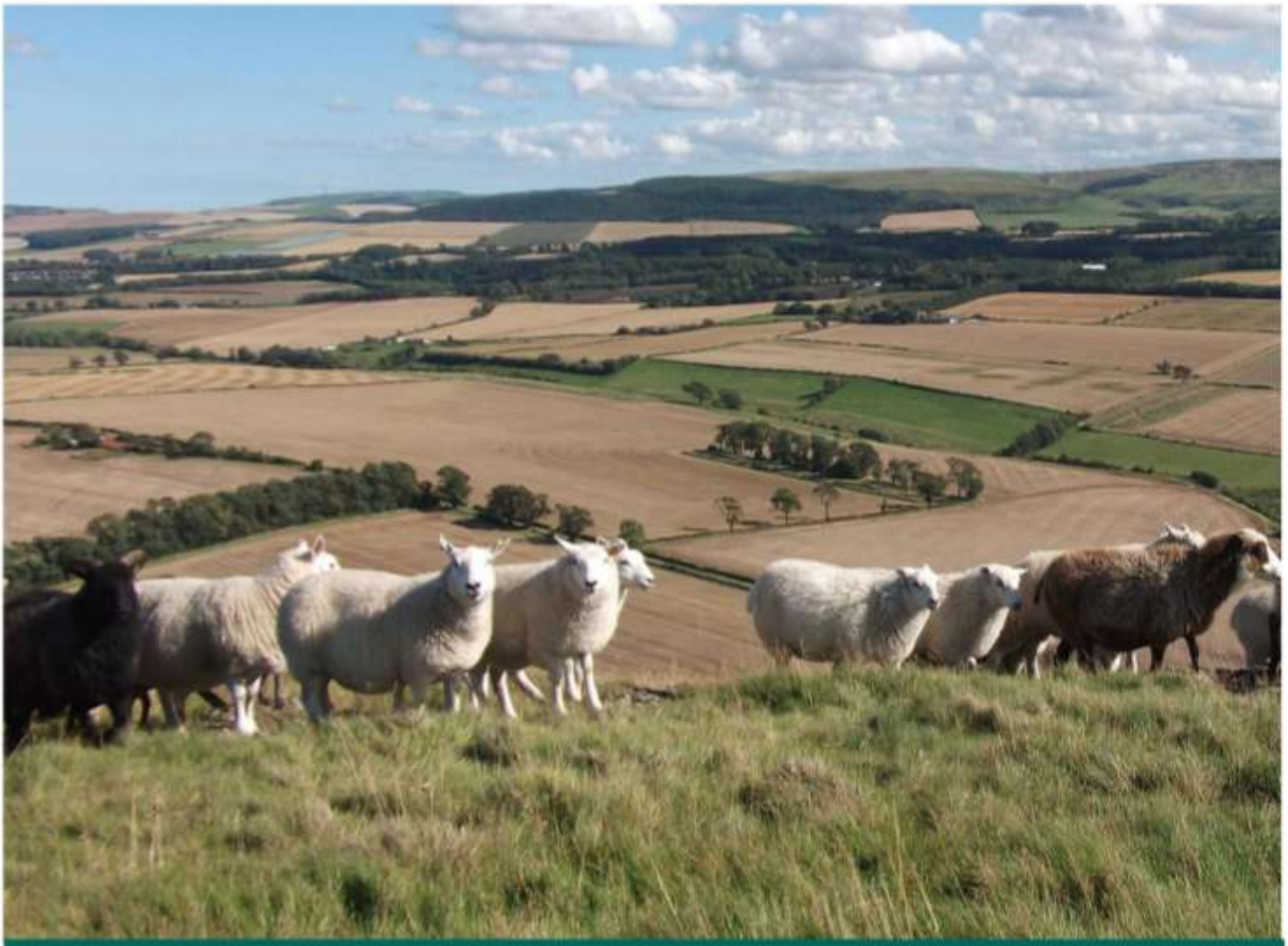
Ten years of the Flying Flock

Scottish Wildlife Trust



a ten-year review of the Scottish Wildlife Trust's Grazing Project

Alistair Whyte (Scottish Wildlife Trust, 2012)

Contents

Front cover image: Laura Cunningham

Acknowledgements

We would like to thank everyone who has been involved in the setting up and running of the Grazing Project over the last ten years. In particular we would like to thank the Conservation Shepherds, Morag Boyd, Tim Brain and Laura Cunningham, as well as the Conservation Managers Andre Thiel and Steve Blow. We would also like to thank the volunteers who support the project by checking the livestock and carrying out botanical monitoring.

Summary

Over the last ten years the Scottish Wildlife Trust's Grazing Project has:

- ***run the only Flying Flock project in Scotland, and has now also established an innovative cattle herd to further improve sites for conservation;***
- ***successfully secured funding from HLF, SNH, landfill trusts, members appeals, donations and legacies;***
- ***grazed Trust reserves in Fife, Falkirk, Stirling, Clackmannanshire, Glasgow and Angus, dramatically improving their condition for biodiversity;***
- ***grazed sites in the wider countryside for a diverse range of organisations;***
- ***developed and implemented a robust monitoring programme;***
- ***generated substantial levels of income through meat sales, covered the costs of grazing external sites and taken advantage of unique marketing opportunities;***
- ***become known as a pioneer in conservation grazing, and disseminated knowledge gained to a wide range of partners.***

Over the next ten years, the Grazing Project will:

- ***continue to successfully manage SSSI features, helping to meet the target of 98% of designated features achieving favourable condition;***
- ***continue to lead the way in demonstrating how conservation grazing can work in practice, and will influence a wider range of partners through innovative techniques;***
- ***continue to generate significant levels of income to fund its activities, and will build successful partnerships with suppliers and customers;***
- ***offset carbon emissions by locking CO^2 into soils and vegetation;***
- ***operate on a landscape scale, bringing Scottish Wildlife Trust and partner sites into favourable condition, generating environmentally-friendly produce and engaging communities.***

Introduction

The more research carried out into species-rich grasslands, the more valuable they appear to be. We have known for many years their intrinsic value for wildlife, and their associated cultural values for the people who visit and enjoy them. Rich, vibrant wildflower meadows, alive with insects and birdlife, are as much a part of the iconic habitats of Scotland as the Caledonian pine forest or the machairs of the West Coast. But in the past few years, more has become known about the added value offered by well-managed grasslands; their capacity as carbon sinks which rival that of woodlands, their role in purifying drinking water, and their value as a habitat for bumblebees, our most important and threatened pollinators.

The key to the survival of any species-rich grassland is in its management, as these are, of course, anthropogenic habitats, created by traditional agricultural practices. In order to be able to conserve these habitats, we need to be able to recreate the conditions which allowed them to flourish in the first place.

The Scottish Wildlife Trust has, for the last ten years, been at the forefront of conservation grazing in Scotland. Starting with 50 sheep and growing the flock to its present day size, the level of expertise developed by the project, both ecologically and practically, through the day to day management of the livestock, has enabled it to punch well above its weight. The project has brought Trust and partner sites into favourable condition, generated income through meat sales (demonstrating that it is possible to graze for conservation and still be competitive in the marketplace) and provided advice to other landowners and organisations. A comprehensive botanical monitoring programme underpins all the grazing work, the results of which have been published in a variety of journals. The project engages with people from all walks of life, and has offered new, exciting ways to become involved in conservation, from helping out as a volunteer shepherd to gathering vital data for the botanical monitoring programme.

The next ten years will see the project continue to grow in terms of its expertise. If circumstances are right, we will also engage with new partners and restore more wildflower-rich habitats across a wider landscape. We will build on the good work already done to maximise the opportunities afforded by the unique value of the produce we generate, from lamb reared on wildlife reserves to nature-friendly wool. We will engage with new research into the value of species-rich grasslands as carbon sinks and will strive to ensure the project is not only carbon neutral, but that it creates a net benefit through the habitats it conserves.

It is telling that one of the most successful appeals the Trust has held to date was for the Grazing Project. The appeal focused on the value of wildflower meadows and the rich variety of wildlife they hold, and clearly struck a chord with a great many people. This is one of the Trust's flagship projects, and we look forward to its continued development over the next ten years.

Part One: Ten Year Review

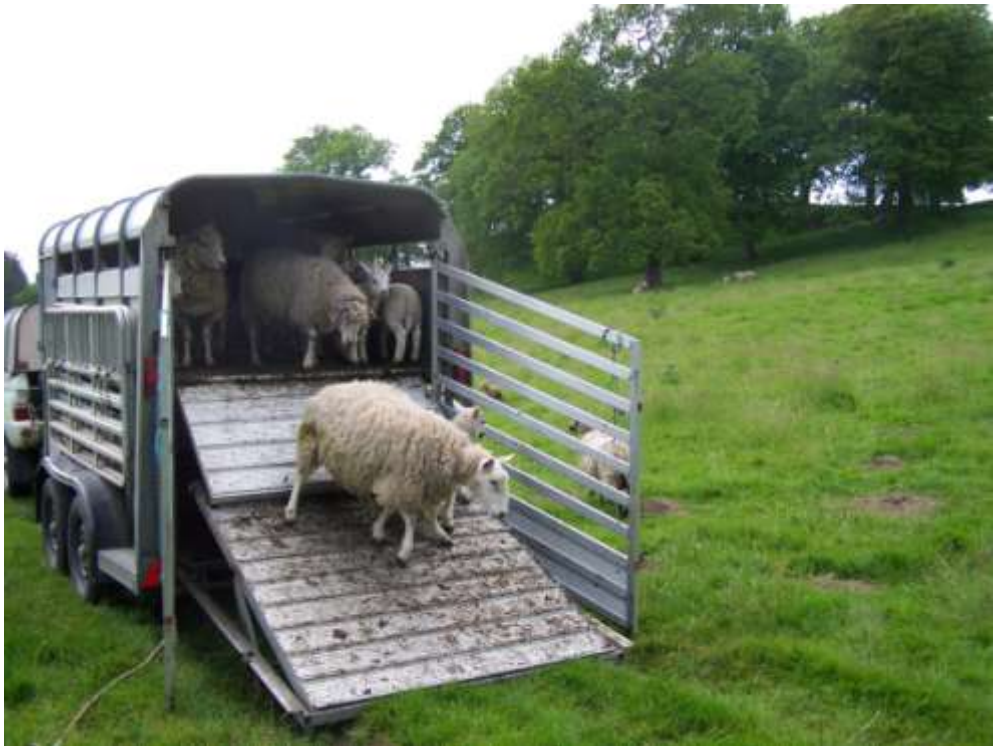
1.1 Establishment of the Flock

The Trust has, for ten years, run the only Flying Flock project in Scotland, and has also established an innovative cattle herd to further improve sites for conservation.

Scottish Wildlife Trust manages a wide range of habitats across its 120 wildlife reserves, 30 of which require some level of conservation grazing to maintain them in good condition.

Prior to 2001, all grazing on Trust reserves was carried out by tenants, local graziers or the original owner of the site. Whilst this was acceptable in some cases, on many reserves this did not achieve the level of control necessary for the maintenance and restoration of habitats. It was difficult to find graziers for some sites and lack of control over stocking densities and timing of grazing made it difficult to improve the reserves.

In 2001, the opportunity arose to develop a grazing project for the Fife reserves, using Heritage Lottery Fund (HLF) funding. The project employed a shepherd who purchased 50 Shetland sheep from Orkney in the winter of 2001/02. A four-wheel-drive crew-cab vehicle and a double deck stock trailer were purchased for daily transport and for moving stock between sites. A mobile handling system for gathering, penning, foot-bathing and sorting sheep was also purchased along with a quantity of electric fencing to concentrate grazing on particular parts of larger sites. The project cost approximately £55,000 to set up and approximately £30,000 per year to run.



Unloading sheep from the Trust's stock trailer.

The flock was initially established using Shetland sheep. More recently, the Shetlands have been crossed with Cheviot and then Texel tups to produce more commercially viable lambs. Some Hebrideans were also bought in 2004 specifically to tackle birch regrowth.

The size of the flock grew from the original 50 sheep to over 400 in 2008. Since that time, the number of animals has been reduced to around 180, to meet spending cut targets and to enable a more streamlined approach to managing the project.

As well as Trust reserves and partner sites, the Trust also rents a small area of high quality grazing land to aid lamb development and stock welfare. As the area of suitable grazed land for partners increases, we hope to reduce reliance on this lay-back land, with associated reduction in rent costs.

In 2010, the Scottish Wildlife Trust acquired its first cows, and we are now growing the herd of Shetland cattle at a slow, sustainable pace. Diversifying into cattle as well as sheep allows us to tackle different or more unfavourable habitats, and to trial new techniques, enabling comparisons to be made between the different types of grazing. At a time when several other organisations are looking into the possibility of establishing a Flying Flock project using sheep, this diversification once again puts the Scottish Wildlife Trust in the position of a pioneer, and consolidates our reputation as an innovative leader in the field.

1.2 Funding

The Grazing Project has successfully secured funding from HLF, SNH, landfill trusts, members appeals, donations and legacies.

The set-up and running costs of the Flying Flock for the first five years were funded through the Heritage Lottery Fund (HLF). Subsequently Scottish Natural Heritage (SNH) provided two years of funding through their Biodiversity Action Grants scheme. This was supplemented by a Scottish Wildlife Trust members' appeal (Glorious Grasslands), which raised £32,000 and was one of the most successful ever Trust appeals.

Following the appeal, the Trust's Conservation Committee took the decision to treat the project as a core cost, rather than a time-limited project.

The project secures regular funding from a range of agri-environment measures at this time Scottish Rural Development funding has been secured from 2010 to 2013. This does not cover the costs of running the flock but does cover associated reserve works and improvements carried out by the flock. Land Managers Options funding is used to fund specific works on reserves to support the project. The Single Farm Payment constitutes a small contribution towards running costs.

Funding has also been received from landfill trusts which distribute landfill tax monies to environmental organisations in specific areas.

Funding is frequently received in the form of one-off donations or legacies. The practical nature of the work, providing real conservation benefits on the ground, the positive impacts, which are

highly visible, and the evocative nature of the wildflower meadows which benefit, all make the project a popular choice for donors.

1.3 Grazing Trust Reserves

The Grazing Project grazes Scottish Wildlife Trust reserves in Fife, Falkirk and Angus, and is dramatically improving their condition for biodiversity.

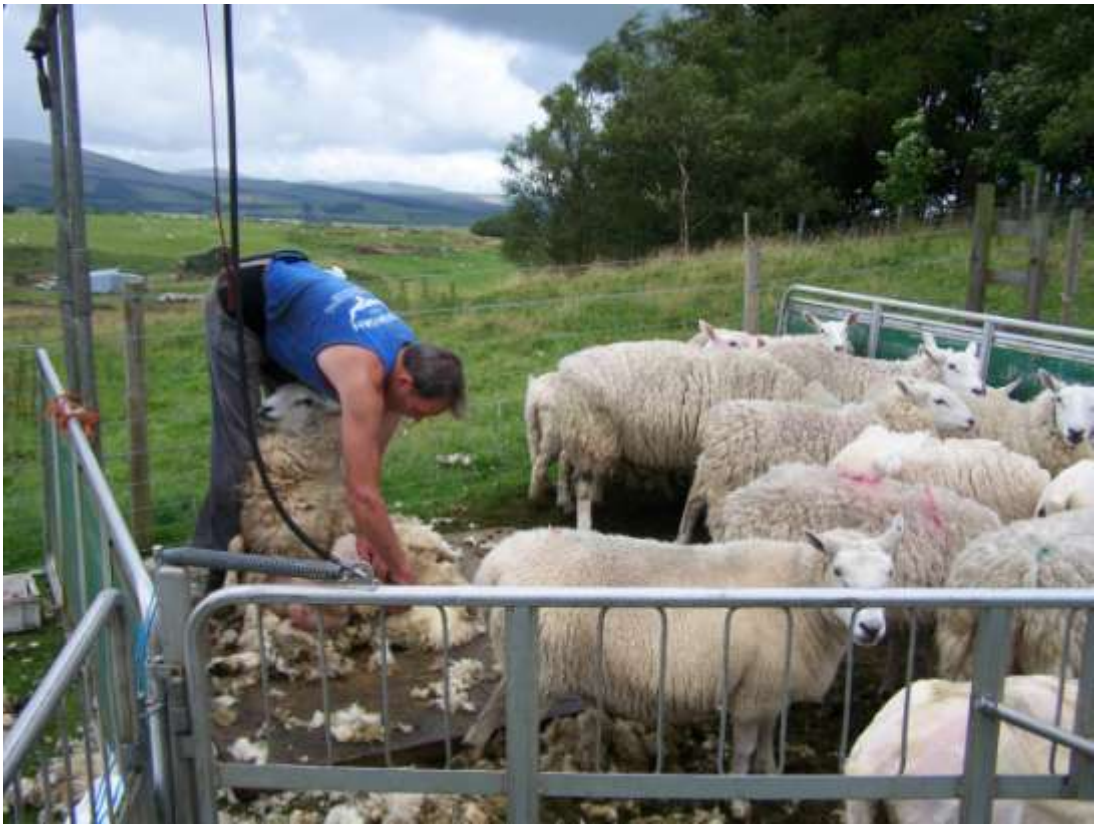
The primary purpose of the project is to improve the condition of Trust reserves through controlled grazing. Species-rich grasslands require grazing to maintain and improve their condition. The flexibility of directly owning a flock, rather than relying on external graziers, allows for a very high level of control over the timing of grazing and stocking densities.

Initially, grazing was carried out following the accepted regime of autumn and winter grazing, with stock being removed from the sites during the spring and summer to allow flowers to set seed. Grazing was carried out at Fleecefaulds, Cullaloe, Lielowan and later Kilminning Coast and Bankhead Moss.

Results from the monitoring programme (see Appendix A) and further advice from SNH suggested that the autumn/winter grazing regime was not having the desired impact on the sites. New research suggested that the germination period was the most critical to establishment of new seedlings, and a decision was taken to graze each reserve to a more site-specific regime, with light summer grazing being included in the programme. Having the ability to alter stocking densities and timings of grazing at short notice and with a high degree of control has enabled the sites to move towards favourable condition.

Since its establishment, the Grazing Project has extended its range and now includes reserves in Falkirk (Bo'mains Meadow), Clackmannanshire (Cambus Pools), South Lanarkshire (Cathkin Marsh) and Angus (Montrose Basin).

The monitoring programme which runs alongside the Grazing Project (see 1.5) allows us to assess the impact of our interventions. The interactions between different factors which influence diversity on a species-rich grassland are notoriously difficult to analyse, but trends can be seen by assessing the data produced by the monitoring programme. Since grazing began, we have begun to see a trend towards a more floristically diverse sward on all sites. Positive indicator species are increasing in number, whilst negative indicators are decreasing. SNH has reclassified SSSI sites from unfavourable to recovering, and, whilst some sites are moving more slowly towards good condition than others, the trend is universally in the right direction. This is something which could not have been achieved using external graziers. The detailed control of stock levels and timings is essential in order to achieve favourable condition on grassland sites.



Shearing takes place each June.

1.4 Grazing External Sites

The Grazing Project grazes sites in the wider countryside for a diverse range of organisations.

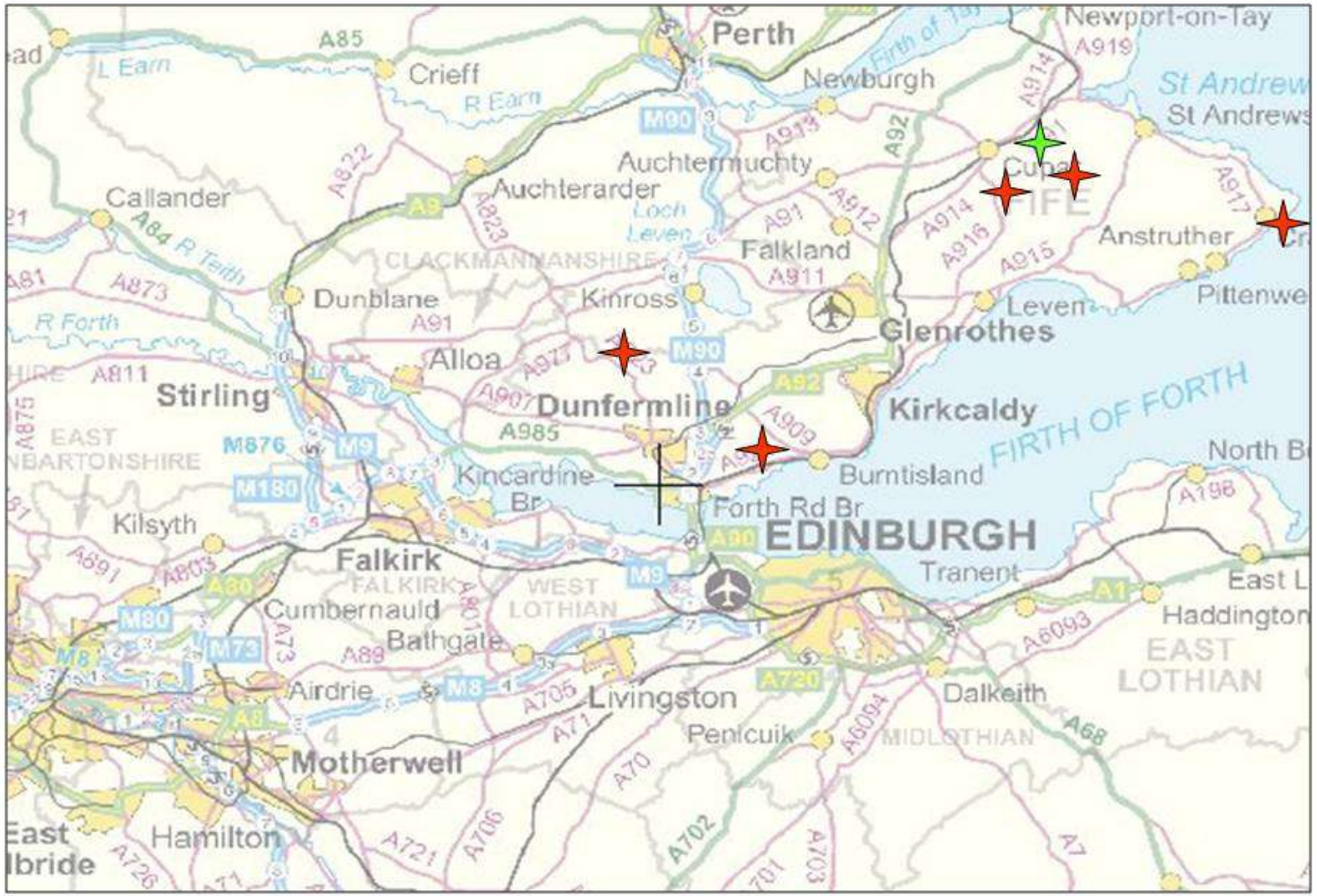
It became clear early in the project that as well as developing a level of expertise about conservation grazing, the Trust had a resource which could be used to bring sites in the wider countryside into favourable condition. Partnerships were formed with Fife and East Lothian local authorities to graze publicly-owned species-rich grasslands. By 2011 this approach had grown to encompass a wide variety of land managers in the wider countryside, and the flock can now be found managing sites as diverse as a former opencast coal site and a community-owned wildflower meadow (see Appendix C). This raises the profile of the project and of the Scottish Wildlife Trust in the wider countryside.

The following three maps illustrate the original sites grazed by the project, the sites grazed in 2008, and the sites grazed in 2011. The increase in sites grazed over the first few years of the project can clearly be seen, along with the reduction in 2011 as the project was refocused. At each stage of the project, the fact that such a wide range of sites has successfully been grazed, with good ecological results, on such a limited budget, is noteworthy.

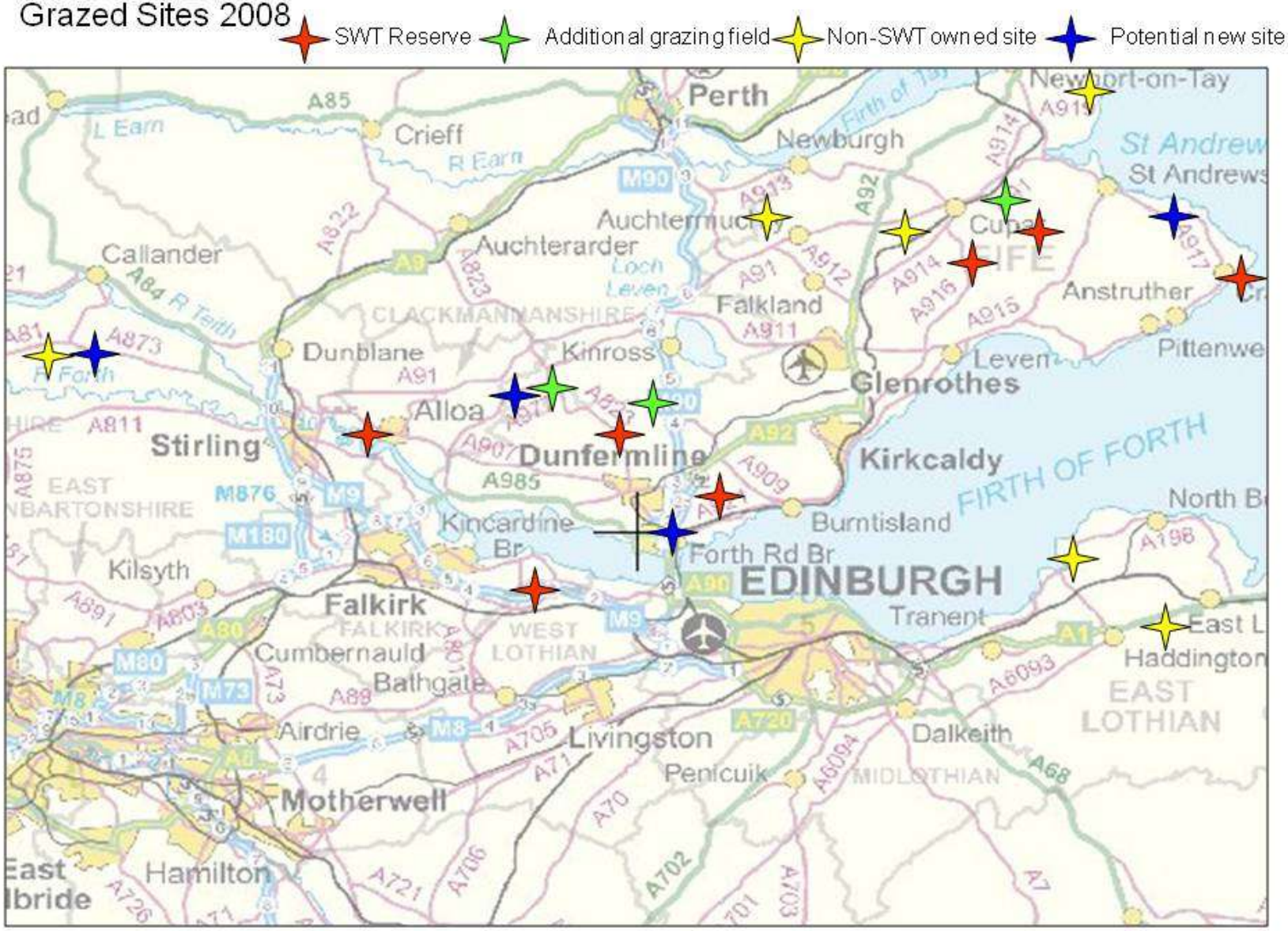
Original Grazed Sites

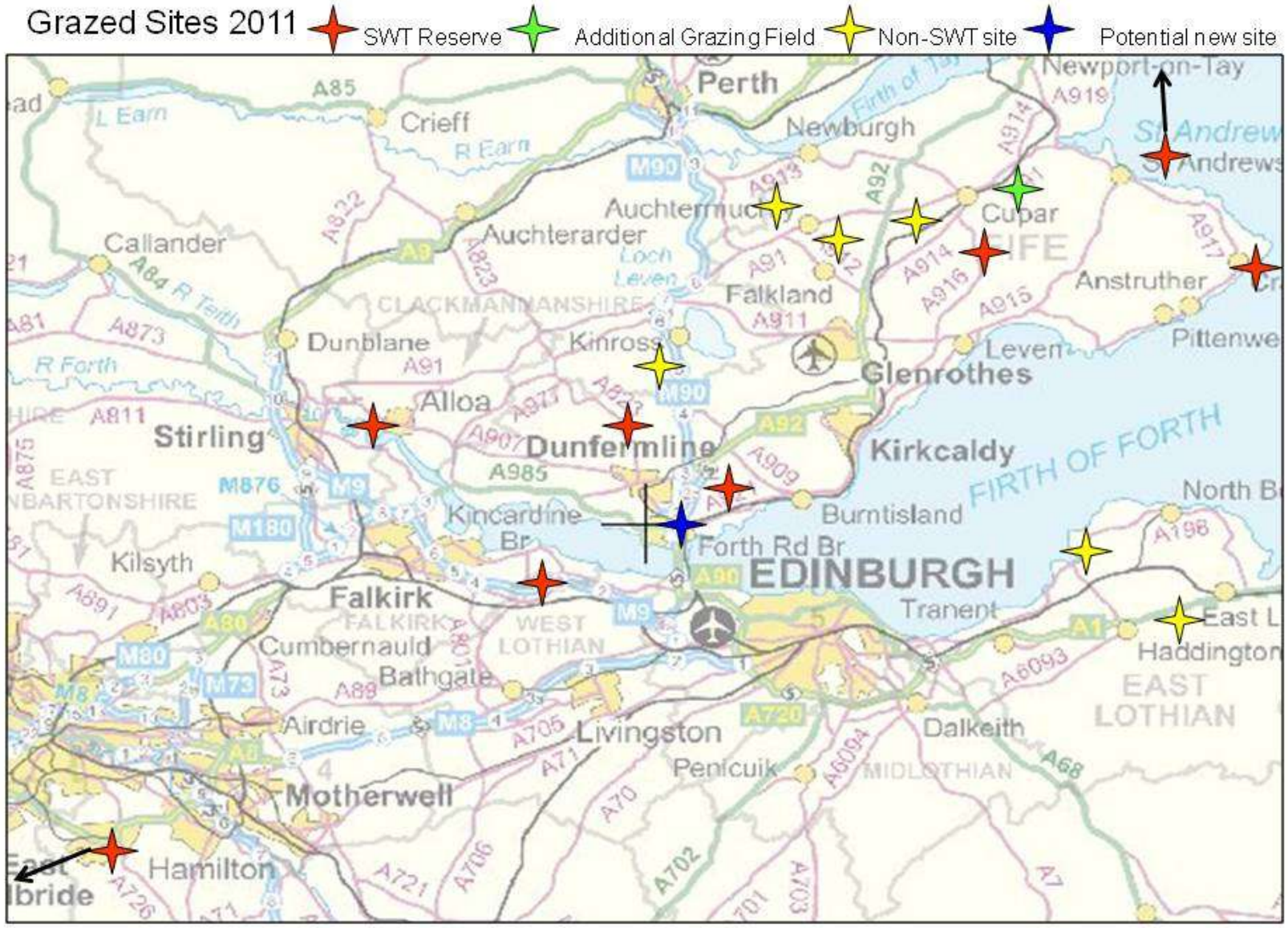
SWT Reserve

Additional grazing field



Grazed Sites 2008




Grazed Sites 2011
SWT Reserve
Additional Grazing Field
Non-SWT site
Potential new site
Perth
Crieff
Newburgh
Newport-on-Tay
Auchterarder
Auchtermuchty
Cupar
Callander
Falkland
Anstruther
Dunblane
Kinross
Glenrothes
Alloa
Stirling
Dunfermline
Kirkcaldy
FIRTH OF FORTH
Kincardine Br
Burntisland
Forth Rd Br
EDINBURGH
Kilsyth
Falkirk
Tranent
Cumbernauld
Bathgate
Haddington
Airdrie
Livingston
Dalkeith
Motherwell
Penicuik
Hamilton
CLACKMANNANSHIRE
WEST LOTHIAN
EAST LOTHIAN
MIDLOTHIAN

1.5 Monitoring Programme

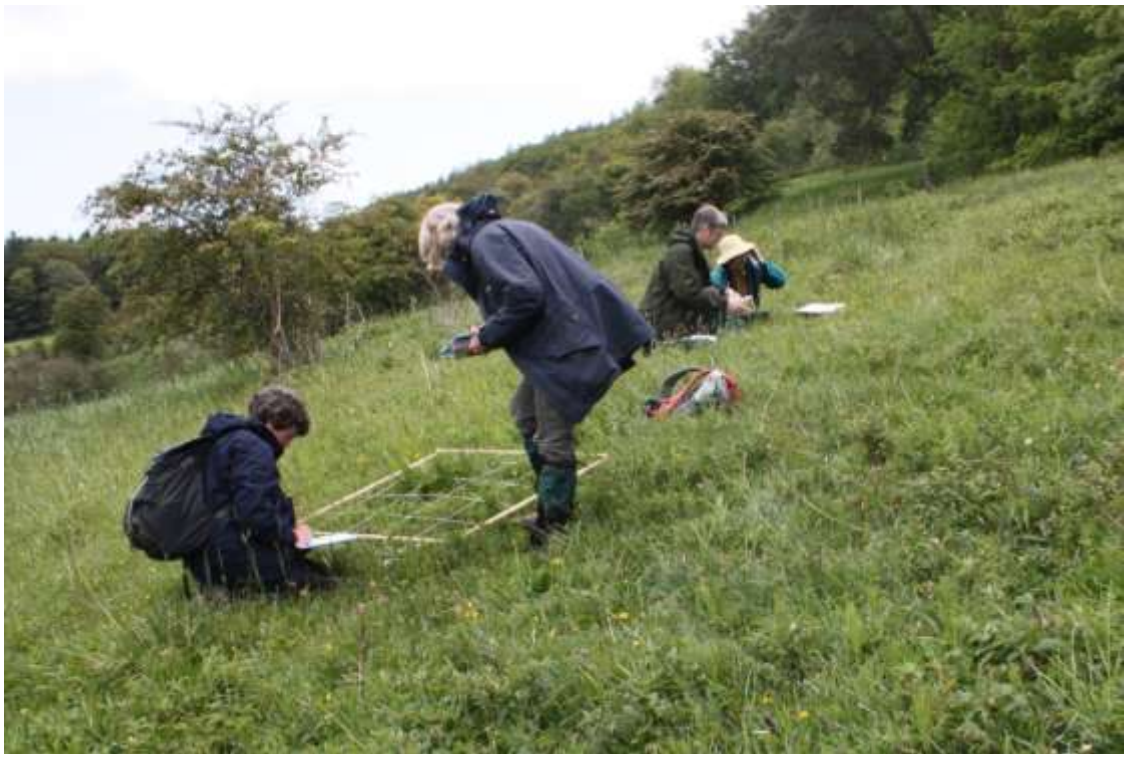
The practical implementation of the Grazing Project is underpinned by a robust monitoring programme.

From its establishment ten years ago, it was recognised that the Grazing Project must be supported by a monitoring programme to assess its impacts. Two methodologies were employed – quadrat monitoring, using fixed quadrats and identifying all species within them, and transects, following the nationally recognised Site Condition Monitoring System developed by the Joint Nature Conservation Committee (JNCC) and used to assess SSSI condition.

The quadrat monitoring technique provides a detailed level of information about all species present on a site, and gives good comparable data from year to year. The transect method is a simple technique using the presence or absence of indicator species as well as indicators such as sward height, bare earth etc to assess the condition of a site. It generates high-quality comparable data which can be gathered simply with basic training, and which, when analysed, can provide a robust assessment of a site's condition.

Initially contractors were used to carry out the monitoring. Since 2010, Trust volunteers, trained by professional botanists, have carried out the monitoring. This has proved both economical and an effective way of engaging local people in species-rich grassland sites. Contractors will be employed once every five years to carry out in-depth analysis of the sites, with volunteers carrying out annual monitoring.

Botanical monitoring results for Trust sites are summarised in Appendices A and B.



Volunteers monitoring Fleecefaulds Meadow Wildlife Reserve.

1.6 Marketing and Income Generation

The Grazing Project generates significant levels of income through meat sales, meets the costs of grazing external sites and takes advantage of unique marketing opportunities.

As an agricultural operation, the grazing project generates products (meat and wool) which can be sold, the income being returned to the project. Since its establishment, the project has grown these commercial operations and now offsets more of its running costs than ever before. Meat sales account for the greatest level of income, with around £10,000 being generated each year by sales through agricultural markets and direct to consumers. Meat prices are subject to significant fluctuations, meaning that the project cannot rely on this source of income at this level. However, through careful stock management and introduction of commercial techniques and practices, the project successfully demonstrates that it is possible to produce commercially viable, competitive products to supply the marketplace.

Wool is a by-product of the grazing project. Wool prices are extremely low (although they have risen slightly recently), which means it is difficult to meet the cost of shearing and certainly to generate a profit from the annual shearing which takes place for animal welfare reasons. However, the project has taken advantage of opportunities to raise awareness of the Flying Flock through marketing wool in innovative ways. Some wool is sold directly to the Wool Marketing Board, for very little return. Over the last three years however Shetland and Hebridean wool has been spun and packaged by the Wool Shed, an Aberdeenshire-based retailer specialising in supplying wool for knitting. The Flying Flock wool is then sold on the Wool Shed's website and in all of the Scottish Wildlife Trust's Visitor Centres. This generates a modest level of income, but is invaluable in raising the profile of the project

The Trust grazes partners' sites when capacity allows. There is always a cost to the Trust in undertaking this work, both in staff time and in animal care, vet bills, fuel and feed. The project recoups this cost from partners by charging a fee for its services.

1.7 Providing Advice

The Grazing Project is recognised as a pioneer in conservation grazing, and disseminates knowledge gained to a wide range of partners.

The Grazing Project has over the last ten years become known as an innovative and ground-breaking way of managing species-rich grasslands. Regular events have been held and attended to disseminate the knowledge gained and to influence partners, share good practice and promote the benefits of grazing schemes. Attendees at such events have included Scottish Natural Heritage area officers and policy officers, Scottish Government staff, representatives from organisations in Northern Ireland and England, private landowners and land agents. In addition to this, the project has been written about widely in a range of publications. Articles by Trust staff have appeared in Grazing Advice Partnership (GAP) newsletters (the national publication for conservation grazing) and *Conservation Land Management.* A paper analysing the results of the monitoring programme was published on *ConservationEvidence.com,* a peer-reviewed online journal, with a subsequent summary being published in *British Wildlife* (see Appendix E).

Promoting the project - Flying Flock event held at Montrose Basin Wildlife Reserve.

1.8 Lessons Learned

The key lesson which has been learned over the last ten years has been the necessity to have direct control over grazing levels and timings, and the ability to alter these for ecological rather than operational reasons. All sites respond differently to grazing regimes, because of the myriad other factors which affect species diversity. If grasslands are to be managed for species richness, this direct control is vital.

The need to maximise income from the project can lead to conflicts between grazing for conservation and grazing for profit. The key here is to achieve a balance between the aims, while never losing sight of the primary importance of conservation as the main aim of the project. Early experiments in traditional breed versus more commercial breeds have indicated that there is little difference in the grazing patterns between breeds. This has meant that the project has been able to move away from the less commercial breeds to more competitive breeds with no reduction in conservation outcomes, but increased returns on meat sales. This evidence would suggest that breed of sheep used is much less important than has previously been thought to be the case.

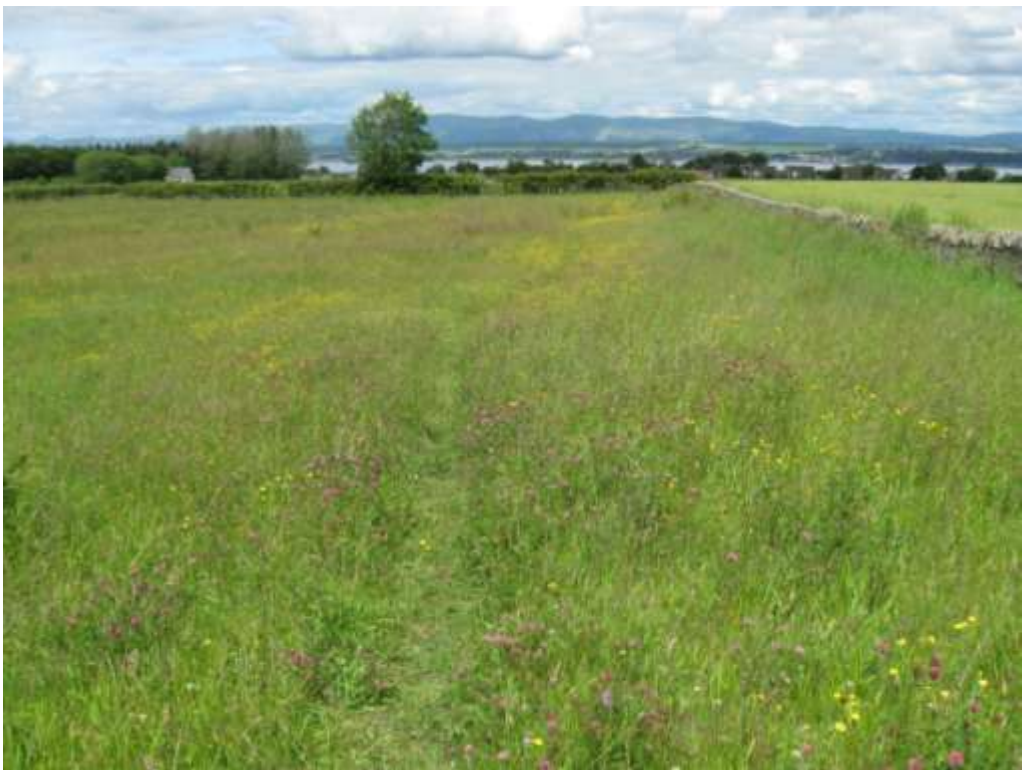
It has become clear that the meat generated from the project not only stands up commercially, but also has an intrinsic appeal due to the way it has been produced. 'Conservation Lamb', the purchase of which goes to help manage wildlife reserves, is proving very popular, and more could be made of this unusual and interesting marketing 'hook'. The Trust's marketing department are looking into options for developing this further.

The project is as sustainable as any ecological intervention, and indeed could be argued to be more so due to the revenue it generates. It requires a consistent input of resources, comparable to any intervention which manages a habitat in a mid-successional state.

By reducing the external sites grazed in 2010/11, the project has been able to become more focused and efficient. This will mean increased stock levels available for reserves. New partnerships will be entered into if financially viable for the Trust, and if operationally viable for the project. In practice, this means that new partnerships are likely to be in Fife or the Lothians, and will be dependent on adequate funding being available. New opportunities such as the Lothians Grazing Scheme, currently being drawn up by SNH, and projects implementing the new Fife LBAP, have the potential to develop the role of the Grazing Project in the wider landscape.

Controlling costs is an important factor in the project, particularly where expenditure is subject to unpredictable variances. These are largely due to extreme weather conditions. Over the last two winters prolonged snow cover has meant that stock have been unable to graze reserves, and have relied on supplementary feeding, which is very costly. Costs can be reduced by reducing the number of livestock before the winter, but this has implications for grazing reserves and partner sites at sufficient densities to be effective.

The project is also subject to increases in fuel prices. By its very nature, the project relies on being mobile, managing sites across a wide geographical area. Transport costs have been reduced by focusing effort primarily on the Fife sites, and by using local volunteers to carry out daily stock checks. Fuel costs are also reduced by having a small, fuel efficient vehicle for stock checking, reducing reliance on the more expensive Landrover. When weather conditions are poor however, given the location of many of the reserves, the Landrover is the only safe and effective method of transport.



Species-rich wildflower meadow at Bo'Mains Wildlife Reserve.

Scottish Wildlife Trust Grazing Project SWOT Analysis

Strengths

- Dedicated, highly skilled project staff member
- Support structures within the Trust (finance, marketing etc)
- Support of members
- Robust evaluation
- Support of key partners e.g. SNH
- Volunteer support
- Unique product in lamb and wool
- Wide recognition of project

Weaknesses

- Lack of long-term funding
- Sites scattered across wide area
- Variable levels of income subject to external market pressures
- Single project staff member, meaning reliance on contractors during annual leave/sick leave
- Additional pressures on Reserve Manager time available to dedicate to project

Opportunities

- SRDP and other funding schemes
- Partnerships with other organisations/landowners
- Further grow lamb and wool sales, in particular capitalising on the unique nature of the products
- Developing expertise in cattle grazing
- Demonstration opportunities surrounding commercial meat production on conservation sites and carbon capture on grassland sites

Threats

- Changes to SRDP
- Reduction in other funding streams
- Market fluctuations
- Specialised project staff member, difficult to replace
- Disease outbreak (e.g. foot and mouth)
- Fuel and feed prices

Part Two: Vision for the Future: Contributing to the Trust's Strategic Framework

2.1 Achieving Favourable Condition on Trust Reserves

The Grazing Project will continue to successfully manage SSSI features, helping to meet the target of 98% of designated features achieving favourable condition.

As demonstrated by the monitoring programme, the sites managed by the Grazing Project have benefited from the direct control of grazing, with the ability to alter stocking densities and timings solely for ecological benefit. Sites grazed are moving towards favourable conservation status. The Trust's new strategic framework runs from 2012 – 2017. Over the course of this period the Grazing Project will help to meet the Trust's Strategic Framework aim of achieving 98% of designated features in favourable condition. Through the expansion of the cattle herd the project will be able to graze a more diverse range of sites, and we will continue with a monitoring programme which demonstrates the impacts achieved. The project will continue to work closely with SNH, both at an area level, regarding specific SSSIs and also at a national level, through SNH's policy and advice departments.

2.2 Demonstrating Best Conservation Practice

The Grazing Project will continue to lead the way in demonstrating how conservation grazing can work in practice, and will influence a wider range of partners through innovative techniques.

The Grazing Project has developed significant levels of expertise both in the practical and scientific aspects of conservation grazing. We will continue to publish the scientific results of our grazing and monitoring programme in a range of publications. We will build on past successful events by showcasing the new techniques we are developing, particularly in the area of generating income from a flying flock and the use of a mobile cattle herd. We will continue to promote the benefits of the project, maintaining our high profile and enhancing the reputation of the Scottish Wildlife Trust.

2.3 Marketing and Income Generation

The Grazing Project will continue to generate significant levels of income to fund its activities, and will build successful partnerships with suppliers and customers.

Over the next ten years the project will grow the income generated from its activities. Meat will be sold through the markets as is currently done – in addition to this we will develop direct relationships with customers to maximise the opportunities afforded by our high welfare and conservation standards. We will work closely with Trust's marketing team to develop these opportunities, and will market produce to high-profile customers such as restaurants able to promote the project and the Trust as a whole.

We will continue to work with partners on sites in the wider countryside. Where financially and operationally viable for the project, we will enter into partnerships which bring external sites into good condition. We will also make the most of the opportunities afforded by these partnerships to raise the profile of the project, both to maximise sales and promote the work of the Trust. The Grazing Project will be a highly visible and recognisable provider of conservation grazing across its operational area.

2.4 A Sustainable Solution: Species-rich Grasslands as Carbon Sinks

The Grazing Project helps offset carbon emissions by locking CO^2 into soils and vegetation.

Species-rich grasslands are vital carbon sinks, sequestering CO^2 which would otherwise enter the atmosphere. New research is showing that grasslands can store as much CO^2 as woodlands per hectare (up to 3 tonnes per hectare). Although the Grazing Project creates CO^2 through fuel emissions, this is offset by the carbon sinks which the project manages and enhances. We will engage with new research and assess in detail the level to which our species-rich grasslands are operating as carbon sinks. This is an exciting new area for the project, and will look at the real large-scale environmental benefits of schemes such as the Grazing Project.

2.5 A Living Landscape

The Grazing Project operates on a landscape scale, bringing Trust and partner sites into favourable condition, generating environmentally-friendly produce and engaging communities.

The Grazing Project is in a unique position to develop and implement the Living Landscape approach to conservation. The successes of managing the Trust's own sites means that we have a network of biodiversity 'hotspots', vital for populating ecological corridors and links between sites. The project also works in the wider countryside, grazing sites for partners, offering advice and expertise, and promoting the value of species-rich grasslands. The Trust has, because of the Grazing Project, been invited to be part of the process of developing the new Fife Local Biodiversity Action Plan, which will, for the first time, take a landscape-scale approach to ensure ecological coherence across the area. The Trust will be an important partner in this process, strategically and operationally.

Through the marketing of its produce, the project demonstrates the links between land use and food. It champions local production, and engages people in their local landscape. Running an agricultural operation on the ground also puts the Trust in a strong position when it comes to lobbying and influencing government on wider countryside issues such as, for example, Rural Development Priorities or CAP reform. Our voice is strong and authoritative because we have the practical experience to support our campaigns.

Appendix A

Scottish Wildlife Trust SSSI sites responses to grazing regimes

The following reserve summaries are based on data gathered by the botanical monitoring programme following SSSI Site Condition Monitoring guidance. Full monitoring results for each reserve are held on file and are used to assess the detail of trends. These summaries focus on indicator species and sward heights.

Kilminning Coast

Kilminning Coast Reserve (10.8ha) consists of a 1km long and ca. 100m wide strip which sits for most part between a wave-cut platform, which is backed by two main features: (i) beach-head sand and shingle deposits and (ii) a raised beach on top of a broad cliff slope and old cliff line at ca. 7 m altitude. In between the vegetation consists of small areas of coastal and wetland habitats and, further inland, unimproved grassland, while blackthorn scrub dominates the centre of the reserve. These habitats support strandline, saltmarsh, fen, lowland heath and neutral grassland communities of European and national importance

The site is divided into three compartments. Compartment 1 (6.28ha) in the southern section consists predominantly of neutral grassland. Compartment 2 (0.64ha) in the centre of the reserve consists of an area of dense blackthorn scrub, while compartment 3 (3.83ha) in the northern section of the reserve consists of a mixture of neutral grassland, gorse and blackthorn scrub and bracken.

The decision was taken to manage compartment one for its neutral grassland, leaving compartments 2 and 3 to revert naturally to coastal scrub communities. This provides a variety of habitats and interest on the reserve and focuses grassland management.

Grazing was initially restricted to the autumn and winter, at medium to high density. This resulted in some improvements to condition, but did not reduce sward height and litter sufficiently for it to be classified as favourable. Initial monitoring following the introduction of grazing raised concerns that common knapweed *Centaurea nigra* was being lost through grazing; monitoring in recent years has suggested that if grazing is increased, the floristic benefits will outweigh any reductions in this species.

Consequently, a decision has been taken to graze the site throughout the spring and summer in an attempt to reduce the sward height and coarser species. This regime will be kept under review and altered as necessary.

In 2011, planned summer grazing had to be cancelled due to the presence of travellers adjacent to the reserve, and the associated risk of dog attacks on sheep. Having already lost three sheep to dogs under these circumstances, the risks were too great. This was disappointing, as the grassland would benefit greatly from this increased level of grazing. The Trust is working closely with Fife Council (who own the site) to remedy the situation, with a view to continuing with the summer grazing regime in 2012.

Grazing Regime

2003: late summer/autumn/winter
2004 - 2005: late summer/autumn

2006 - 2008: autumn
2009: autumn - spring – summer
2010: autumn – winter – spring
2011: autumn - winter

3.7 – 11 sheep/ha

Kilminning DAFOR monitoring summary							
	2003	**2004**	**2005**	**2008**	**2009**	**2010**	**2011**
Positive indicator species/taxa							
Agrimonia eupatoria agrimony				R	R	R	R
Carex spp. (*C. flacca, C. nigra, C. panicea*)				R	R	R	R
Centaurea nigra common knapweed	R	R	F	F	F	O	O
Filipendula ulmaria meadowsweet				R	R	O	R
Galium verum lady's bedstraw				R	R	O	
Hypochoeris radicata cat's-ear				R	R	O	R
Lathyrus pratensis meadow vetchling				R	R	R	O
Lotus corniculatus bird's-foot-trefoil	R				R	R	O
Orchidaceae orchid spp.				R	R		R
Rhinanthus minor yellow rattle					R		
Succisa pratensis devils'-bit scabious			R				
Negative indicator species							
Anthriscus sylvestris cow parsley	R	R					
Cirsium arvense creeping thistle	O	F	F	F – A	R	O	R
Cirsium vulgare spear thistle				R	R		
Equisetum arvense field horsetail						R	R
Galium aparine cleavers	R	R	O	R	R	F	F
Rumex crispus curled dock			R		R		
Rumex obtusifolius broad-leaved dock			R			R	
Senecio jacobaea common ragwort				O	R	O	R
Urtica dioica stinging nettle	R	R	O – F	F	R	R	R
Holcus lanatus Yorkshire fog	A	A	F	F – A	O	F	A
Lolium perenne perennial rye-grass				R	R		R
Phleum pratense timothy				R	R	R	R
Trifolium repens white clover	A	R		R	R	R	O
Arrhenatherum elatius false oat-grass	A		A – D	A – D	F	A	A
Dactylis glomerata cock's-foot	A		F – A	F – A	R	F	F
Pteridium aquilinum bracken			O – F				
Mean sward height (cm)	**41**	**14**	**31.8**	**55**	**65**	**38.5**	**31.8**

The diversity of the sward, with two positive indicator species in 2003 and eight in 2011, has increased since grazing began. It appears as if common knapweed peaked between 2005 and 2009, decreasing after this, most likely in response to increased grazing levels. Negative indicator species slightly dropped in abundance, although number of species increased from eight to eleven. Sward height has varied considerably across the period, although, as a hay cut is taken from the site, this is not a critical factor.

The evidence suggests that the grazing regime is having a positive impact on the diversity of the sward. Further summer grazing would continue to move the site into favourable condition.

After visiting the site in 2010 SNH reclassified its status from 'unfavourable no change' to 'unfavourable recovering'.

Fleecefaulds Meadow

Fleecefaulds Meadow (13.28ha) lies on a north-west-facing scarp formed in large measure by a quartz dolerite sill. Close to the sill lies a deposit of Carboniferous limestone about 3.2m thick, possibly a former coral reef.

There are large areas of mesotrophic grassland including areas of old hay meadow; National Vegetation Classification (NVC) MG5 with elements of northern hay meadow, MG3. An outstanding area of *Filipendula* tall fern M27 dominates the lower part of the middle of the SSSI".

Particularly noteworthy is the MG5, Crested Dog's Tail/Lesser Knapweed grassland (*Cynosurus cristatus -Centaurea nigra* grassland). This flower rich grassland, typical of grazed hay-meadows throughout lowland Britain, occurs on the westerly facing slopes, where it is often found in association with the scrubby woodland community. On the valley floor can be found M23, Soft Rush - Sharp-flowered Rush mire (*Juncus effusus - J. acutiflorus*) community, and M27, Meadowsweet - Wild Angelica mire (*Filipendula ulmaria - Angelica sylvestris*) community.

Small patches of gorse dominated scrub occur throughout the site, together with W8, Ash - Field Maple - Dog's Mercury Woodland (*Fraxinus excelsior - Acer campestre - Mercurialis perennis*) community. Approximately 1 .28ha of the site is woodland including a recently planted deciduous woodland.

The site is managed through a combination of sheep and cattle grazing, along with creeping thistle and wild raspberry control, and scrub control.

Grazing Regime

Autumn, winter, spring grazing

2.9 – 8.8 sheep/ha

Fleecefaulds Unit 1 DAFOR monitoring summary							
Positive indicator species/taxa	**2003**	**2004**	**2005**	**2008**	**2009**	**2010**	**2011**
Alchemilla spp. lady's-mantle			F	F	O	no data	O
Carex spp. (C. flacca, C. nigra, C. panacea)			O - F	F	A	no data	A
Centaurea nigra common knapweed	O	F	A	A	A	no data	A
Filipendula ulmaria meadowsweet			O	O	R	no data	O
Galium verum lady's bedstraw			R	R	R	no data	R
Hypochoeris radicata cat's-ear			R			no data	R
Lathyrus linifolius bitter-vetch				R	O	no data	R
Lathyrus pratensis meadow vetchling			O - F	A	A	no data	A
Lotus corniculatus bird's-foot-trefoil			F	F	A	no data	A
Orchidaceae orchid spp.				A	O	no data	F
Potentilla erecta tormentil			F	A	A	no data	A
Rhinanthus minor yellow rattle	R	O	F - A	A	A	no data	A
Succisa pratensis devils'-bit scabious			F	A	A	no data	A
Negative indicator species						no data	
Cirsium arvense creeping thistle	A	A	O	R	R	no data	R

Equisetum arvense field horsetail	R			R	R	no data	O
Galium aparine cleavers	R	R				no data	R
Senecio jacobaea common ragwort				R	R	no data	R
Urtica dioica/common nettle							R
Holcus lanatus Yorkshire fog	A	A	F	A	O	no data	A
Trifolium repens white clover				F	R	no data	R
Dactylis glomerata cock's-foot		R		R	R	no data	R
Deschampsia cespitosa tufted hair-grass	R	R	R	R	R	no data	R
Mean sward height (cm)	**18.6**	**21.8**	**18**	**20**	**24.3**	no data	**30.25**
Fleecefaulds Unit 2 DAFOR monitoring summary							
Positive indicator species/taxa	**2003**	**2004**	**2005**	**2008**	**2009**	**2010**	**2011**
Alchemilla spp. lady's-mantle	R		O	O	R	no data	A
Carex spp. (C. flacca, C. nigra, C. panacea)							O
Centaurea nigra common knapweed	F	A	A - F	A	A	no data	A
Filipendula ulmaria meadowsweet		R	O	O		no data	F
Galium verum lady's bedstraw			R	R		no data	R
Hypochoeris radicata cat's-ear							R
Lathyrus linifolius bitter-vetch							R
Lathyrus pratensis meadow vetchling			O	F	F	no data	A
Leucanthemum vulgare oxeye daisy			R	R		no data	R
Leontodon spp. hawkbit							R
Lotus corniculatus bird's-foot-trefoil			O		R	no data	A
Orchidaceae orchid spp.					R	no data	O
Pimpinella saxifraga Burnet Saxifrage							R
Potentilla erecta tormentil			O - R	R		no data	O
Primula veris cowslip				R		no data	
Rhinanthus minor yellow rattle			O	F	O	no data	F
Succisa pratensis devils'-bit scabious			F		R	no data	R
Negative Indicator Species							
Cirsium arvense creeping thistle	O	F	O - F	F	F	no data	F
Equisetum arvense field horsetail				F	R	no data	O
Galium aparine cleavers	R			O	O	no data	O
Rumex obtusifolius Broad leaved dock							R
Urtica dioica stinging nettle			O		R	no data	R
Holcus lanatus Yorkshire fog	A	A	F	A	A	no data	A
Lolium perene perennial rye-grass							
Phleum pratense timothy					R	no data	R
Trifolium repens white clover		O		O	R	no data	O
Arrhenatherum elatius false oat-grass							O
Dactylis glomerata cock's-foot	F	O	O	A	A	no data	O
Deschampsia cespitosa tufted hair grass							R
Mean sward height (cm)	**27**	**33**	**28**	**45**	**56**	no data	**50.25**
Fleecefaulds Unit 3 DAFOR monitoring summary							
Positive indicator species/taxa	**2003**	**2004**	**2005**	**2008**	**2009**	**2010**	**2011**
Alchemilla spp. lady's-mantle			R	R	R	no data	R
Ananome nemorosa/ wood anenome							R
Carex spp. (C. flacca, C. nigra, C. panicea)				R		no data	R
Centaurea nigra common knapweed	F	F	O - F	F	O	no data	
Filipendula ulmaria meadowsweet			F	F	R	no data	
Galium verum lady's bedstraw			R	R		no data	

Lathyrus linifolius bitter-vetch							R
Lathyrus pratensis meadow vetchling			O - F	O	R	no data	
Lotus corniculatus bird's-foot-trefoil			O			no data	
Orchidaceae orchid spp.				R	R	no data	R
Potentilla erecta tormentil	F	A	O	O	R	no data	R
Primula veris cowslip		R		R		no data	
Rhinanthus minor yellow rattle					R	no data	
Succisa pratensis devils'-bit scabious			O			no data	R
Negative indicator species						no data	
Cirsium arvense creeping thistle	A	O	F	A	A	no data	
Equisetum arvense field horsetail					R	no data	
Galium aparine cleavers			R	A	O	no data	
Senecio jacobaea common ragwort			R			no data	
Urtica dioica stinging nettle				R	R	no data	A
Holcus lanatus Yorkshire fog	A	A	F	A	A	no data	
Lolium perenne perennial rye-grass							R
Phleum pratense timothy							R
Trifolium repens white clover	R			O	R	no data	
Arrhenatherum elatius false oat-grass				R		no data	
Dactylis glomerata cock's-foot		F	O	R	R	no data	R
Deschampsia cespitosa tufted hair-grass				O	R	no data	R
Mean sward height (cm)	**38.6**	**15.8**	**30**	**35**	**45.3**	no data	**46.9**

Fleecefaulds is a complex site which responds in varied ways to grazing. As a general trend, species diversity seems to be increasing. The introduction of cattle grazing in 2010 should go some way towards reducing the dominance of negative indicators such as creeping thistle. The hard winters of 2009 and 2010, with prolonged snow cover, meant that although stock were on the site they could not graze it. Fleecefaulds would benefit from a continuation of the current grazing regime but at higher stocking densities.

Lielowan Meadow

Lielowan is a small herb-rich meadow (2.7 hectares) occupying a narrow strip along the B914 road from Kelty to Saline in Fife. The site grades from dry neutral grassland along its upper northern slopes, alongside the road, down into rush pasture and marsh in the valley bottom. A number of tiny streams, originating in the higher land the other side of the road, flow down the valley side into the wetland areas.

The most notable plant community is the species rich neutral grassland. Some of this has been described as calcareous in the past but this was not confirmed by the National Vegetation Classification (NVC) survey carried out by Scottish Natural Heritage (SNH 2000).

Of particular note in the dry grassland is a substantial population of Salad Burnet *Sanguisorba minor*, here at the northern limit of its range.

Grazing Regime
2002: autumn
2003: autumn
2004 – 2009: spring/summer/autumn

12.5 sheep/ha

Lielowan DAFOR monitoring summary							
Positive indicator species/taxa	**2003**	**2004**	**2005**	**2008**	**2009**	**2010**	**2011**
Alchemilla spp. lady's-mantle					R	no data	R
Centaurea nigra common knapweed	O	R	O	A	O	no data	O
Filipendula ulmaria meadowsweet	A	A	O	F	A	no data	A
Lathyrus linifolius bitter vetch						no data	R
Lathyrus pratensis meadow vetchling	A	A	O	F	F	no data	F
Lotus corniculatus bird's-foot-trefoil					R	no data	R
Orchidaceae orchid spp.				R		no data	
Pimpinella saxifraga Burnet Saxifrage						no data	R
Sanguisisorba minor salad burnet						no data	R
Potentilla erecta tormentil				R		no data	
Negative Indicator Species						no data	
Cirsium arvense creeping thistle	A	A	F - A	A	A	no data	A
Equisetum arvense field horsetail		R	O	O	R	no data	
Galium aparine cleavers		R		R		no data	R
Rumex obtusifolius Broad leaved dock							R
Senecio jacobaea common ragwort							R
Urtica dioica stinging nettle	O	O	O - F	F	R	no data	R
Holcus lanatus Yorkshire fog	A	A	F	A	A	no data	O
Lolium perenne perennial rye-grass				O		no data	R
Trifolium repens white clover			O	F	R	no data	
Arrhenatherum elatius false oat-grass		A	O - F	A	O	no data	
Dactylis glomerata cock's-foot	A	F	O - F	A	F	no data	O
Deschampsia cespitosa tufted hair-grass	R	R	R		R	no data	R
Mean sward height (cm)	**37.6**	**26.2**	**25.4**	**25**	**15.2**	no data	**36.5**

The site was initially grazed to an autumn/winter regime at a medium – high density. Monitoring demonstrated that this was ineffective at reducing the rank sward and improving the condition of the site, and, despite grazing, the site was declining in condition. Spring and summer grazing was introduced, and the benefits of this changed regime were recorded. Within a year, subtle but apparent signs of increased diversity were recorded, and this has continued in subsequent years. **The latest round of monitoring indicated a continued improvement and the site is now classified as 'unfavourable recovering'.**

Bo'mains Meadow

This is the only SSSI of its type within the Falkirk and Clackmannan council areas and is comparatively rich in higher plants with over 100 species recently recorded. It is a typical Crested Dog's tail-Common Knapweed NVC type with the Meadow Vetchling sub-community (MG5a). Notable species include Greater Butterfly Orchid and Common Twayblade. A hay cut is taken from the site each autumn.

Grazing regime

Autumn/winter
15.7 sheep/ha

Bo'Mains DAFOR monitoring summary						
Positive indicator species					**2009**	**2010**
Alchemilla spp. lady's-mantle					R	no data
Carex spp. (C. flacca, C. nigra, C. panicea)					O	no data
Centaurea nigra common knapweed					A	no data
Hypochoeris radicata cat's-ear					O	no data
Lathyrus pratensis meadow vetchling					A	no data
Leontodon spp. hawkbit					R	no data
Orchidaceae orchid spp.					O	no data
Potentilla erecta tormentil					R	no data
Rhinanthus minor yellow rattle					A	no data
Negative indicator species						no data
Cirsium arvense creeping thistle					O	no data
Holcus lanatus Yorkshire fog					F	no data
Arrhenatherum elatius false oat-grass					R	no data
Dactylis glomerata cock's-foot					R	no data
Deschampsia cespitosa tufted hair-grass					R	no data
Mean sward height (cm)					**18.1**	no data

The site was introduced later than the others into the grazing scheme, and has therefore not been under management or monitoring for as long. Medium – high intensity grazing for a short period after taking a cut from the meadow has been the favoured management. **Monitoring in 2009 indicated that this regime is having the required benefits, with the site being assessed as being in favourable condition.**

Bankhead Moss

The main habitat type at Bankhead Moss (17ha) is a raised bog with the peat dome and lagg habitats covering in excess of 7ha, with a typical dome-shaped profile composed of peat, which, in the centre of the bog, is at least 7 m deep. It is one of only two remaining examples of this habitat type in North East Fife and represents an isolated eastern outlier of a mire type more typical of higher rainfall areas further west.

As such, it is the only non-grassland site to have been grazed by the Grazing Project. Access for livestock is now restricted (since 2010) due to changes in neighbouring landowners. Before this, sheep were used to reduce invasive birch regrowth as part of an ongoing project to restore the condition of the bog.

The sheep were successful to a certain degree in restricting birch regrowth. They were grazed on the site during the summer, generally during June, July and August. The most recent monitoring results have assessed the centre of the bog as being in favourable condition, with birch regrowth being restricted to the perimeter. Concern was raised that sheep were eroding the surface of the bog. Since the sheep have been off the site, these bare areas have recolonised rapidly. Birch control is now carried out with volunteers and conservation teams.

Appendix B

Non-designated Trust sites responses to grazing

Resource limitations restrict the detailed year on year monitoring to SSSI sites. However, the Trust also grazes non-designated grassland sites which are monitored when funds are available.

Cullaloe

Cullaloe Wildlife Reserve encompasses ca. 25.3 ha and comprises a mosaic of open and running water, swamp, basic flush, unimproved neutral, calcareous and marshy grassland, scrub, broadleaved and mixed woodland plantation on the site of a now unused reservoir system. The Grazing Project grazes an area of neutral grassland adjacent to the reservoir.

The following summary taken from Ben Averis's monitoring report (2009) offers an assessment of the condition of the site:

The condition and flora of this U4b grassland is very similar to that recorded in July 2008. The sward is dominated by Holcus lanatus, Festuca rubra, Anthoxanthum odoratum *and* Potentilla erecta. *H. lanatus, although abundant, does not form dense, thick swards.*

The grassland has been assessed using the recording sheet for MG5 (used for all other grasslands in this project), but a recording sheet is available for the U4 community so this has been used too. The assessment is actually very similar using either recording sheet: on this MG5 form it is favourable for most criteria but fails in having forb cover too low, positive indicator species too few/scarce (although it meets the 'reduced target') and the sward just 6.5 mm too tall. These failures are so slight that I consider the vegetation best regarded as being in favourable condition by MG5 or U4 standards.

Chamerion angustifolium *was mentioned in 2005 as a slight potential threat, but in both 2008 and 2009 was found in insufficient quantity for it to be a threat now. Continuation of the current grazing regime will hopefully maintain this vegetation in more or less its present state.*

The grazing regime will be continued to maintain the sward structure.

Cambus Pools

Cambus Pools comprises 6.2 ha and lies on the north bank of the River Forth, immediately west of the mouth of the River Devon, in Clackmannanshire. The site is flat and consists of low-lying rough grazing surrounded by the flood banking along the Rivers Forth and Devon. The site was previously used for rough grazing.

A total of 115 species of vascular plant have been recorded, the site being primarily wet grassland comprising mostly tufted hair-grass (*Deschampsia cespitosa*), with some areas dominated by brown bent (*Agrostis canina*), tall fescue (*Festuca arundinacea*), and marsh foxtail (*Alopecurus geniculatus*). A number of willow, (*Salix* spp) and hawthorn, (*Crataegus monogyna*) have been planted to provide shelter.

The key features of interest are two shallow pools of brackish water, maintained by rainfall and seepage through the river embankment.

The site has been grazed by sheep to maintain the grassland and to reduce reed encroachment into the grassland areas. From 2012, cattle will be used to assess whether they will be more effective at breaking up the sward and tackling reed growth.

Appendix C

Wider Countryside Sites Grazed by the Trust 2001 - 2011

Site	Area	Landowner	Approx Hectarages
Flanders Moss National Nature Reserve	Stirling	Scottish Natural Heritage	36ha
Trapain Law	East Lothian	East Lothian Council	35ha
Aberlady Bay	East Lothian	East Lothian Council	10ha
East Poldar, Flanders Moss	Stirling	Private	4ha
Auchtermuchty Common	Fife	Local trust	4ha
Landart Project	Fife	Scottish Coal	4ha
Hill of Tarvit	Fife	Local organisation	1ha
Gaddon Loch	Fife	Fife Council	1ha

Appendix D:

A Typical Year for the Grazing Project

Grazing timings vary from year to year in response to local conditions, but flock management follows a set routine. The following programme indicates the month by month activities of the flock.

Month	Activity
Jan	Winter grazing on reserves – additional feeding if necessary
Feb	Winter grazing on reserves - additional feeding if necessary
Mar	Begin preparations for lambing – in-lamb ewes moved to shepherd's smallholding
Apr	Lambing
May	Lambing. First lambs and ewes put to grazing
Jun	Summer grazing on reserves. Shearing
Jul	Summer grazing on reserves. Cattle to Cathkin and Cambus (from 2012)
Aug	Summer grazing on reserves.
Sept	Stocking densities increased. Cattle to Fleecefaulds. Aftermath grazing on sites where hay cut is taken
Oct	Tupping and reserve grazing
Nov	Tupping and reserve grazing
Dec	Winter grazing on reserves

Appendix E

Published Papers

Day J. (after Whyte 2010) Improving and Maintaining Species-rich grasslands using a mobile grazing system, British Wildlife, October 2010

Jones S. And Blow S. (2007) Conservation Grazing; a Scottish Perspective Conservation Land Management 5, 1

Whyte A. (2010) Establishment and use of a sheep flock to maintain and improve mesotrophic species-rich grasslands in Fife and Falkirk, Scotland , Conservation Evidence 7, 44 - 51

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