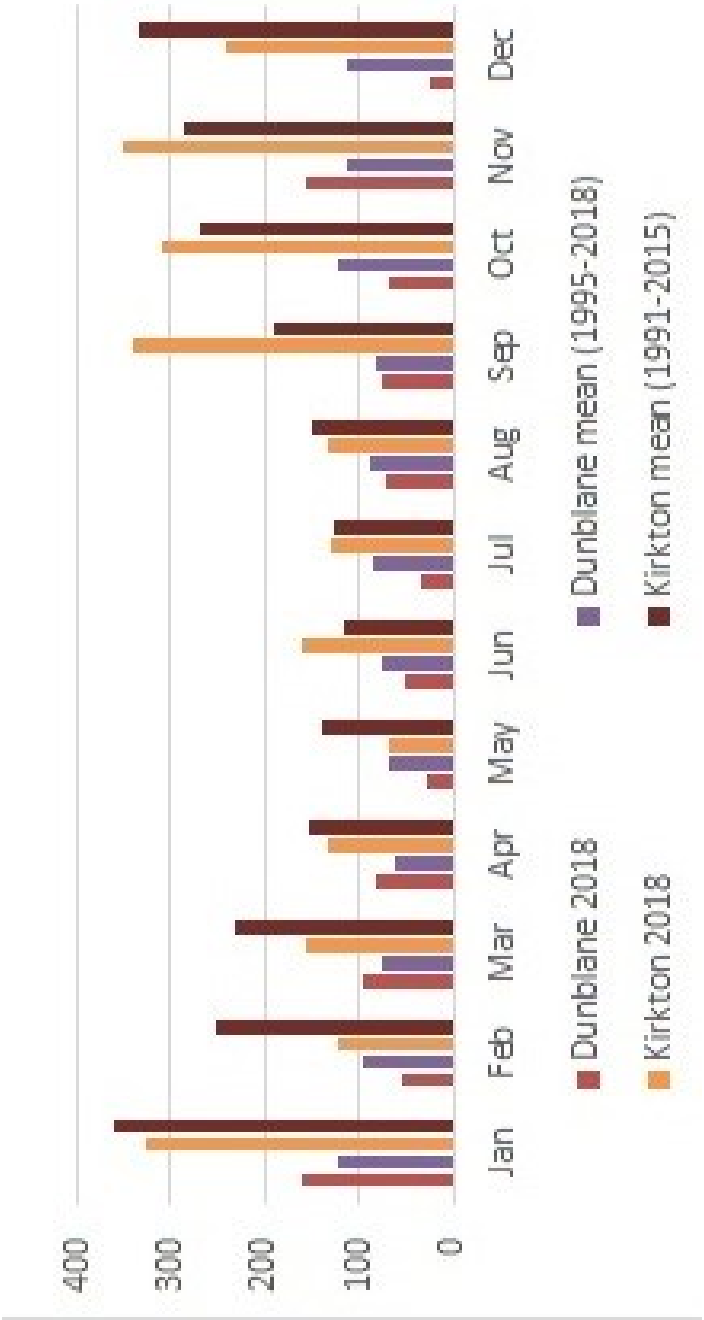

Plate 11. The waterfall at Linn Mill with the remains of the old corn mill wheelpit in the bottom right hand corner.

Plate 12. Leaf litter marking the line of the lade leaving a stone cut ditch to become a ditch cut into the glacial clay cover.

Plate 13. The excavations of the second access point found in the Craigrie lade.

Plate 14. The excavation of the third access point in the Craigrie lade in the valley of the Tulligarth burn showing the manhole, back -filled lade bed and the upcast bank.

Plate 15. The Remains of the Craigrie lade leaving the Back Wood and entering the fields of the Craigrie farm

Plate 16. The remains of the Craigrie lade protected by dense growths of hawthorn on Kings Seat Hill.

Plate 17. The reduced remains of the front of the southern end of the earthen bank of the Garrison dam.

Plate 18. The remains of the Tulligarth lade turning southwards away from the valley of the Tulligarth burn.

Plate 19. Abandoned waggonway stone blocks reinforcing a late 19th century wooden pier at Clackmannan Harbour.

Plate 20. Stone block from Clackmannan Harbour

Plate 21. Stone blocks at Clackmannan Pow.

Plate 22. Stone block from Kelliebank wharf at Alloa harbour

Plate 23. Cast iron waggonway chair found at the site of Carsebridge Distillery, Alloa.

Plate 24. Waggonway stone blocks at the carpark at the former Tillicoultry station.