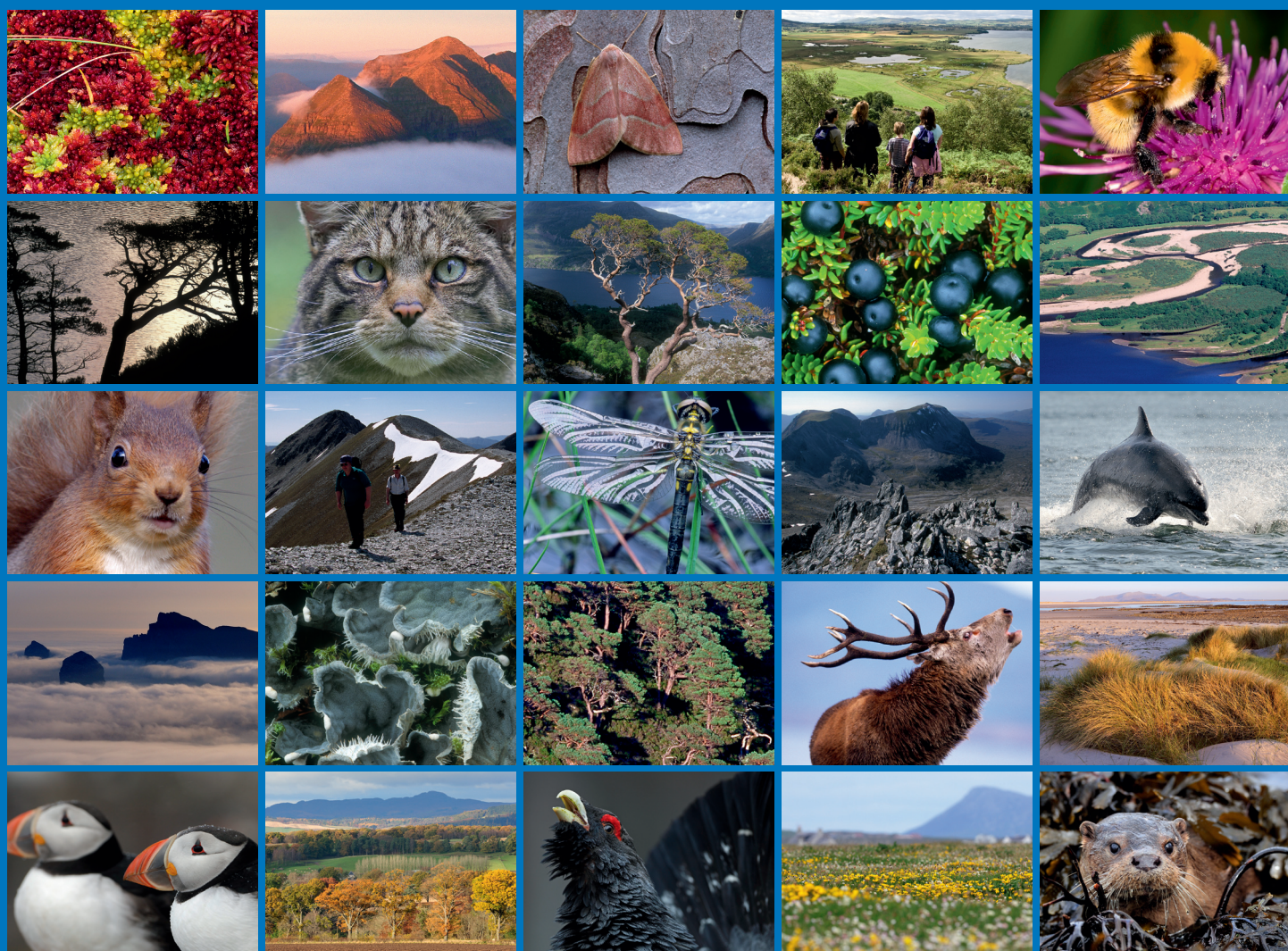


The design of a monitoring programme for Bean Geese on the Slamannan Plateau





Scottish Natural Heritage

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COMMISSIONED REPORT

Commissioned Report No. 389

The design of a monitoring programme for Bean Geese on the Slamannan Plateau

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COMMISSIONED REPORT

Summary

The design of a monitoring programme for Bean Geese on the Slamannan Plateau

Commissioned Report No. 389

Contractor: The Wildfowl & Wetlands Trust

Year of publication: 2010

Background

In Britain, Taiga Bean Geese *Anser fabalis fabalis* have a very restricted distribution. There are two British winter flocks which occupy an important part of the traditional winter range of the species; one winters at the Yare marshes, Norfolk and the other on the Slamannan Plateau, central Scotland. The flock wintering at the Slamannan Plateau area numbered around 130 – 150 birds in the 1990s. During 2005/06 to 2008/09, the population increased to around 250 - 300 birds. Bean Geese are of international importance and are protected under the Wildlife and Countryside Act 1981, Annex II/I of the EC Birds Directive and Appendix III of the Berne Convention. The UK statutory conservation agencies have a statutory requirement to assess whether notified features are in favourable or unfavourable condition at all designated sites, including Special Protection Sites (SPAs). Favourable condition describes a target set of conditions under which a specified feature is likely to maintain or improve its status.

Detailed monitoring of the Slamannan Bean Geese has been carried out on behalf of the Bean Goose Action group (BGAG) since winter 1993/94, jointly funded by several members of the Group. Recently, there have been some local concerns that the current methodology is excessive and intrusive. This monitoring has assisted in identifying the fields where Bean Geese feed and the preferred roost sites throughout the winter. The results of this work have been used to inform discussions on threats to the Bean Geese on the Slamannan Plateau, in the classification of Slamannan Plateau SPA and SSSI, in the development of the Bean Goose Management Scheme, as well as the preparation and implementation of the Bean Goose Action Plan. These data are also used by the local authorities and developers in relation to development planning proposals. This report provides an independent assessment of the monitoring requirements and methodologies for these geese, to ensure that they meet the requirements of all stakeholders, are fit for purpose and minimise any impact on local people and/or disturbance to the geese.

Main findings

- A review of the current methodology to monitor Bean Geese at Slamanna Plateau was undertaken. Between seasons 1997/98 and 2008/09, roost counts were undertaken on 264 days (mean 33 each season), standardised route counts on 10 days (mean five in two seasons) and field counts on 912 days (mean 76 each season).
- The number of new fields in which geese were seen increased from the start of the season to the end. The geese were recorded in a mean of less than twenty fields prior to the middle of December, but had been recorded in a mean of over thirty fields by the end of February. The mean flock size recorded declined as the season progressed from c.120 birds to c.80 birds.
- The mean number of fields in which the geese were recorded during the season was 33 (range 22 in 2001/02 to 49 in 2005/06). Overall, Bean Geese were recorded in 129 different fields. Certain fields were more important for Bean Geese than others. Thus, 10 fields accounted for nearly half (48.3%) of all goose use and 20 fields accounted for 65.3% of all goose use.
- Approaches to monitoring of goose populations elsewhere was discussed including summarising goose monitoring at the national level, as part of the Local Goose Management Schemes in Scotland and locally in the Yare Valley, Norfolk and on Tiree.
- A monitoring programme, including details of methodologies that meet the requirements of (a) the site designations, and (b) the BGAG was proposed. The key recommendations were:
 1. One roost count a month is undertaken from October to February.
 2. Two field counts each week during October and the first half of November, and then one field count a week from the second half of November to the end of February.
 3. Flock counts are undertaken using a standardised route and the same fields are checked each day.
 4. Checks of areas outwith the Slamannan Plateau should be undertaken from October to March during times when the geese are not present.
 5. *Ad hoc* age assessments to be undertaken, if the observer is able.
 6. BGAG to help progress the Bean Goose Biodiversity Action targets, including considering the use of satellite transmitters
- A comparison of the quality and value of data that would be derived from the proposed monitoring programme compared with the current monitoring was made. For example, reducing future monitoring surveillance to once a month might result in a 4.4% reduction in the assessment of abundance based on roost counts and reducing field counts to once a week basis might result in a 13.4% reduction in the number of fields in which geese are recorded.
- An estimate of the time and resources needed to undertake the monitoring was given. The proposed frequency of surveillance comprises approx. 28 days work, plus travel expenses. This comprised ten hours undertaking roost counts, 72 hours undertaking flock counts in the early part of the season, 84 hours in the later part of the season, 12 hours undertaking flock searches outwith the Slamannan Plateau area (if needed), 31 hours data collation and 15 hours for report production.

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1 INTRODUCTION

In Britain, Taiga Bean Geese *Anser fabalis fabalis* have a very restricted distribution. There are two British winter flocks which occupy an important part of the traditional winter range of the species; one winters at the Yare marshes, Norfolk and the other on the Slamannan Plateau, central Scotland.

In Scotland, the Bean Goose was regarded as a common winter visitor during the 19th century, being the commonest goose species in many localities (Berry 1939). A widespread decline began in the 1860s until, in the early part of the 20th century, only a few winter flocks remained (Owen *et al.* 1986). The number of Bean Geese wintering at the Dee Marshes (Galloway) began to decline from the early 1960s (maximum 240 geese in 1954/55) with the last record being ten birds in 1990/91. The flock appeared to move to the Carron Valley, central Scotland in the 1980s/early 1990s, although there had been earlier records there in the 1940s/50s. The maximum recorded at Carron Valley was 122 geese in 1987/88. From the late 1980s, the birds were also recorded at the Slamannan Plateau and eventually relocated there (Fig.1, see also Hearn 2004).

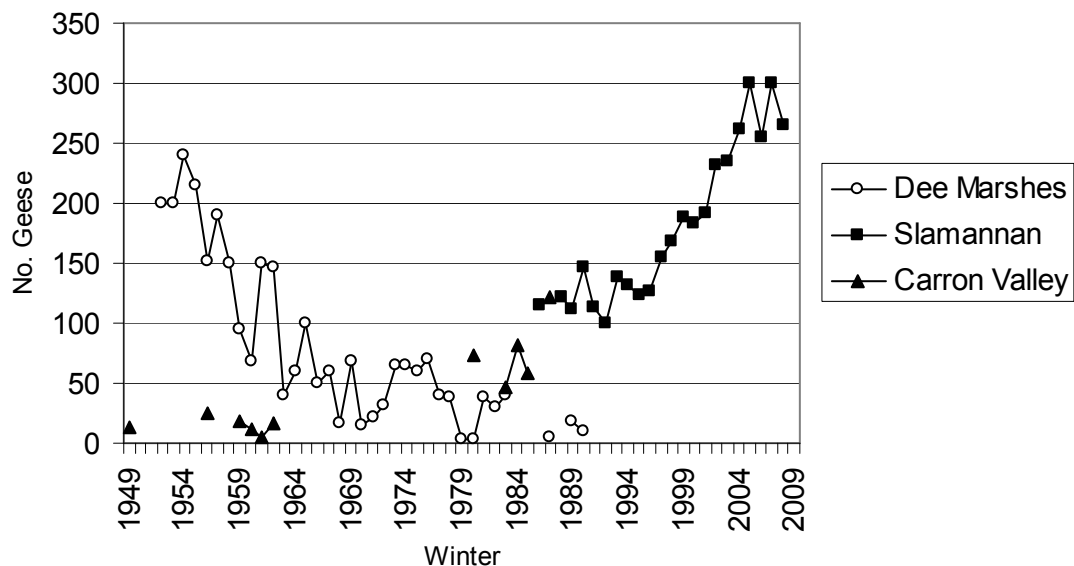


Figure 1. Maximum winter counts of Taiga Bean Geese at the three principal wintering sites in Scotland, 1949/50 to 2008/09

The flock wintering at the Slamannan Plateau area numbered around 130 – 150 birds in the 1990s (Hearn 2004). During 2005/06 to 2008/09, the population increased to around 250 - 300 birds¹ (Maciver 2009). Bean Geese are of international importance and are protected under the Wildlife and Countryside Act 1981, Annex II/I of the EC Birds Directive and Appendix III of the Berne Convention.

The Slamannan Plateau area frequented by the Bean Geese was designated a Site of Special Scientific Interest (SSSI) in 2006 and a Special Protection Area (SPA) in 2008. For the Slamannan Plateau SPA, the winter flock of Bean Geese is the notified feature of the site supporting “over 53% of the population in Great Britain”. At the time of designation, the five year mean count (for 2000/01 to 2004/05) was 221 individuals. The boundary of the Slamannan Plateau SPA (591.3 Ha, Fig.2) includes most of the Royal Society for the

¹ <http://www.wwt.org.uk/research/monitoring>

Protection of Birds (RSPB) Fannyside Reserve (59.2 Ha), which is managed mainly for Bean Geese.

The SPA is subject to steady development pressure. Recent proposals have included housing, wind turbines and sewage sludge deposition. Several areas of forestry were planted in the past, directly reducing the area available for feeding geese and influencing remaining feeding areas through enclosure. In more recent years, applications to plant new forests have decreased. Some of the goose resting and roosting areas have been subject to peat milling operations, although these too have now stopped. If the production of peat from these areas becomes commercially viable, the operations may recommence.

Recreational use is not high, nevertheless walking, cycling, horse riding and bird watching take place. If the level of use by these activities was to increase in an unplanned manner, then it may result in disturbance to the geese. To reduce the instances of bird watchers causing disturbance, a website ² has been developed which gives details of suitable places from which to view the geese.

In recognition of the importance of the Slamannan Plateau for wintering Bean Geese a group was established in 1994 representing conservation interests in the area. The broad aims of the Bean Goose Action Group (BGAG) are to help conserve the population of Bean Geese wintering in central Scotland by protecting and managing the habitats used by the geese. The group seeks to minimise potential land use conflicts in the Slamannan Plateau area through the development of land management guidelines to assist industries such as farming, forestry and mineral extraction. It also seeks to influence the practice of planning policies for conserving Bean Geese without discouraging employment prospects or the enhancement of the landscape. The group includes representatives from Scottish Natural Heritage (SNH), RSPB Scotland, Central Scotland Forest Trust (CSFT), Forestry Commission Scotland (FCS), Forest Enterprise (FE), Scottish Agricultural College (SAC) and Falkirk and North Lanarkshire Councils.

While damaging changes in land management can be controlled in part through the provisions of The Nature Conservation (Scotland) Act 2004, applying to the Slamannan Plateau and West Fannyside Moss SSSIs, they are also addressed through the 'Slamannan Plateau Bean Goose Management Scheme'. This scheme was developed by SNH to support land managers to maintain suitable habitat conditions for Bean Geese within the SPA. The scheme is now closed to new entrants, having run between 1 March 2006 and April 2008, but it is hoped that the prescriptions of the scheme will be incorporated in the Scotland Rural Development Programme.

² <http://www.bean-geese.pwp.blueyonder.co.uk/index.htm>

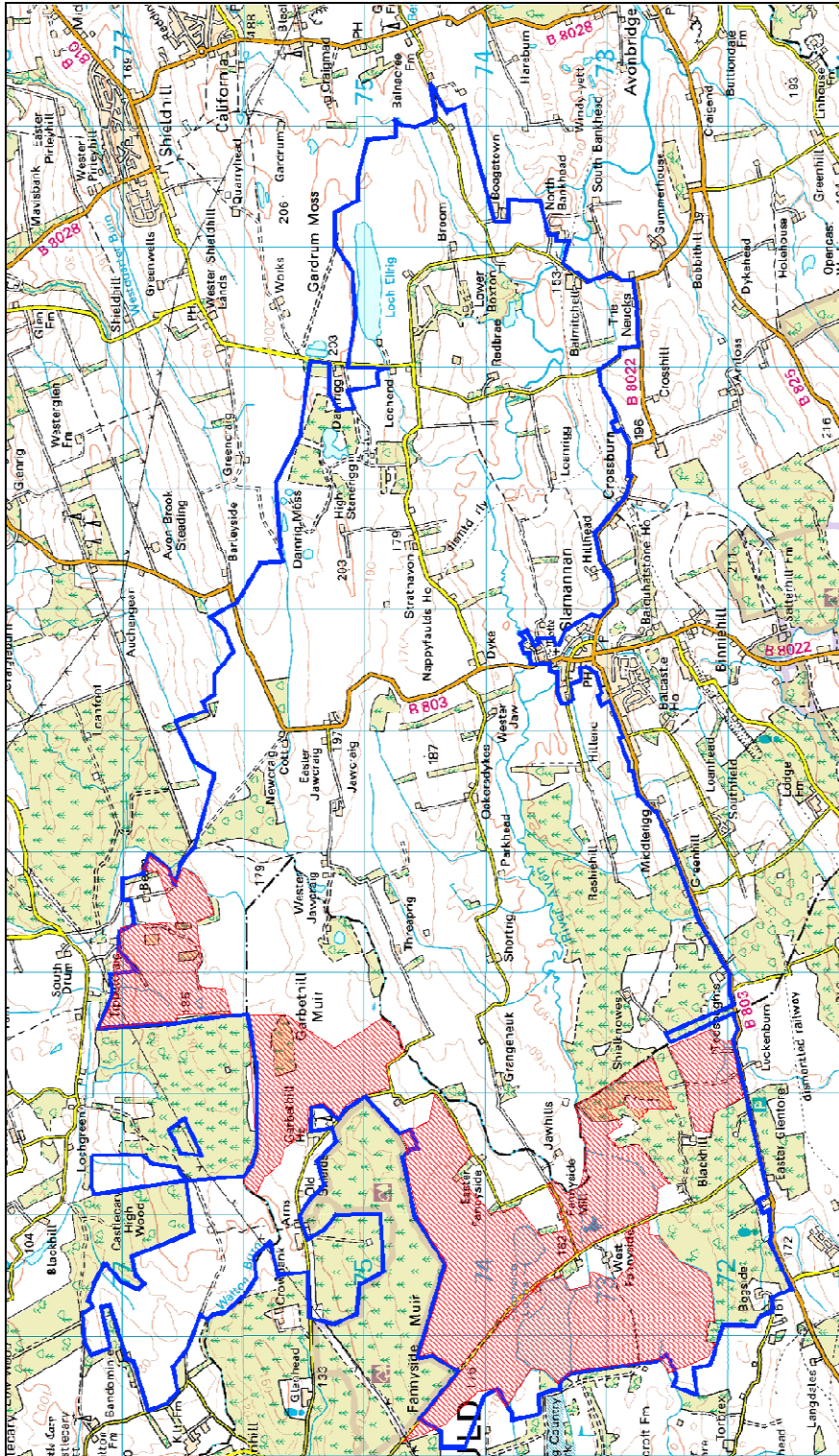


Figure 2. The Slamannan Plateau SPA (591.3 Ha, stippled red) and approximate area with allocated field numbers used when checking fields used by Bean Geese (blue line, after Smith et al. 1994). Based upon Ordnance Survey material with the permission of the Controller of HMSO © Crown copyright (2010) Licence no. 100017908

The UK statutory conservation agencies have a statutory requirement to assess whether notified features are in favourable or unfavourable condition at all designated sites, including SPAs. Favourable condition describes a target set of conditions under which a specified feature is likely to maintain or improve its status.

Detailed monitoring of the Slamannan Bean Geese has been carried out on behalf of the BGAG since winter 1993/94, jointly funded by several members of the Group. Recently, there have been some local concerns that the current monitoring methodology is excessive and intrusive. This monitoring has assisted in identifying the fields where Bean Geese feed and the preferred roost sites throughout the winter. The results of this work have been used to inform discussions on threats to the Bean Geese on the Slamannan Plateau, in the classification of Slamannan Plateau SPA and SSSI, in the development of the Bean Goose Management Scheme, as well as the preparation and implementation of the Bean Goose Action Plan. These data are also used by the local authorities and developers in relation to development planning proposals.

This report provides an independent assessment of the monitoring requirements and methodologies for these geese, to ensure that they meet the requirements of all stakeholders, are fit for purpose and minimise any impact on local people and/or disturbance to the geese.

2 OBJECTIVE

The objectives of the study are to design a monitoring programme for Bean Geese on the Slamannan Plateau that will meet:

- SNH's responsibilities for monitoring the condition of the interest feature of the Slamannan Plateau SPA and SSSI (Taiga Bean Goose).
- The wider needs of the BGAG.

3 METHODS

The findings and recommendations of the study include:

- A review of the current methodology and relevant approaches to monitoring of goose populations elsewhere.
- The development of a recommended monitoring programme, including details of proposed methodologies that meet the requirements of (a) the site designations, and (b) the BGAG.
- A comparison of the quality and value of data that would be derived from the proposed monitoring programme compared with the current monitoring.
- An estimate of the time and resources needed to undertake the proposed monitoring.

4 A REVIEW AND ASSESSMENT OF THE CURRENT METHODOLOGY

Details of the current monitoring methodology and results have been obtained from summary data published in BGAG annual reports (e.g. Maciver 2009) and discussions with the current Bean Goose Officer (A. Maciver). Unless otherwise indicated, the data used for all analyses, presented in tables and figures are based on data presented in the BGAG annual reports for seasons 1997/98 to 2008/09 inclusive.

Between seasons 1997/98 and 2008/09, roost counts were undertaken on 264 days, standardised route counts on ten days and field counts on 912 days. In many cases, field, standardised route and roost counts were often carried out on the same day.

4.1 Roost counts

Since the late 1980s, when Bean Geese moved from the Carron Valley to the Slamannan Plateau area, the geese have primarily roosted on Loch Elrig (NS8874), East and West Fannyside Lochs (NS8073) and Fannyside Muir (NS8074). Since the early 2000s, roosting has mostly occurred on the Fannyside Lochs and the nearby Fannyside Muir. During periods of frost and snow, the flock will often remain out in their feeding areas and may not return to roost.

Roost counts have been carried out both on the morning flights and as birds return to the roost at dusk. The roost counts were often undertaken before or after field counts took place. At dusk, geese can sometimes arrive after dark, posing problems of identification and estimating numbers in flight. Arriving geese can split into two (or more) flocks, one landing on one of the Fannyside Lochs, the other landing on Fannyside Muir. The arrival of geese can be staggered such that the counter may not be sure if all the geese have arrived to roost. On occasions birds will flight to either of the lochs and during darkness movements can occur between the loch and the muir (see also Smith *et al.* 1994).

Since winter 1997/98, 398 roost counts have been made (including days when no geese were counted coming to roost); a mean of 33 counts each season (range: three in 1997/98 to 111 in 2005/06) (Fig.3). Season 2005/06 was exceptional due to extra roost counts being undertaken by ornithologists on behalf of Scotts UK Ltd., the company that owns part of Fannyside Muir (Maciver 2006).

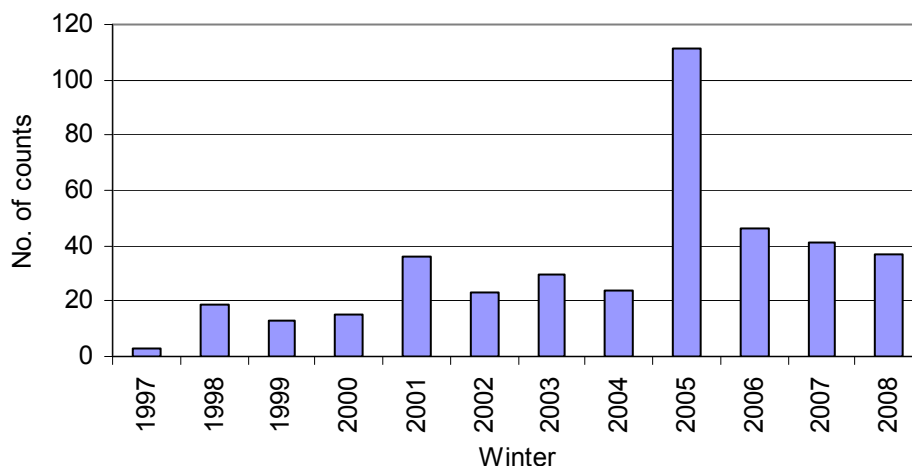


Figure 3. Number of roost counts of Bean Geese at the Slamannan Plateau, 1997/98 to 2008/09

Roost counts have generally provided a similar count total to field counts (see below). In eight out of the last 11 seasons, the highest roost count has been the same as the maximum

winter count derived from field counts. The largest difference occurred in 2005/06 when 284 birds were counted at roost and 300 birds were counted in fields (a difference of 3.4%).

4.2 Standardised route count

A standardised route count (undertaken by three to four teams of observers) was carried out in season 1997/98 (one count each month, November to March) and season 1998/1999 (one count each month, October to February) but was stopped as it became difficult to get observers to check areas where geese were not present. In both winters, the standardised route count recorded the same winter peak count, on at least one occasion, as that derived from roost counts or field counts (see below). However, on four out of five route counts in 1997/98 and two out of five route counts in 1998/99, the number of geese recorded was below the winter peak.

From 1999/2000, it was felt that the areas likely to hold geese could be gauged through experience of the observers (the geese tended to use similar areas year after year) and through direct observations of the geese leaving the roost at dawn. However, systematic monitoring, through a standardised route count, provides negative records (ie where geese do not occur) as well as positives, is repeatable and statistically more robust than the additional non-standardised monitoring of field use (see 4.3 below).

4.3 Field counts

From 1997/98, non-standardised monitoring of field use has provided information on the distribution and abundance of Bean Geese in the Slamannan Plateau area. The route has varied from time to time (the entire plateau was not visited during every visit), depending on what time the counter had available and where the geese were thought to be. Field counts tended to take between four and six hours. Observations were made at different times of the day. Often, morning field counts were made after watching (and counting) birds flying from the roost. Alternatively, field counts were made in the afternoon, before checking (and counting) geese flying into roost at dusk. Duplicate counts could occur during field counting. The flock size and the field number were recorded and each observation was timed. Whilst the field counts can be considered non-systematic (the same route was not followed and the same fields were not checked each day) many fields in the Slamannan Plateau were inevitably checked for geese, either whilst driving between flocks or during scans from vantage points to locate the feeding flocks. Whilst the positive records of flocks were always recorded, checked fields that contained no geese were not. Within the regularly checked area (see Figure 2) c.356 fields/land units have been coded, the field codes largely following those used by Smith *et al.* (1994)

The mean number of days on which field counts were carried out each season was 76 (range 53-103, Fig.4). In total, this generated 1,702 records (separate flocks of Bean Geese), or c.142 records per season.

From October to February, the geese begin to use more fields and, in addition, due to the nature of the landscape, the geese often disappear over contour lines and can therefore be hard to locate. The landscape of the Slamannan Plateau is one of rolling land mixed with forestry and woodland blocks. Locating the geese can prove taxing. The geese can be relatively shy, especially during the hunting season (although Bean Geese are protected, Pink-footed Geese *Anser brachyrhynchus* and Greylag Geese *A.anser*, which also frequent the area, are legal quarry) adding to difficulties in locating feeding flocks.

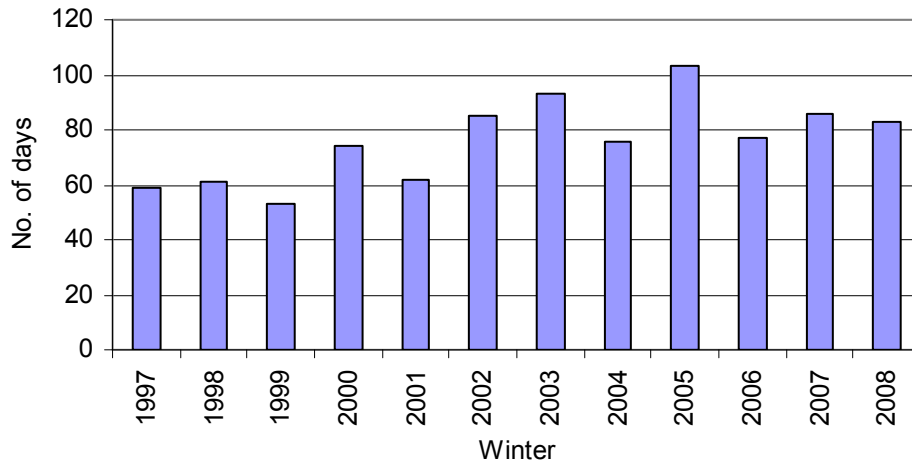


Figure 4. The number of days on which field counts of Bean Geese at the Slamannan Plateau were undertaken, 1997/98 to 2008/09

From October to February, the mean number of days on which field counts were undertaken each month varied from 13 to 16 (Fig.5). The highest number of counts in any one month was 26, undertaken in October 2005.

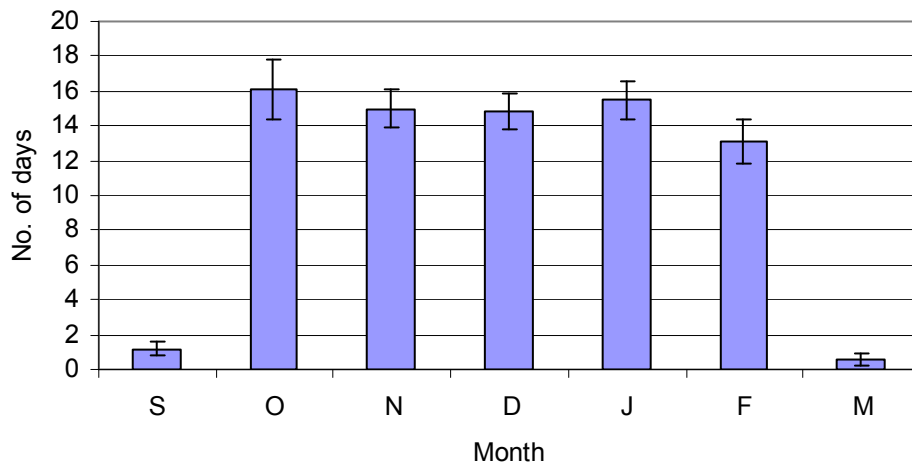


Figure 5. The mean number of days in each month on which fields counts were undertaken at the Slamannan Plateau. Based on pooled data from 1997/98 to 2008/09. Standard errors shown

During the 2000s, the birds were fairly consistent with their autumn arrival on the plateau and feeding at this time in the Luckenburn Farm area. The highest count of feeding birds, thought to represent the season maximum, was normally achieved early in the season at this area, before the flock split up and started to use new areas (see below). The number of new fields in which geese were seen, increased from the start of the season to the end. The geese had been recorded in a mean of less than twenty fields prior to the middle of December, but had been recorded in a mean of over thirty fields by the end of February (Fig. 6).

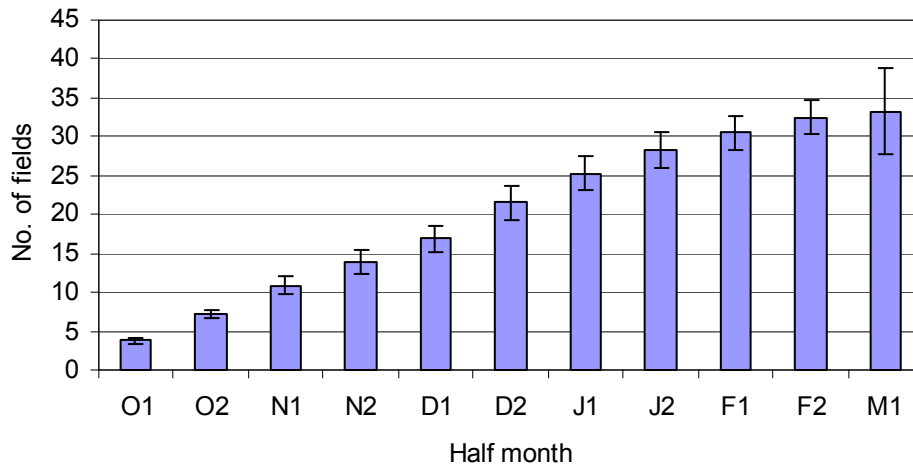


Figure 6. The cumulative number of fields in which Bean Geese were recorded at the Slamannan Plateau from the first half of October (O1) to the first half of March (M1). Based on pooled data from 1997/98 to 2008/09. Standard errors shown

From late October onwards, the geese begin to use more fields and, in addition, due to the nature of the landscape, the geese often disappear over contour lines and can therefore be missed. Field checking was a case of using the observer's experience, gained over many years, assessing where the geese were likely to be. The main feeding areas of the Bean Geese have moved from east to west over the past ten years, however, eastern areas were still periodically checked when the observer counted Pink-footed Geese using this part of the plateau. Whilst no record was kept of the fields checked that contained no Bean Geese, large parts of the Slamannan Plateau area were checked for feeding geese.

Once the geese arrived at the Slamannan Plateau (usually by the second half of October), the mean flock size recorded declined as the season progressed from c.120 birds to c.80 birds (Fig.7).

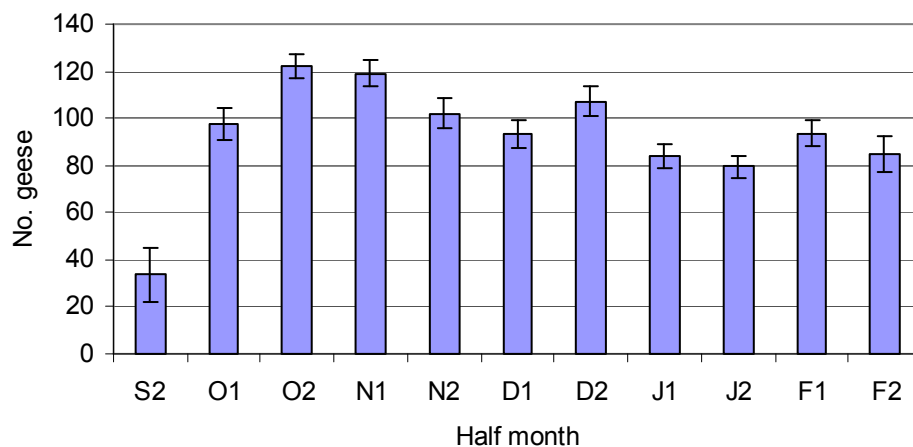


Figure 7. Mean flock size of Bean Geese at the Slamannan Plateau as the season progressed. Based on pooled data from 1997/98 to 2008/09. Standard errors shown

The mean number of fields in which the geese were recorded during the season was 33 (range 22 in 2001/02 to 49 in 2005/06, Fig.8). Overall, Bean Geese were recorded in 129 different fields (c.36% of the coded fields/units).

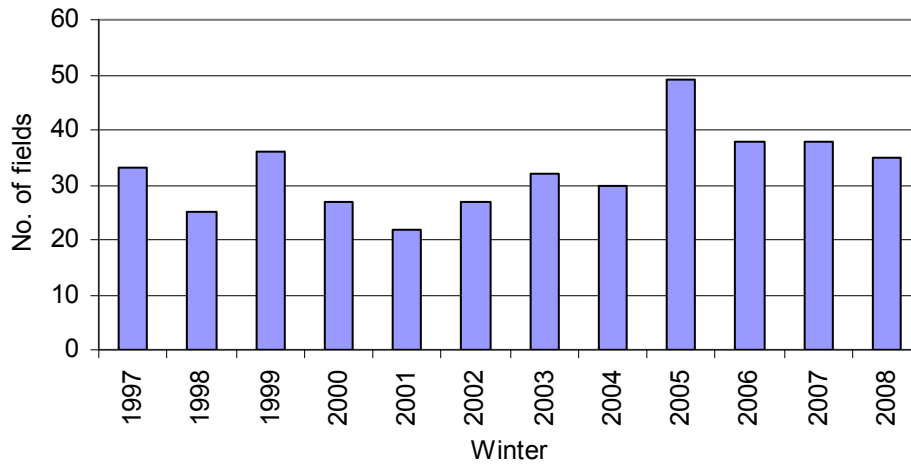


Figure 8. The number of different fields in which Bean Geese were recorded at the Slamannan Plateau, 1997/98 to 2008/09

Certain fields were more important for Bean Geese than others (Table 1, Figs.9 and 10). Thus, ten fields accounted for nearly half (48.3%) of all goose use and 20 fields accounted for 65.3% of all goose use (Figs.9 and 10).

Table 1. The ten fields most used by Bean Geese at the Slamannan Plateau (expressed as a percent of overall goose use, measured in goose days)

Field number	Goose use (%)	Field number	Goose use (%)
26	12.6	261	2.6
170	7.6	80	2.4
9	5.9	38	2.3
251	4.3	29	2.0
305	3.6	306	1.4
8	3.0	24	1.3
326	3.0	40	1.3
48	2.8	120	1.3
335	2.8	278	1.2
255	2.7	342	1.2

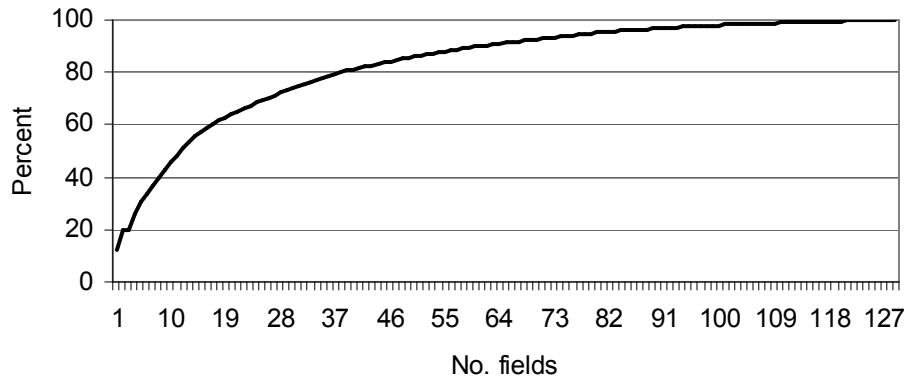


Figure 9. The number of fields used by Bean Geese and goose use (expressed as a percent of overall goose use, measured in goose days)

Since 1997/98, any disturbance events that occurred during the time that the observer was counting the geese were recorded and, since 2005/06, the habitat type of the field was recorded, as well as the number and type of any domestic stock in the fields.

A summary of the monitoring activities, as well as all raw data, have been provided in annual reports since winter 1997/98 (Simpson & Maciver 1998-2005, Maciver 2006-2009). Summary information is shown in Appendix 1.

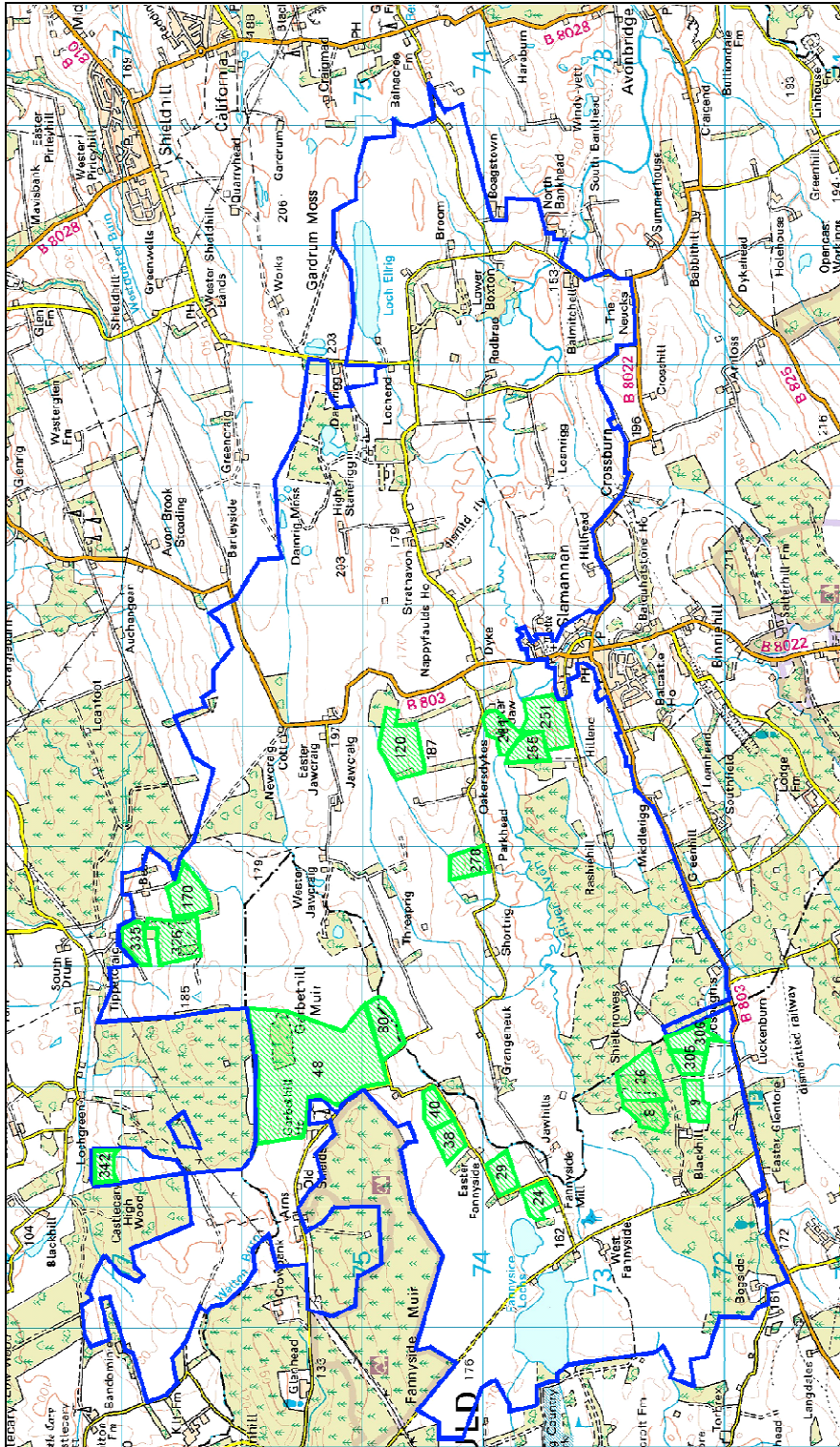


Figure 10. The twenty fields in which Bean Geese have most often been recorded on the Slamannan Plateau (stippled green). Field numbers correspond to those currently in use and follow Smith et al. (1994). See also Table 1. Based upon Ordnance Survey material with the permission of the Controller of HMSO © Crown copyright (2010) Licence no. 100017908

5 APPROACHES TO MONITORING OF GOOSE POPULATIONS ELSEWHERE

5.1 Goose monitoring in Scotland

The monitoring of goose abundance and distribution within Scotland varies according to scale and need. National population assessments are carried out largely as part of the Goose & Swan Monitoring Programme (GSMP)³, either annually through coordinated coverage of known roost sites or feeding areas, e.g. Pink-footed Geese, or less frequently, e.g. a Greenland Barnacle Goose *Branta leucopsis* population census is carried out once every five years, since the census necessitates aerial survey of offshore islands. Gross distribution information is collated at the same time as census, although quite often this only refers to counts made at roost sites, thus feeding distribution is often poorly monitored.

At the site level (particularly individual wetlands), goose roost counts are undertaken as part of the GSMP or other national surveys (as above) and/or additionally through the Wetland Bird Survey (WeBS)⁴. In the majority of cases, counts are organised by NGOs (e.g. BTO and WWT) and are carried out either by volunteer counters or, in the case of nature reserves, by reserve staff (mostly by NGO staff). The statutory monitoring of designated features associated with SSSIs and SPAs is thus largely reliant on a network of volunteer counters, the results of which are collated, and reported on, by NGOs (often under contract to statutory agencies).

Monitoring of goose abundance and distribution of feeding areas occurs in most areas where Scottish Government (SG) Local Goose Management Schemes (LGMS) are in operation, notably on Islay. The scale and frequency of goose counting varies between schemes (Table 2) and the greatest amount of monitoring is associated with LGMS where payments are related to goose use.

³ organised by the Wildfowl & Wetlands Trust (WWT) and the Joint Nature Conservation Committee (JNCC)

⁴ a partnership of the British Trust for Ornithology (BTO), RSPB and JNCC, in association with WWT

Table 2. The scale and frequency of goose monitoring undertaken within Local Goose Management Schemes in Scotland

Local Goose Management Scheme	Goose species involved	Monitoring of goose abundance and distribution	Payments related to goose use	Frequency of counts	Additional ¹ sources of funding for monitoring
Islay	Barnacle and Greenland White-fronted	✓	✓	3-4 times a month	
Tiree and Coll	Greylag	✓ ²	Scaring related to goose use	Monthly	RSPB Scotland
Kintyre	Greenland White-fronted	✓	✓	Weekly	
South Walls, Hoy, Orkney	Barnacle	✓	Scaring related to goose use	Weekly	
Loch of Strathbeg	Pink-footed	Indirectly through goose droppings	✓	Monthly	
Uists	Greylag	✓ ²	Scaring related to goose use	Twice a year (August and February)	Volunteers
Solway	Barnacle	✓	✓	6 day cycle (more than weekly)	

¹ Local Goose Management Schemes (including goose monitoring) are funded by Scottish Government through SNH

² The monitoring of goose abundance and distribution started before the introduction of LGMSs; on Tiree in 1995 (LGMS started in 2003), and on the Uists in the late 1980s (LGMS started in 2000).

³ RSPB Scotland Tiree officer is partly funded by a SNH Area Framework agreement that includes monthly counts of all geese

In addition, specific feeding distribution surveys have been undertaken, although in an *ad hoc* fashion. For example, feeding distribution studies have been undertaken around the Moray Firth (Stenhouse 1996), Loch Leven (Newton & Campbell 1973, Hearn & Mitchell 1994), Strathallan (Bell & Newton 1995) and the Loch of Strathbeg (Giroux & Patterson 1995). In many areas, close to goose roosts designated as SPAs, the feeding distribution of geese is poorly known. Feeding distribution information has been sought for particular planning enquiries, notably where planning applications for wind turbines are being considered (e.g. Brooks & Mitchell 1996). However, in most cases, the methodology varies; there is no set timetable to surveillance, and the frequency of counts is often dictated by local conditions, the scale of the area being surveyed and budgetary constraints.

In summary, there is no fixed methodology for monitoring goose abundance and distribution in Scotland. Individual monitoring programmes have been tailored for local conditions and needs. Frequency and scale of monitoring is often driven by costs as much as a guiding methodology. However, broad goals for adequate monitoring are given in Table 3.

Table 3. Examples of frequency of monitoring goose abundance and distribution

	Example of organisations requiring information	Examples of schemes	Minimum	Timing	Preferred	Timing
International	Wetlands International, Member States, Countryside Agencies	International Waterbird Census	Annual	January	Monthly	September to March
National population census	Countryside Agencies, Conservation organisations	WeBS	Monthly	September to March	Monthly	September to March
National population census	Countryside Agencies, Conservation organisations	Grey Goose counts	Two counts in autumn	October, November or December	Monthly	September to March
Conservation agencies statutory requirement	SNH	Site condition monitoring	Annual ¹	Aim for month of peak count	Monthly	September to March
Site specific surveys	SNH/Scottish Government	Local Goose Management Schemes	Monthly (or bi-annual)	Varies	Monthly or fortnightly	Varies
Site specific surveys	Developers, competent authorities, advisors (including RSPB / SNH)	Planning enquiries	Monthly	Varies	Weekly or more regular	Varies

¹ Site condition monitoring (Common Standards Monitoring) indicates a minimum of one count once every six years. However, in order to provide comparable data for other SPAs (which are often provided by WeBS etc.) one count per winter is considered a minimum and one count a month desirable.

Two examples of current goose monitoring methods are further considered in detail:

5.2 Bean Goose monitoring in the Yare Valley, Norfolk

Bean Geese primarily feed within the RSPB Buckenham Marshes reserve area and they are counted by RSPB staff and volunteers (all costs are borne by RSPB). Abundance and distribution are monitored through daytime field checks (not roost counts). All fields within the RSPB reserve are checked, but fields outwith the reserve, which the geese may use from time to time, are not. Up to ten years ago, the geese were counted up to five days a week (on a four month RSPB winter contract). In more recent years, the geese have been counted approximately twice each week (as part of a wider project looking at disturbance). The distribution of the geese is plotted to field level. The reserve manager considers that counts once a week provide a minimum monitoring schedule for the RSPB reserve and provide a winter maximum count. The birds exhibit high site faithfulness, preferring the same suite of fields year after year. Despite attempts to manage nearby fields for Bean Geese, they were not attracted to them, preferring instead to continue to use their traditional feeding areas. The number of birds using the site has declined from c.400 birds to c.100 birds in the last 15 years, probably due to short-stopping in Denmark (Fig.11).

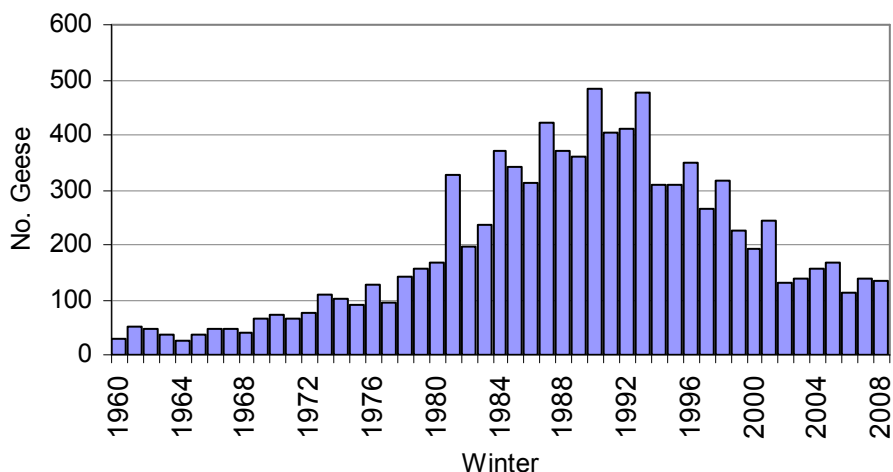


Figure 11. The number of Taiga Bean Geese counted at RSPB Buckenham Marshes (Yare Valley), Norfolk 1960/61 to 2008/09. RSPB data.

Approximate *minimum* costs for monitoring Bean Geese in the Yare Valley, Norfolk are:

- Staff time: 16 days for counting geese (two half days each week for four months, November to February)
- 8.5 days for data inputting (two hours each week for four months, November to February)
- 24.5 days total**
- Travel 60 miles a day for 14 days = 840 miles at 35p per mile = £294

5.3 Goose monitoring on Tiree

The Tiree goose counts follow a standardised route along roads and tracks, with short walks to vantage points included as well. The route was set up in 1995 for repeatable regular monitoring of all goose species. It was not set up with a LGMS in mind - although the data have been used to inform the current scheme. The route aims to cover the entire island and includes viewing offshore islets. All improved / cropped ground is checked at close range (which holds most geese), whilst all machair and sliabh areas (which hold much lower goose densities) are also checked as closely as possible. A few areas can only be covered by distant viewing through a telescope, but such areas typically only hold very few geese. No areas which regularly hold geese in any numbers are missed. All flocks encountered are marked with a number on a map of the island with details of each flock entered onto a count form, which includes flock number, species, count, field number, habitat and details of any rings seen, age counts done etc. In practice each "flock" consists of all geese observed in a given field compartment.

The counts are felt to take in >90% of the Greylag Geese present (up to c.4000 birds) and all of the Barnacle (up to c.2000 birds) and Greenland White-fronted Geese *Anser albifrons flavirostris* (up to c 900 birds). Counts take two whole days to complete - covering half the island each time with a divide between the counts down the middle of the island. Short daylight hours in mid-winter make the December count in particular quite a rush to complete, whilst any unexpected shooting disturbance during the count or a sudden closing in of the weather can cause major problems with the count (sometimes the count is abandoned and undertaken again on a new day). Total mileage is c.120 miles over each two-day count. One post-breeding Greylag Goose count is carried out in late August/early September and then monthly counts throughout the winter (up to March) fitting in with the national/international count dates. A count in October is optional as most of the Greenland

geese have not arrived by then. Additional summer counts for the LGMS have also been carried out in May, June and July to map summer Greylag Goose distribution.

Approximate *minimum* costs for monitoring geese on Tiree are:

Staff time:	14 days counting geese (two full days each month for seven months, September to March)
	3.5 days for data inputting (half a day each month for seven months)
	three days annual report writing
	20.5 days total
Travel	60 miles a day for 14 days = 840 miles

6 PROPOSED METHODOLOGIES FOR A MONITORING PROGRAMME

6.1 Abundance and distribution

Objective 3 of the Bean Goose Biodiversity Action Plan (2009, Appendix 2) recommends three targets for future research and monitoring in order to further the knowledge of Bean Goose requirements and behaviour. These include **continued annual monitoring of bird numbers and areas preferred for grazing, loafing and roosting**; following the migration route back to Sweden by fitting a radio or satellite tracking device to one of the birds, and achieving a better understanding of roosting and night-time movements of the flock. Future monitoring should fulfill the first of these requirements, those of the members of BGAG, as well as taking into account national and/or statutory obligations. Budgetary considerations are also an important factor and need to be balanced with the recommendations of the frequency of surveillance.

In order to assess the monitoring needs of stakeholders, information was sought from, and provided by:

Neville Makan	SNH Area Officer
Christine Urquhart	SNH (National) ornithologist
Simon Cohen	SNH (National) ornithologist
Angus Maciver	BGAG
Toby Wilson	RSPB Scotland
Andy Gallagher	Forestry Commission Scotland (FCS)
Ian Ludbrook	Falkirk District Council (FDC) Development Services
Emily Wadsworth	Central Scotland Forestry Trust (CSFT)
Laura Whyte	North Lanarkshire Council (NLC)

In addition, requirements of the Goose Science Advisory Group (GSAG), Wildfowl and Wetlands Trust and WeBS were obtained from Christine Urquhart, Richard Hearn and Chas Holt (BTO), respectively. An assessment of the monitoring requirements is given in Table 4.

Table 4. Requirements of stakeholders for surveillance of Bean Geese at the Slamannan Plateau

	Abundance (Winter peak count ¹)	Distribution (Individual field use)	Productivity assessment
SNH (national)	✓ ²		✓
SNH (local)	✓		
RSPB Scotland	✓	✓	Desirable
FDC	✓	✓	
NLC	✓	✓	
CSFT	✓	✓	
FCS	✓	✓	
<i>Other bodies</i>			
GSAG	✓	✓	✓
WWT	✓		✓
WeBS partnership	✓		

✓ - considered essential

¹ Obtained either through roost counts or field counts

² Statutory requirement of SPA monitoring

The future requirements therefore appear to be:

- an adequate assessment of peak winter numbers (for statutory requirements of monitoring the SPA and other international/monitoring schemes). This can be obtained from regular roost counts (once a month) backed up by counts from regular field checks (once a week) with extra emphasis placed on the period just after arrival (twice a week).
- Distribution data throughout the season (for local planning issues). This can be obtained through the field checks either through the non-standardised monitoring currently undertaken, or preferably through systematic monitoring through the re-instating of a standardised route count.

The following suggestions for future monitoring of Bean Geese at the Slamannan Plateau are made following the assessment of needs (given above) and a comparison of the quality and value of data that would be derived from the proposed monitoring programme compared with the current monitoring (section 7 below). Consideration also needs to be given to ensuring the monitoring programme can be achieved by contracted individuals who may not have prior knowledge of the habits of these particular geese or the landscape of the Slamannan Plateau.

The minimum requirement for monitoring **abundance** at the site is counting the maximum number of birds present each season (winter peak count) ideally through roost counts. The highest count (derived either from roost counts or field counts - see below) should be used as the winter maximum. When recording roost counts, each flock should be noted (as is currently reported), but there is also a need to record, separately, the total number of birds roosting at a site. Any other geese counted at the roost site should be recorded.

Recommendation 1. One roost count a month to be undertaken from October to February

When assessing **distribution**, previous counts suggest that, by early November, all of the birds likely to winter at the site have arrived. The birds tend to use the Luckenburn Farm area shortly after arrival, dispersing to use more fields (Fig.6) and breaking into smaller flocks (Fig.7) as the season progresses. This provides a useful check on the maximum winter count derived from roost counts (see above) and it makes sense to undertake more field counts at this time than later in the season. If the number of field counts is reduced, however, to once a week after early November, it is likely that the total number of fields used by the geese will be underestimated somewhat (see Fig.12 in next section). However the frequency of field counts needs to be balanced by available budgets. Maintaining regular counts later in the season offers vigilance in case there is a cold weather movement of extra Bean Geese into the area (although this has never been noted), or the timing of arrival of the wintering birds changes (increasingly possible given the extent of short-stopping among some other European goose populations).

Recommendation 2. Two field counts each week during October and the first half of November, and then one field count a week from the second half of November to the end of February

The distribution of geese at different times of the winter highlights changes in the importance of certain fields/areas and this suggests that regular/standardised monitoring throughout the season is required. A standardised route also allows analysis of the areas/fields that the geese prefer compared to those that they avoid. Recording which fields have been checked for geese (and where none were recorded) allows for these comparisons to be achieved. As is, the current monitoring methodology involves checking large areas, but the fields checked

that do not hold geese are not recorded. Reverting to a standardised route in which a record is kept of all fields checked ought to be relatively easily achieved.

Given that the geese have only been recorded in 129 fields and 80% of the total number of birds encountered have been recorded on 37 fields (Fig. 9) a standardised route can be developed that can be undertaken in four to six hours. An example of a standardised route has been provided by Angus Maciver and covers 31 miles (50 Km) (Appendix 3). Some of the vantage points can only be accessed on foot. The route will need to be devised and discussed with those undertaking future monitoring but, as a minimum, should include checking all 129 fields the geese have been recorded in to date. If a major shift in the distribution of Bean Geese is detected through future monitoring (see recommendation 4 below), the standardised route can be re-assessed to ensure that newly used areas are checked.

Recommendation 3. Flock counts are undertaken using a standardised route and the same fields are checked each day.

Future monitoring using a standardised route and checking the same fields on each day necessitates a subtle shift in how data are recorded. Positive records of goose flocks can be recorded in the same manner as currently, but a record needs to be maintained of all fields checked which held no geese.

As is current practice, any disturbance events occurring during the time that the observer counts the geese, the habitat type of the field, as well as the number and type of any domestic stock in the fields should be recorded. The number and location of any other geese encountered during the field counts needs to be recorded.

In the last few winters (2007/08 and 2008/09) part of the flock has not been located in the Slamannan Plateau area in January and February; the birds either having moved to a new area some distance away or are feeding undetected just outwith the Slamannan Plateau area. In order to determine where the geese are, checks need to be undertaken in locations outwith the Slamannan Plateau area. Similarly, if flocks of Bean Geese are reported outwith the Slamannan Plateau area these should be checked. Records of any Bean Geese encountered during these extra checks need to be recorded and reported in a systematic way. If a new regular winter area is located, consideration could be given to extending the standardised route to accommodate that area.

Recommendation 4. Checks of areas outwith the Slamannan Plateau should be undertaken from October to March during times when the geese are not present

Once flocks are encountered, the current recording is considered adequate. If, however, members of BGAG require further information about field use, and in particular feeding preferences, behavioural observations could be undertaken whilst carrying out field counts. For example, flock scans will ascertain which fields the geese are actively feeding in (as opposed to loafing in). Although, undertaking extra observations would require more time once the birds have been located.

6.2 Age assessments

An estimate of the **proportion of young** in a sample of the autumn flock is a key requirement for SNH (nationally), GSAG and WWT. Since those undertaking Bean Goose monitoring locally have excellent opportunities for close observations of the geese, sample age counts could be undertaken, if the observer is able, on an *ad hoc* basis (at no extra cost).

Recommendation 5. *Ad hoc* age assessments to be undertaken, if the observer is able.

6.3 Further research

Objective 3 of the Bean Goose Biodiversity Action Plan (2009, Appendix 2) recommends two further targets for future research and monitoring in order to further the knowledge of Bean Goose

- following the migration route back to Sweden by fitting a radio or satellite tracking device to one of the birds, and
- achieving a better understanding of roosting and night-time movements of the flock

The scope of this review falls short of providing suggestions for furthering these two targets. However, both targets complement the proposed monitoring methodology and would provide valuable supplementary information. Use of a satellite transmitters has greatly improved the understanding of the feeding distribution of Greenland White-fronted Geese at Loch Ken (Dumfries & Galloway) and, in addition, has provided information about roost locations and frequency of use (WWT data unpubl.). The use of satellite transmitters on Bean Goose caught at the Slamannan Plateau might well reveal new feeding areas, frequency of roost use, locations Bean Geese move to when not in the Slamannan Plateau, as well as describing the staging and breeding quarters of the geese.

Recommendation 6. BGAG to help progress the Bean Goose Biodiversity Action targets, including considering the use of satellite transmitters

7 A COMPARISON OF THE QUALITY AND VALUE OF DATA THAT WOULD BE DERIVED FROM THE PROPOSED MONITORING PROGRAMME COMPARED WITH THE CURRENT MONITORING

In order to compare the quality and value of data derived from a future monitoring programme compared to the current monitoring programme a sampling procedure using the existing collated data was used. Three measures of surveillance were examined:

Abundance (based on roost counts and supplemented by field counts)

Distribution (based on the number of fields used by Bean Geese)

7.1 Abundance: roost counts and field counts

7.1.1 Methods

Using roost count data collected from 1997/98 until 2008/09, each daily total (which included nil counts) was allocated a week number, a half month number and a month number (see Appendix 4 for details). When two roost counts were carried out on the same day, the highest count for that day was used. For each sampling time period (week, half month, month), a random daily total was chosen from the collated data. The highest randomly sampled value, for each time period, was then compared with the highest daily total obtained from the current monitoring programme data. The same sampling procedure was then used with field count data (including duplicate counts).

7.1.2 Results

Treating the current number of roost count monitoring (c.33 counts per winter season) as an arbitrary maximum level of monitoring, future monitoring surveillance on a once a week basis resulted in 1.9% reduction in roost count totals, once every two weeks resulted in a 4.6% reduction and counts undertaken once a month led to a 4.4% reduction (Fig.12). Thus, reducing the roost counts to once a month led to a slight reduction in the maximum totals obtained from the surveillance currently undertaken.

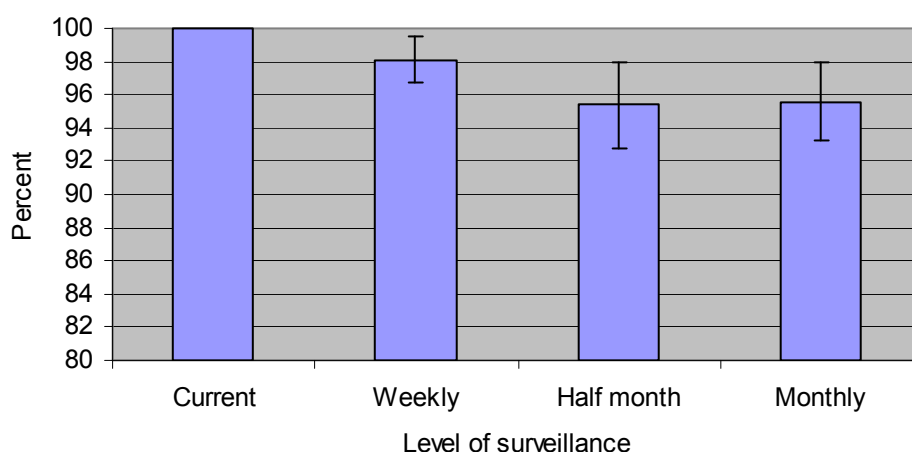


Figure 12. Peak mean roost count totals obtained by sampling existing Bean Goose count data, weekly, half monthly and monthly. Expressed as percent of current values (left hand column). Data pooled from 1997/98 until 2008/09. Standard errors shown. Note different scale to Figure 13

Treating the current number of field counts (c.76 counts per winter season) as an arbitrary maximum level of monitoring, future monitoring surveillance on a once a week basis resulted in a 22.1% reduction in winter peak mean field count daily totals, once every two weeks resulted in a 25.5% reduction and field counts undertaken once a month led to a 43.5% reduction (Fig.13).

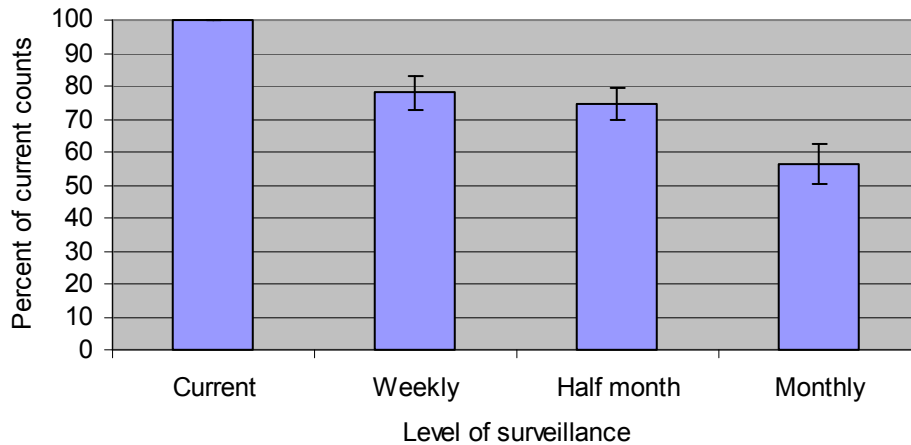


Figure 13. Peak mean field count daily totals obtained by sampling existing Bean Goose count data, weekly, half monthly and monthly. Expressed as percent of current values (left hand column). Data pooled from 1997/98 until 2008/09. Standard errors shown

Field counts do not follow a standardised route and included duplicate counts, thus the results in Fig.13 do not represent a reduction in the winter peak count, but simply suggest that if fewer counts are undertaken, the field count daily totals are likely to be reduced.

7.2 Distribution: the number of fields used by Bean Geese

7.2.1 Methods

Using field count data collected from 1997/98 until 2008/09, each field in which Bean Geese were recorded was allocated a week number, a half month number and a month number. For each time period (week, half month, month) data from a random day was chosen from the available data. If geese were recorded using more than one field during a day, all fields from that day were used in the analysis. The number of fields in which Bean Geese were recorded for each time period was then compared with the total number of fields obtained from the current monitoring programme data.

7.2.2 Results

Treating the current level of monitoring (c.76 counts per winter season) as an arbitrary maximum level of field use, future monitoring surveillance on a once a week basis resulted in a 13.4% reduction in the number of fields in which geese were recorded, once every two weeks resulted in a 38.6% reduction and counts undertaken once a month led to a 63.0% reduction (Fig.14).

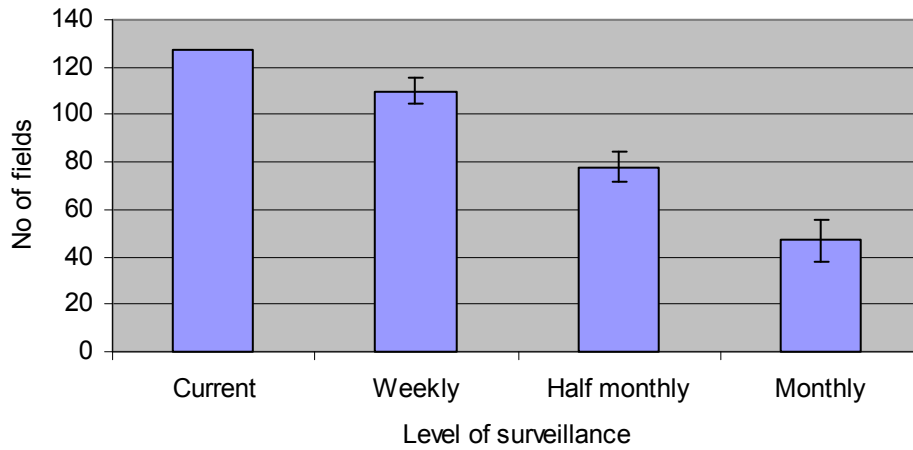


Figure 14. The number of fields in which Bean Geese were recorded obtained by sampling existing Bean Goose count data, weekly, half monthly and monthly. Data pooled from 1997/98 until 2008/09. Standard errors shown

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9 APPENDICES

Appendix 1. Summary of data presented in annual Bean Goose reports

Winter	Number of days on which counts were undertaken (number of separate counts)			Source
	Roost	Standardised route	Field counts	
1997/98	3 (3)	5 (11)	59 (124)	Simpson, J. & Maciver, A. (1998)
1998/99	15 (19)	5 (11)	61 (101)	Simpson, J. & Maciver, A. (1999)
1999/00	9 (13)		53 (111)	Simpson, J. & Maciver, A. (2000)
2000/01	14 (15)		74 (123)	Simpson, J. & Maciver, A. (2001)
2001/02	29 (36)		62 (109)	Simpson, J. & Maciver, A. (2002)
2002/03	20 (23)		85 (143)	Simpson, J. & Maciver, A. (2003)
2003/04	30 (30)		93 (176)	Simpson, J. & Maciver, A. (2004)
2004/05	20 (24)		76 (138)	Simpson, J. & Maciver, A. (2005)
2005/06	44 (111)		103(221)	Maciver (2006)
2006/07	29 (46)		77 (136)	Maciver (2007)
2007/08	26 (41)		86 (158)	Maciver (2008)
2008/09	25 (37)		83 (163)	Maciver (2009)
Total	264 (398)	10 (22)	912 (1,703)	

Appendix 2. Objective and targets for research and monitoring from the Bean Goose Action Plan (2006)

Objective 3 of the Bean Goose Biodiversity Action Plan (2009) recommends three targets for future research and monitoring:

- Further knowledge of bean goose requirements and behaviour, in particular investigating local movements and behaviour of individual birds and the migration route to Sweden (ongoing).

Target 3.1

Continue annual monitoring of bird numbers and areas preferred for grazing, loafing and roosting (ongoing).

Target 3.2

Follow the migration route back to Sweden by fitting a radio or satellite tracking device to one of the birds

Target 3.3

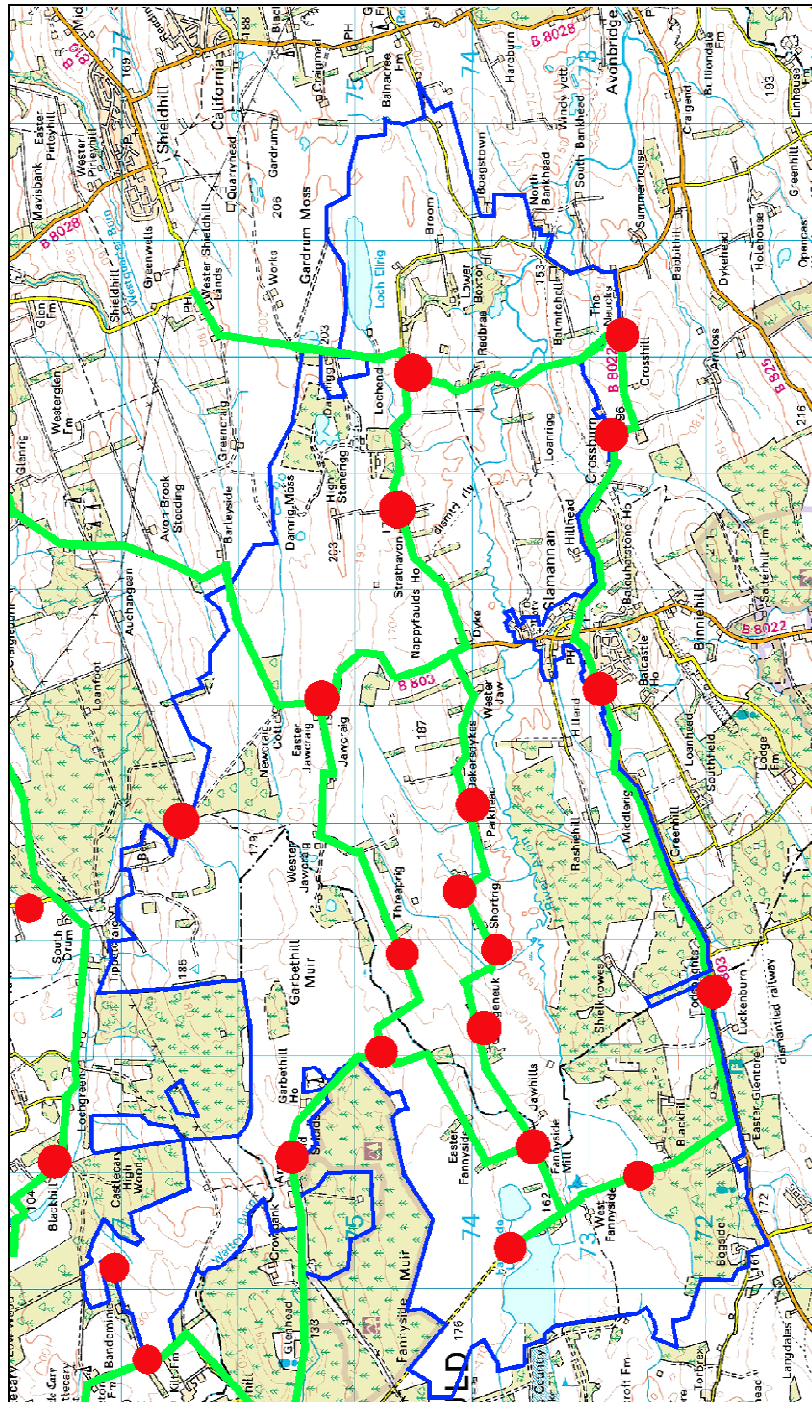
Achieve a better understanding of roosting and nighttime movements of the flock.

ACTION								
5. Research and monitoring	Lead	Partners	2009	2010	2011	2012	2013	2018
5.1 Monitor annually species numbers and fields used for feeding and roosting and produce an annual report.	AM	RSPB Scotland SNH FalkC NLanC	✓	✓	✓	✓	✓	✓
5.2 Produce an updated GIS map of key bean goose feeding and roosting fields based on data from action	SNH		✓	✓	✓	✓	✓	✓
5.3 Conduct further research into the local movements and behaviour of individual birds in the central Scotland flock by fitting neck collars.	BGAG	SNH AM					✓	
5.4 Follow migration route back to Sweden by fitting a radio transmitter to one of the birds	BGAG				✓			
5.5 Monitor roosting and night time movement of bean goose flock.	RSPB Scotland	SNH BGAG		✓				
5.6 Make contact with universities, research units and other organisations/individuals with an interest in bean geese.	BGAG		✓	✓	✓	✓	✓	✓
5.7 Establish links with those involved in the management of the Norfolk flock to maximise opportunities for joint working.	BGAG		✓					

Abbreviations: AM: Angus Maciver. BGAG: Bean Goose Action Group. FalkC: Falkirk Council Development Services. NLanC: North Lanarkshire Council. RSPB: Royal Society for the Protection of Birds. SNH: Scottish Natural Heritage

Appendix 3. Example standardised route

Angus Maciver has provided an example standardised route which shows the road network taken (green, approx 31 miles/50 Km) and suitable vantage points (red dots) allowing for coverage of the Slamannan Plateau currently used by Bean Geese. Some vantage points need to be accessed on foot.



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Appendix 4. Sample time periods

Allocation of week numbers, half week numbers and monthly numbers used in comparisons of current monitoring programme and future surveillance rates.

Seven day period of surveillance	Week number	Half month number	Month number
1 – 7 October	1	1	1
2 - 14 October	2	1	1
15 – 21 October	3	2	1
22 – 31 October ¹	4	2	1
1 – 7 November	5	3	2
2 - 14 November	6	3	2
15 – 21 November	7	4	2
22 – 30 November ²	8	4	2
1 – 7 December	9	5	3
2 - 14 December	10	5	3
15 – 21 December	11	6	3
22 – 31 December	12	6	3
1 – 7 January	13	7	4
2 - 14 January	14	7	4
15 – 21 January	15	8	4
22 – 31 January ¹	16	8	4
1 – 7 February	17	9	5
2 - 14 February	18	9	5
15 – 21 February	19	10	5
22 – 28 February ³	20	10	5

¹ – contains ten days

² – contains nine days

³ – contains eight days in 2000, 2004 and 2008

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