

Report 2 of 3 for RSPB, SNH, FCS and GWCT

Black grouse conservation review

Scotland Rural Development Programme spend

Robert Hawkes
(2013)

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Executive summary

Context: Much of the conservation action for black grouse, aimed at achieving the biodiversity action plan targets of population recovery and range expansion, have been delivered through Rural Priorities (RP), an environmental element of the Scotland Rural Development Programme (SRDP). By assessing SRDP investment in relation to black grouse distributions, trends and existing guidelines, this report identifies how much has been committed and whether this investment has been appropriately targeted.

Approach: RP expenditure is explored through two datasets: 1) overall RP spend (expenditure on 25 RP options of potential black grouse benefit), and 2) black grouse package spend (investment through the black grouse package only). The first dataset provides an overarching account of RP money designed to deliver a wide range of rural objectives, whilst the latter is a more accurate account of expenditure directly relevant to this species. Known lek records from an RSPB and BTO meta dataset (the Bird Conservation Targeting Project (BCTP)) were used to examine this investment in relation to the known Scottish black grouse distribution. This dataset appears to be a good fit of the 2008-11 Breeding Bird Atlas black grouse range.

Results: Between 2007 to November 2011, over £8 million has been committed through the black grouse package, with a further £92 million committed through RP options of potential benefit to black grouse. The highest concentration of investment through the black grouse package occurred within South East Scotland, the region of greatest recent declines (Sim *et al.* 2008). The majority of this expenditure has occurred within parishes containing at least one priority lek site (4+ males). Conversely, over £1 million has been spent within parishes that contain no BCTP lek record. This report also summarises expenditure through different options.

Conclusions: Although the effectiveness of SRDP is unknown, black grouse package expenditure has been delivered both well and poorly. As SRDP is an applicant led process designed to deliver a range of rural objectives, this observation is not surprising. Future resources must be targeted effectively if agri-environment support is to deliver the Scottish Biodiversity Action Plan targets for black grouse.

Glossary

- BCTP: Bird Conservation Targeting Project
- FCS: Forestry Commission Scotland
- GWCT: Game and Wildlife Conservation Trust
- NBN: National Biodiversity Network
- NFE: National Forest Estate
- RDC: Rural Development Contract
- RP: Rural Priorities
- RPAC: Regional Proposal Assessment Committee
- RSPB: Royal Society for the Protection of Birds
- SBAP: Scottish Biodiversity Action Plan
- SNH: Scottish Natural Heritage
- SRDP: Scotland Rural Development Programme
- SUP: Southern Uplands Partnership

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1) Introduction

Across the UK black grouse (*Tetrao tetrix*) have undergone a long term decline (Holloway 2006), with recent estimates from 1995-1996 and 2005 highlighting a significant drop from 4719 to 3344 displaying males within Scotland (Sim *et al.* 2008). The causes of these trends are complex and varied, with different demographic stages driving declines between populations (Baines *et al.* 2007). Loss of suitable habitat through agricultural intensification, increasing grazing pressure, afforestation and forest maturation, alongside low survival rates mediated by predation and fence collisions, have all been cited as key contributors (Baines 1996, Baines & Andrew, 2003, Baines & Hudson 1995, Baines & Summers 1997, Cayford 1990, Cole *et al.* in 2012, Pearce-Higgins *et al.* 2007, Starling-Westerburg 2001, Summers *et al.* 2004, Warren & Baines. 2002). Supported by recent research, the Scottish population is believed to contain two separate genetic units, north and south of the central belt (Höglund *et al.* 2011). Although both populations have suffered declines recent losses have been greatest across the south (Sim *et al.* 2008). Black grouse are red listed as a species of high conservation concern (Gregory *et al.* 2002), listed on Annex 2B of the EU Birds Directive (2009/147/EC), are a UK Biodiversity Action Plan (UKBAP) species and a priority under the Species Action Framework (SNH 2007). Despite the discontinuation of the United Kingdom BAP process in 2008, maintaining a Scottish population of 3250 males across 230 10km² grid squares by 2030 is still a Scottish BAP (SBAP) conservation priority (Biodiversity Action Reporting System 2006).

Black grouse conservation is largely informed by scientific evidence (Cole *et al.* 2012). To maximise the benefits of positive management a targeted approach is widely considered crucial. In 2007, the black grouse SBAP steering group developed a set of national guidelines. In declining populations the aim was to halt further losses and maintain range, with preference given to collaborative work around leks containing 4+ males, or 3+ males where positive management was underway in adjacent areas. Within stable or increasing populations preference was given to areas holding 4+ males. Encouraging range expansion was a lower

priority. Lek records held by the RSPB, between 2000-2007, were used to identify priority areas.

Action towards the delivery of SBAP targets can be funded through the Scotland Rural Development Programme (SRDP). This scheme includes options designed to improve black grouse habitats and enhance the survival of birds. Since the start of SRDP the Royal Society for the Protection of Birds (RSPB), Scottish Natural Heritage (SNH), Forestry Commission Scotland (FCS), Game and Wildlife Conservation Trust (GWCT) and Southern Uplands Partnership (SUP), amongst others, have provided land managers with best practice black grouse guidance (Hawkes 2013).

By exploring committed investment in relation to black grouse distributions, trends and existing targeting guidelines this report identifies how much has been committed through SRDP and whether this investment has been well targeted. Recommendations for improving and prioritising future agri-environment investment to help deliver the black grouse SBAP targets are provided.

Objectives

1. To summarise SRDP investment of relevance to black grouse.
2. To appraise total SRDP investment of relevance to black grouse in relation to range, population trends and existing targeting guidelines.
3. To appraise where key management options of relevance to black grouse have been spent.

1.2 Background: Black grouse management under SRDP

Conservation measures through SRDP are principally supported by Rural Priorities (RP), a competitive mechanism designed to deliver the programme's environmental objectives (for an overview visit: www.scotland.gov.uk/Topics/farmingrural/SRDP/RuralPriorities). Under RP, 25 options of potential black grouse benefit are listed within the black grouse package. Each option offers financial returns for a particular management practice, e.g. away wintering sheep. Many of the options focus upon a common objective (e.g. native woodland creation), hereafter referred to as 'management scenarios'. Seven management scenarios, available through the black grouse package, are listed below (the option(s) within each scenario are listed in italics).

- **Woodland management:** Managing/restructuring existing woodlands. (*Woodland Improvement Grant, Sustainable management of forests*).
- **Scrub and ancient wood pasture management:** Managing shrub communities or ancient wood pasture through grazing control. (*Scrub and tall herb communities, Ancient wood pasture*).
- **Native woodland creation:** (*Woodland Creation – Natural regenerated native woodland, Woodland creation – Native woodland planting*).
- **Moorland management:** (*Wildlife management on upland peat sites, Management of moorland grazing, Moorland grazing on uplands and peat lands, Moorland – stock dispersal, Away-wintering of sheep, Off-wintering of sheep, Muirburn and heather swiping, Habitat grazing management*).
- **In-bye management:** (*Management of species rich grassland, Creation and management of species rich grassland, Management of habitat mosaics, Mown grassland for wildlife, Open grazed or wet grassland for wildlife, Biodiversity cropping on in-bye*).
- **Predator control:** (*Mammal or bird control – predator control for black grouse and capercaillie*).
- **Bracken control:** (*Bracken management programme for habitat enhancement*).

2) Methods

2.1 Identifying SRDP spend of relevance to black grouse

To quantify how much spend of relevance to black grouse has been committed through RP a data request was submitted to the Agriculture, Food and Rural Communities Directorate of the Scottish Government. Details of every Rural Development Contract (RDC) between 2007 and November 2011 containing at least one option listed under the black grouse package were attained. Information was available at the parish level; a sufficient scale to provide an accurate picture of expenditure whilst complying with the data protection restrictions operating at the time. For each parish the options (and their associated package), committed expenditure, and area (ha) of all agreed RDC(s) were specified. Estimates of area were not available for 'Woodland Improvement Grants', 'Native woodland Creation – Natural regenerated native woodland & Native woodland planting', 'skill development', and 'bird and mammal control'. Duplicate area estimates were removed (e.g. initial bracken control and subsequent annual treatments).

RP spend was explored through two datasets: 1) 'overall RP spend' (from the 25 options within the black grouse package across all RP packages), and 2) and 'black grouse package spend' (investment from the black grouse package only). The first dataset (overall RP spend) provides an overarching understanding of all potentially relevant spend. The second dataset (black grouse package spend) provides a more accurate account of how expenditure targeted for black grouse has been distributed. Both data sets were digitized to the parish level within ArcGIS (ESRI 2011). All spatial analyses were preformed in Arc Map.

To focus the 'overall RP spend' dataset towards locations where management is likely to be beneficial, only parishes with known black grouse occupancy were considered. Occupancy was inferred as any parish that coincided within a 2km radius of each known lek. Lek records were collected as part of the Bird Conservation Targeting Project (BCTP), a partnership initiative between the BTO, Natural England, the RSPB, and SNH. The BCTP dataset used within this report contains all lek records held by the RSPB and BTO between 2005-09 (plus any 2010 data

available), this includes data from; most localised monitoring groups, the National Biodiversity Network, other RSPB datasets (e.g. RSPB led surveys, partnership surveys, the trial management project), biological record centres, and BTO datasets (including preliminary data from the 2007-2011 Bird Atlas). Data held by the BCTP is validated by local record centres and regional RSPB black grouse practitioners for accuracy. In some cases, where a data source is absent (e.g. the Deeside study group), other initiatives included within the BCTP have been able to confirm black grouse presence over the same area (e.g. the 2009 North East Scotland black grouse survey). Because the purpose of this dataset is to confirm bird presence, the exclusion of some datasets, in some cases, is not problematic. However, where monitoring is missing altogether (through a complete absence of monitoring or missing monitoring information from the BCTP dataset) black grouse presence cannot be confirmed. Therefore, any interpretation of black range within this report is probably an underestimate.

2.2 Quantifying SRDP spend on a national level

'Committed spend' and 'total area of management' was summarised across all identified RDC's to provide a national assessment of SRDP expenditure for both datasets. Similar calculations were made in parallel to this for each prescription and management scenario (section 1.2).

2.3 Relating SRDP spend to a number of black grouse parameters

To assess how total SRDP spend has been invested in relation to black grouse distribution, trends and management guidance the analyses outlined in Table 1 were performed.

2.4 Quantifying the spatial spread of SRDP spend

Using the 'overall RP spend' dataset total expenditure for each management scenario was summarised across all occupied parishes within nine RPACs.



Figure 1: The location of the four Scottish regions as described by the last national survey (Sim *et al.* 2008)

Table 1: The analyses and datasets used to examine how SRDP has been spent in relation to bird distributions, trends and management guidance

| Question | Analysed datasets | | Process |
|---|-------------------|----------------------|---|
| | All RP spend | Black grouse package | |
| Where has investment focused throughout Scotland? | Yes | Yes | Total investment was explored across all occupied parishes to give an estimate of spend relative to range. Total spend was summarised for each RPAC and the four Scottish regions identified within Figure 1. |
| How may leks have received investment? | Yes | Yes | The centre of every BCTP lek record from 2005-11 was superimposed over both datasets to infer the presence or absence of spend. |
| How much has been spent beyond the known black grouse range? | No | Yes | To summarise the extent and location of investment beyond the range all parishes without a BCTP lek record were identified. |
| How has money been spent in relation to regional black grouse trends? | Yes | Yes | Total investment was summed across all occupied parishes within four Scottish regions (Figure 1) and compared to known population trends (from 1995/6 to 2005 (Sim <i>et al.</i> 2008)). |
| Has investment reflected targeting guidance (areas with 4+ males)? | Yes | Yes | Total spend was grouped into the following categories: 1) parishes with at least one lek of 4+ males, 2) parishes with at least one lek of 1-3 male(s), and 3) parishes with no lek record. BCTP records were used to identify bird presence and numbers. |

3) Results

3.1 Quantifying SRDP spend on a national level

Between 2007-11 £103,425,325 was committed across 25 RP options (from 36 packages) of potential black grouse benefit within all parishes containing at least one lek record between 2005-11 (Table 2). Several options were not quantifiable by area, for those that were committed expenditure occurred over 358,731 ha. Of this total £8,071,336 was committed over a minimum of 76,903 ha through the black grouse package.

Total rural priority spend

In total, 24 options of relevance to black grouse have been utilised through RP (Table 2). 'Habitat grazing management' featured in no application. The options 'Native Woodland Planting', 'Open Grazed or Wet Grassland for Wildlife' and 'Sustainable Management of Forests' received the greatest levels of capital investment, £51,633,534, £9,296,523 and £7,799,014, respectively (Fig 2A).

Across the seven management scenarios, 'native woodland creation' prescriptions received the highest total investment (£53,197,754) (Table 3, Fig 3A), followed by 'In-bye management' (£16,614,819) and 'moorland management' (£13,653,626). 'Predator control' (£1,583,002) and 'Scrub and ancient wood pasture management' (£1,028,712) received the lowest.

Total black grouse package spend

In total, 22 options have been utilised through the black grouse package (Table 2). 'Habitat grazing management', 'Management/Restoration of Lowland Raised Bogs' and 'Buffer Areas for Fens and Lowland Raised Bogs' did not feature within any application. The options 'Mammal or Bird Control', 'Bracken Control' and 'Muirburn and Heather Swiping' received the greatest

levels of capital investment, £1,667,694, £957,104, and £935,474, respectively (Fig 2B). Because the RP overall dataset only considers parishes with a BCTP record, predator control, which is largely funded in designated sites, has received more money through the black grouse package.

Across the seven management scenarios, 'moorland management' prescriptions received the highest total investment (£3,348,001) (Table 3, Fig 3B), followed by predator control (£1,667,694) and bracken control (£957,104). 'Scrub and ancient wood pasture management' (£234,136) and 'woodland management' (£135,349) received the lowest.

Table 2: Total committed expenditure (£) and application area (ha) of each Rural Priority option of potential relevance to black grouse. Note, * = no available data

| Option | All Rural priorities | | Black grouse package only | |
|--|----------------------|-----------------|---------------------------|-----------------|
| | Total committed (£) | Total area (ha) | Total committed (£) | Total area (ha) |
| Ancient Wood Pasture | 221,003 | 290 | 25,375 | 91 |
| Away-Wintering of Sheep | 2,739,950 | 22,059 | 695,732 | 5,228 |
| Biodiversity Cropping on In-Bye | 51,467 | 169 | 5,675 | 16 |
| Bracken Management Programme | 3,746,032 | 11,431 | 957,104 | 2,752 |
| Creation of Species Rich Grassland for wildlife | 606,232 | 331 | 7,788 | 5 |
| Mammal and Bird Control | 1,583,002 | * | 1,667,694 | * |
| Management of Habitat Mosaics | 3,827,269 | 6,330 | 326,217 | 518 |
| Management of Moorland Grazing | 1,954,208 | 158,415 | 591,223 | 52,288 |
| Management of Species Rich Grassland | 2,845,148 | 4,337 | 90,380 | 131 |
| Moorland - Stock Disposal | 2,202,283 | 19,763 | 568,402 | 5,305 |
| Moorland Grazing on Uplands and Peatlands | 328,216 | 23,648 | 54,253 | 3,363 |
| Mown Grassland for Wildlife | 3,815,449 | 3,929 | 61,860 | 58 |
| Muirburn and Heather Swiping | 1,643,036 | 4,835 | 935,474 | 2,792 |
| Off-Wintering of Sheep | 718,491 | 11,199 | 176,210 | 2,668 |
| Open Grazed or Wet Grassland for Wildlife | 9,296,523 | 14,306 | 722,075 | 1,124 |
| Scrub and Tall Herb Communities | 807,709 | 1,348 | 208,761 | 398 |
| Skills development - individual training | 52,865 | * | 413 | * |
| Sustainable Management Of Forests | 7,799,014 | 23,054 | 13,660 | 26 |
| Wildlife Management on Upland and Peatland Sites | 240,174 | 52,650 | 490 | 140 |
| Native woodland - natural regeneration | 1,564,221 | * | 14,135 | * |
| Native woodland planting | 51,633,534 | * | 826,726 | * |
| Woodland Improvement Grant | 5,198,882 | * | 121,689 | * |
| Buffer Areas for Fens and Lowland Raised Bogs | 323,604 | 211 | 0 | 0 |
| Habitat Grazing Management | 0 | 0 | 0 | 0 |
| Lowland Raised Bogs | 227,015 | 426 | 0 | 0 |
| Total | 103,425,325 | 358,731 | 8,071,336 | 76,903 |

Table 3: Total committed expenditure (£) for each management scenario

| Management scenario | All rural priorities (£) | Black grouse package only (£) |
|---|---------------------------------|--------------------------------------|
| Native woodland creation | 53,197,754 | 840,861 |
| Woodland management | 12,997,896 | 135,349 |
| Scrub and ancient wood pasture management | 1,028,712 | 234,136 |
| Moorland management | 13,653,626 | 3,348,001 |
| In-bye management | 16,614,819 | 887,778 |
| Bracken control | 3,746,032 | 957,104 |
| Predator control | 1,583,002 | 1,667,694 |

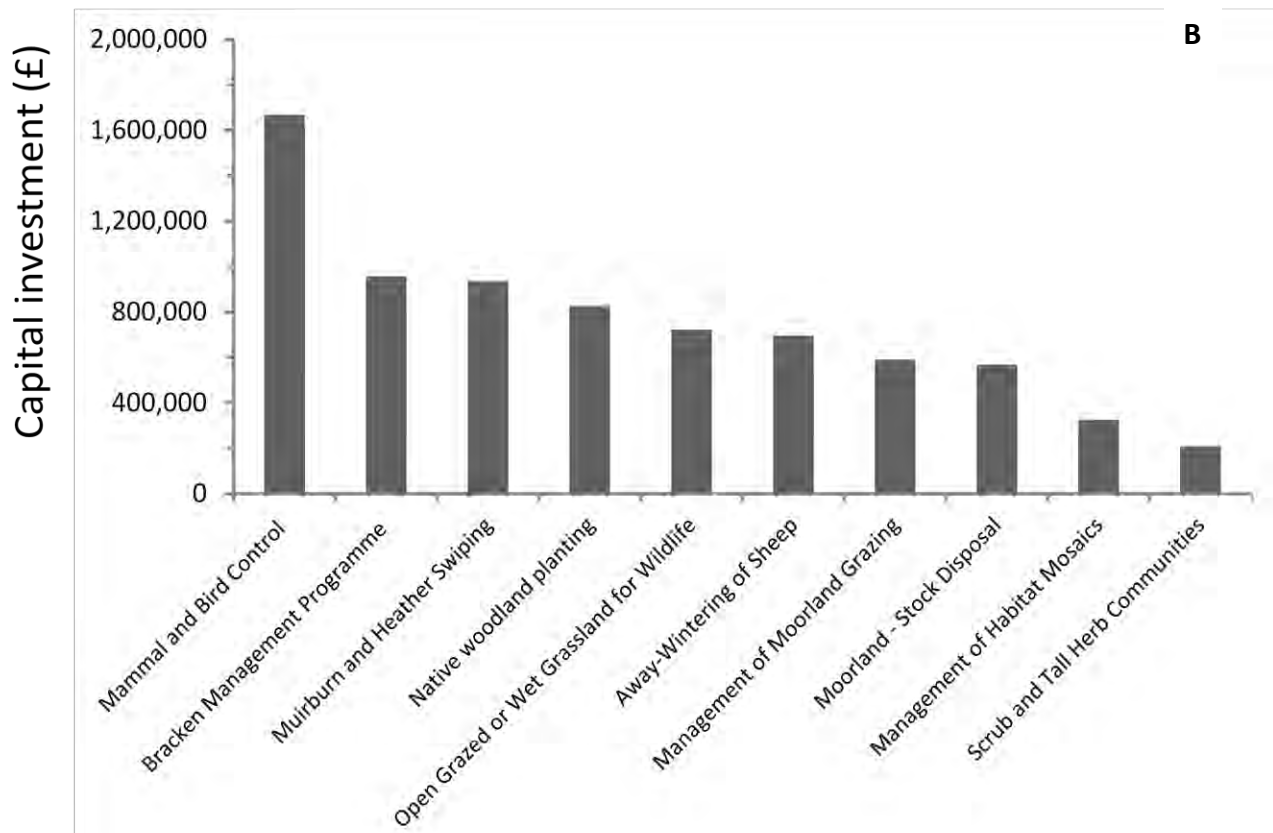
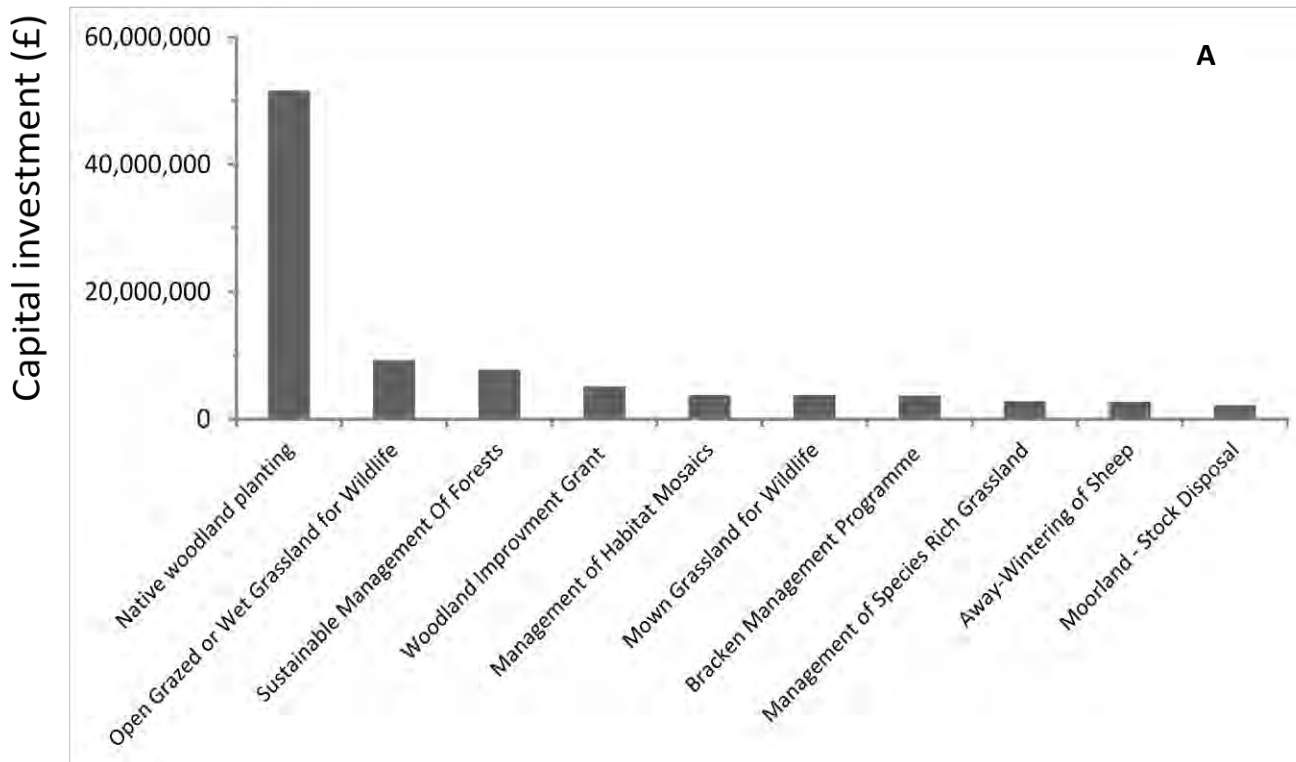


Figure 2: Committed investment for each Rural Priority option listed under the black grouse package: A) overall RP spend, B) black grouse package spend

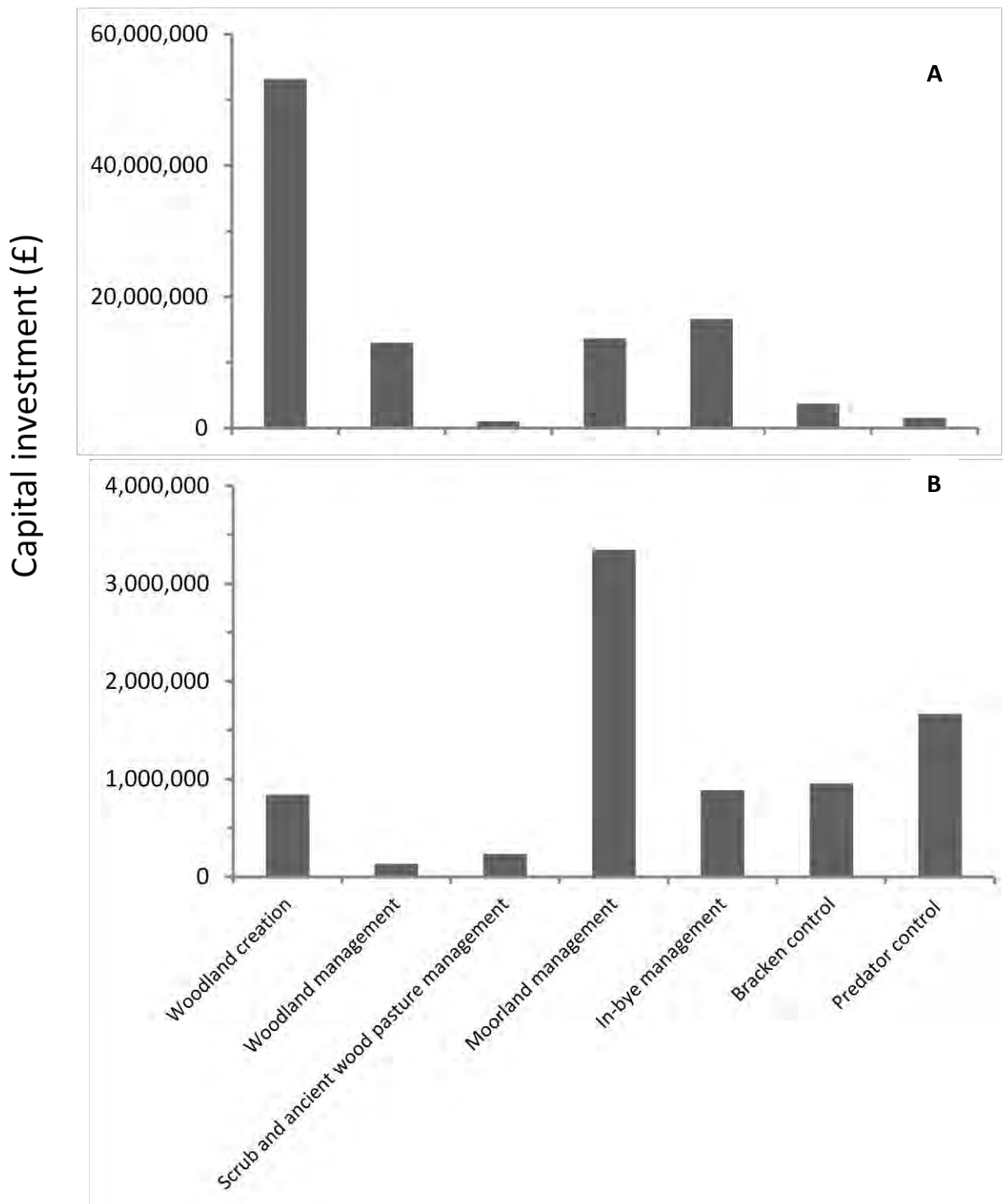


Figure 3: Committed investment for each management scenarios of potential benefit to black grouse: A) overall RP spend, B) black grouse package spend

3.2 Relating SRDP spend to a number of black grouse parameters

Total rural priority spend

RP spend of relevance to black grouse occurred within 305/336 parishes with lek occupancy (Fig. 4A). There are a few leks that are located within parishes which have received no investment (72/1666). Across all occupied parishes investment (per unit area) was highest in the Borders (£36.8 per ha) and Grampian (£23.5 per ha) (Fig. 5A), whilst Ayrshire (£13.1 per ha) and the Clyde Valley (£16.3 per ha) received the lowest.

Although these figures take into account differences in parish size, parishes within North Scotland are generally larger. When one superimposes the known distribution of Scottish black grouse over these parishes, those in the south are typically a better fit of the existing range. As a result, when examining the amount of per unit area SRDP expenditure between parishes of known black grouse occupancy, those in the north generally include a greater amount of space which is potentially irrelevant to black grouse conservation. Therefore, differences in per unit area spend between RPACs are not accurately comparable because of this bias.

Across all occupied parishes, capital commitments were highest in South East Scotland (£33.3 per ha), the region of greatest black grouse declines (-69%) (Fig. 6A) (Sim *et al.* 2008). Spend (per unit area) was similar between the south west (£19.6 per ha), north (£18.6 per ha) and north east (£22.1 per ha) irrespective of variations in reported declines (-49%, -19%, and -9%, respectively (the latter two are not statistically significant) (Sim *et al.* 2008)).

Both total and per unit area spend was higher within parishes containing at least one lek of 4+ males (£54,741,545, £21.3 per ha) compared to those of 1-3 males (£48,683,781, £19.8 per ha) (Fig. 7A).

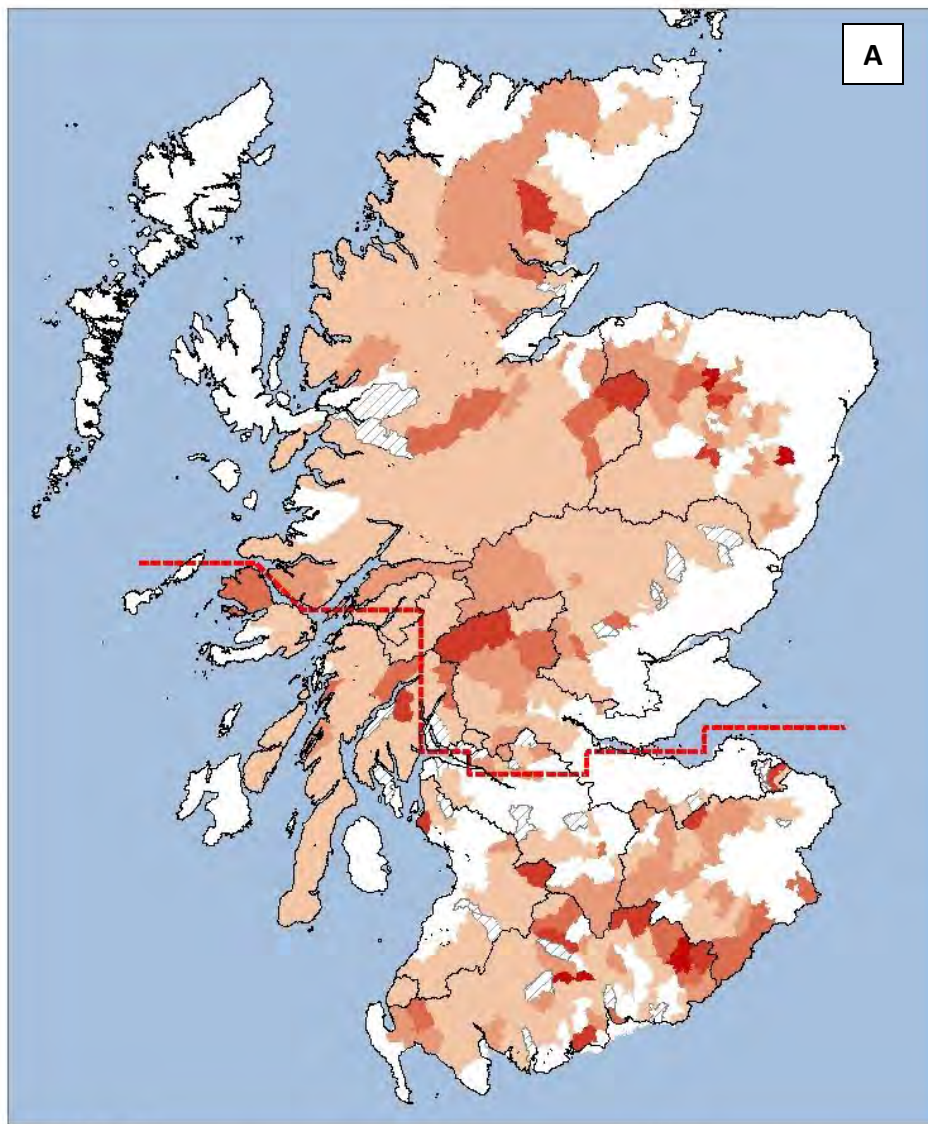
Total black grouse package spend

Black grouse package spend occurred within 96 parishes within and beyond the black grouse range, as defined by the BCTP dataset (Fig. 4B). These parishes cover a large portion of the known lek sites (686 out of 1666 records), however, a large number of leks throughout the Scottish range have received no investment. Across all occupied parishes investment (per unit area) was highest in the Borders (£6.8 per ha) and Tayside (£2.6 per ha) (Fig. 5B), whilst Dumfries and Galloway (£0.3 per ha) and the Highlands (£0.5 per ha) received the lowest.

In total, £1,053,481 was spent under the black grouse package across 16 parishes with no lek record in the BCPT dataset, amounting to 13.1% of overall package spend (Fig. 8). However, care must be taken when using this figure to interpret the extent of spend beyond the actual black grouse range. Not every monitoring survey is included within the BCTP dataset whilst some areas have received no monitoring altogether (Hawkes and Corrigan 2013). Some 'unoccupied' parishes may therefore contain a lek.

Across all occupied parishes capital commitments were highest in South East Scotland (by over four fold) (£8.5 per ha), the region of greatest black grouse declines (-69%) (Fig. 7B) (Sim *et al.* 2008). Spend (per unit area) within the south west (£1.2 per ha), north (£0.6 per ha), north east (£1.7 per ha), did not follow regional variations in reported declines (-49%, -19%, and -9%, respectively (the latter two are not statistically significant) (Sim *et al.* 2008)).

Of 96 parishes receiving investment, 51 had at least one lek record of 4+ males, 29 had at least one lek record (1-3 males), and 16 had no record, as defined by the BCTP dataset. Total committed spend was highest within parishes containing at least one lek of +4 males (£5,234,299), followed by parishes with at least one lek (£1,783,555). Parishes with no lek record received the least (£1,053,481) (Fig. 8). Per unit area spend follows the reverse pattern; parishes with no lek record received the highest concentrations of spend (£8.3 per ha), followed by those with at least one lek of 1-3 males (£5.7 per ha) and +4 males (£4.1 per ha).



Rural priorities:
Total committed spend (£/ha) within parishes
of known black grouse occupancy

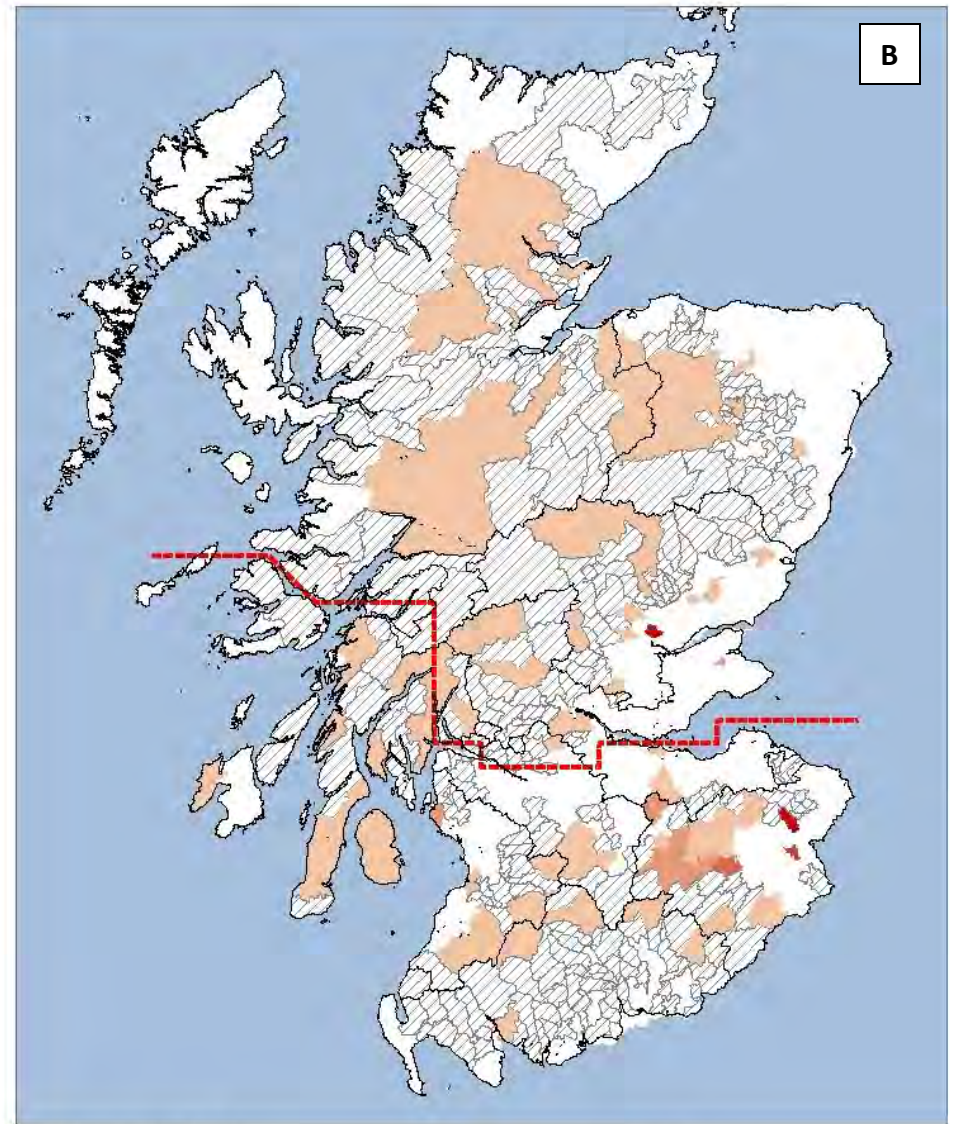
0 50 100
Km

Created by Robert Hawkes and Paul Britten, 15 March 2012



Legend

- North/ South divide
- ▨ Occupied parish with no RP spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend



Black grouse package:
Total committed spend (£/ha)

0 50 100
Km

Created by Robert Hawkes and Paul Britten, 03 July 2012



Legend

- North/ South divide
- ▨ Occupied parish with no RP spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend

Figure 4: Committed SRDP spend (£/ha): A) overall RP spend, B) black grouse package spend

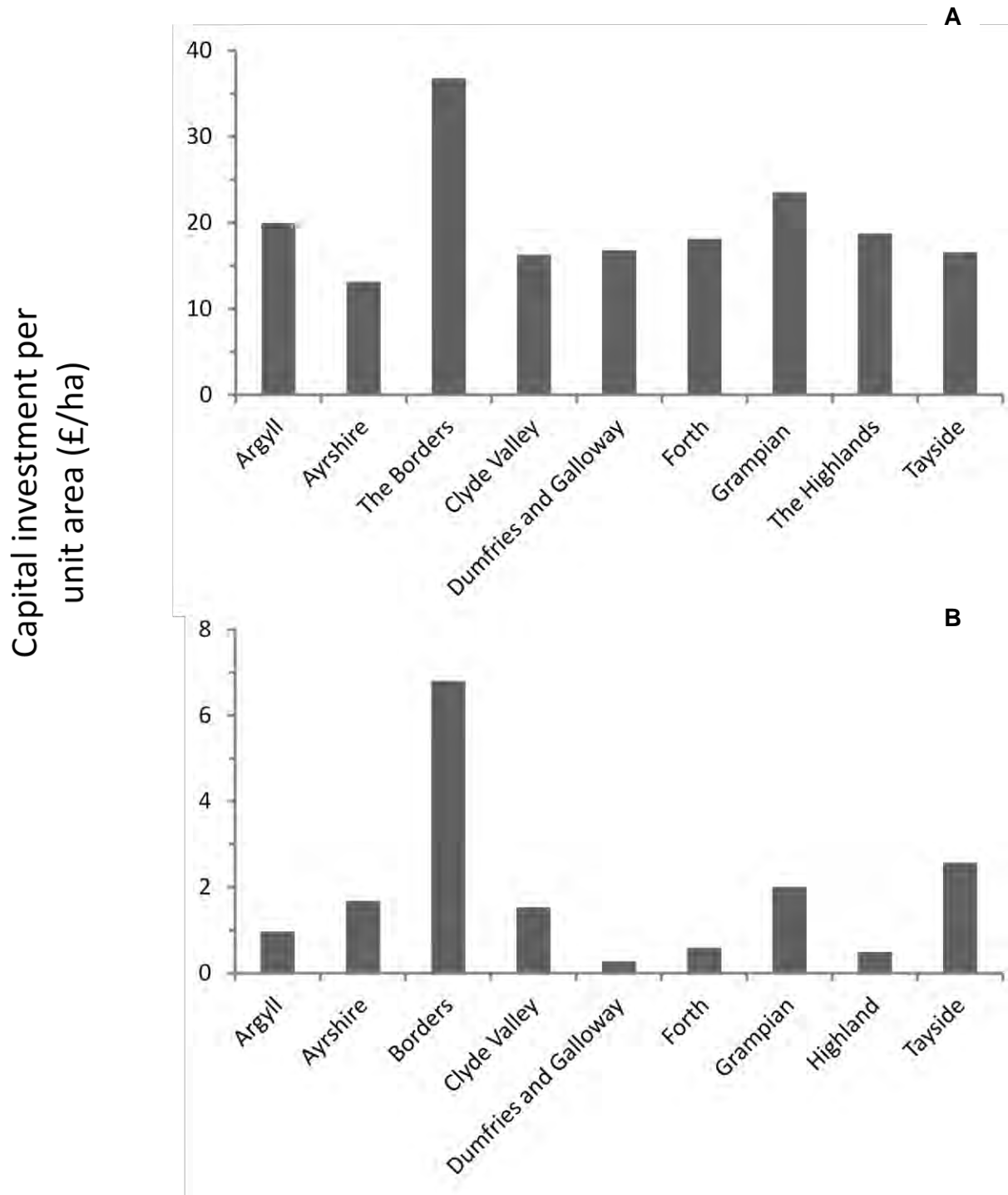


Figure 5: Per unit area spend (£/ha) through RP across nine RPACs across all occupied parishes: A) overall RP spend, B) black grouse package spend

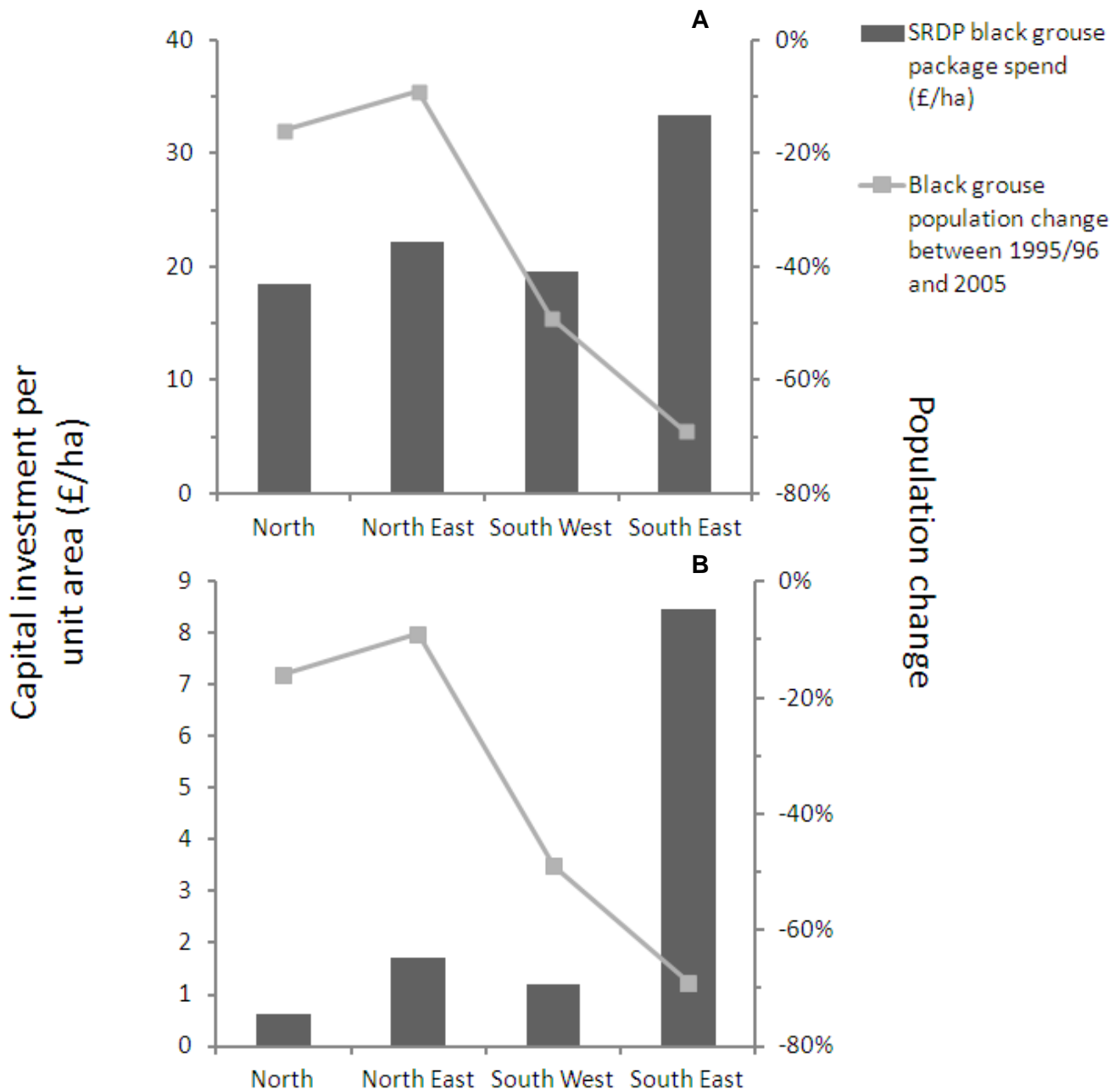


Figure 6: Committed SRDP spend (£/ha) across all occupied parishes within four Scottish regions in relation to population change between 1995/6 - 2005 (Sim *et al.* 2008): A) overall RP spend, B) black grouse package spend

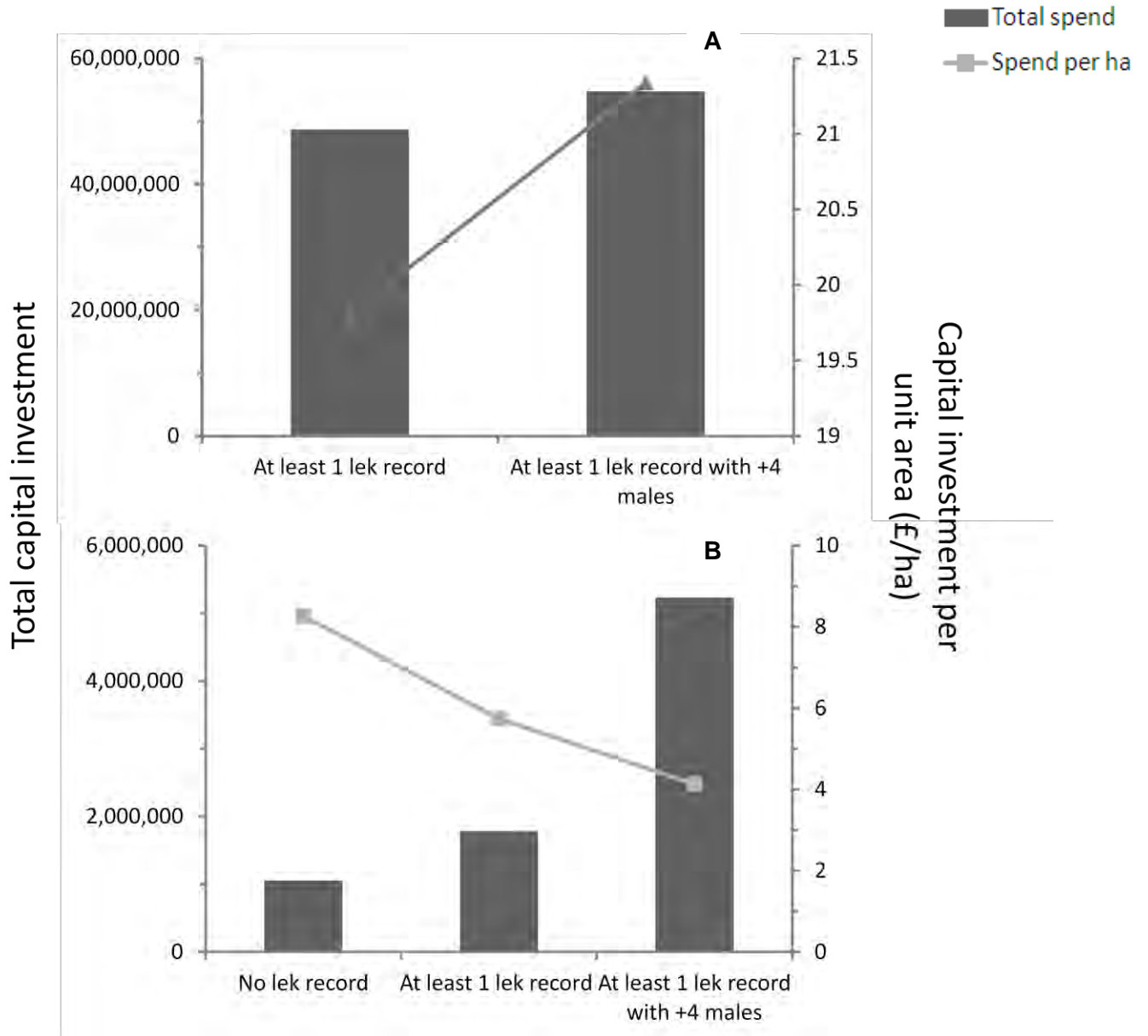
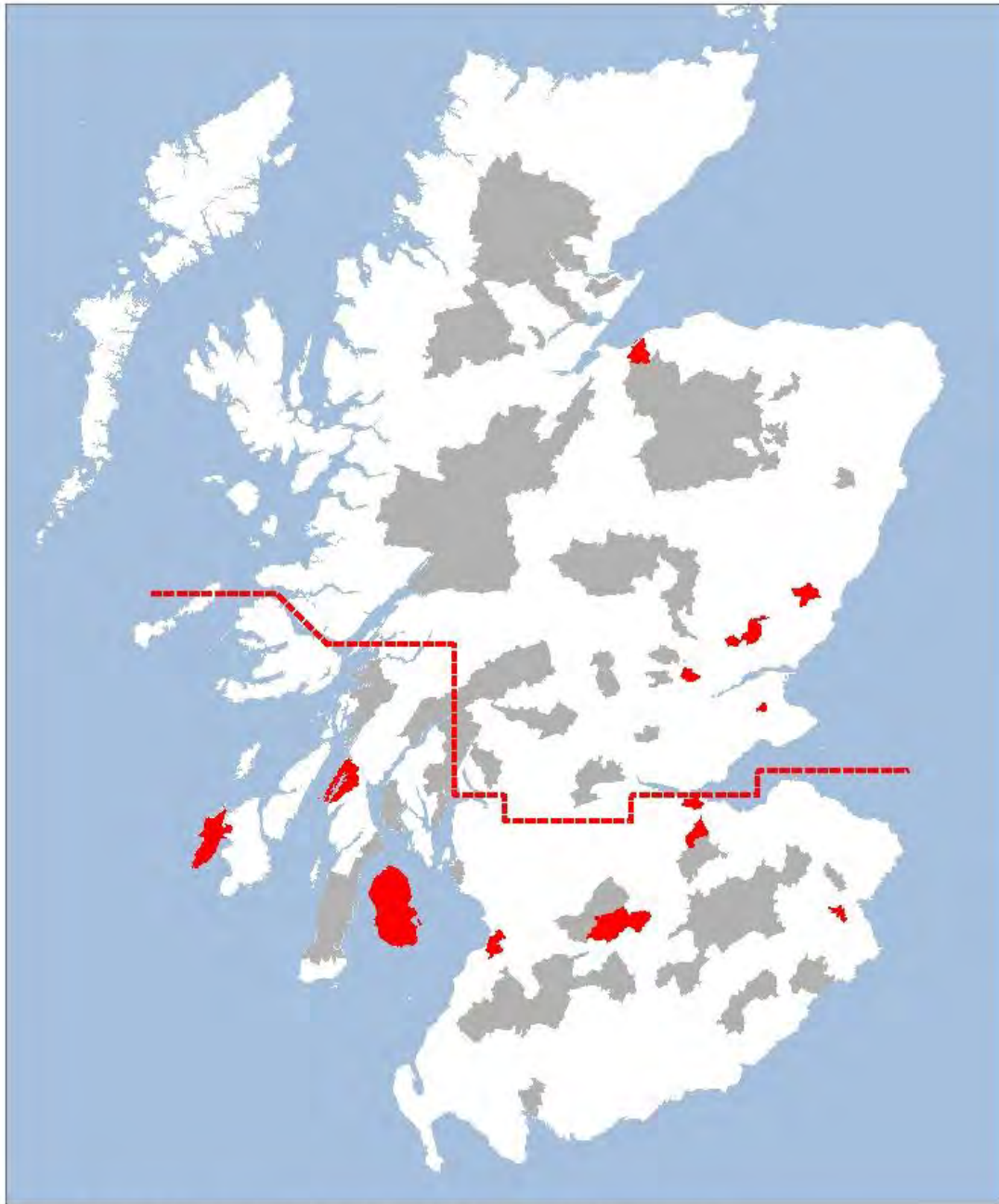


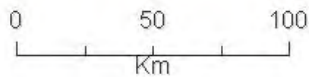
Figure 7: Committed SRDP spend (total and £/ha) in relation to bird presence and numbers: A) overall RP spend, B) black grouse package spend



Black grouse package spend in relation to bird presence

Legend

- - - North/ South divide
- No lek record
- At least one lek record



Created by Robert Hawkes and Paul Britten, 03 July 2012



Figure 8: Committed SRDP spend through the black grouse package spend in relation to the known presence of a known lek record (as interpreted from the BCTP dataset)

3.3 Quantifying the spatial spread of SRDP spend

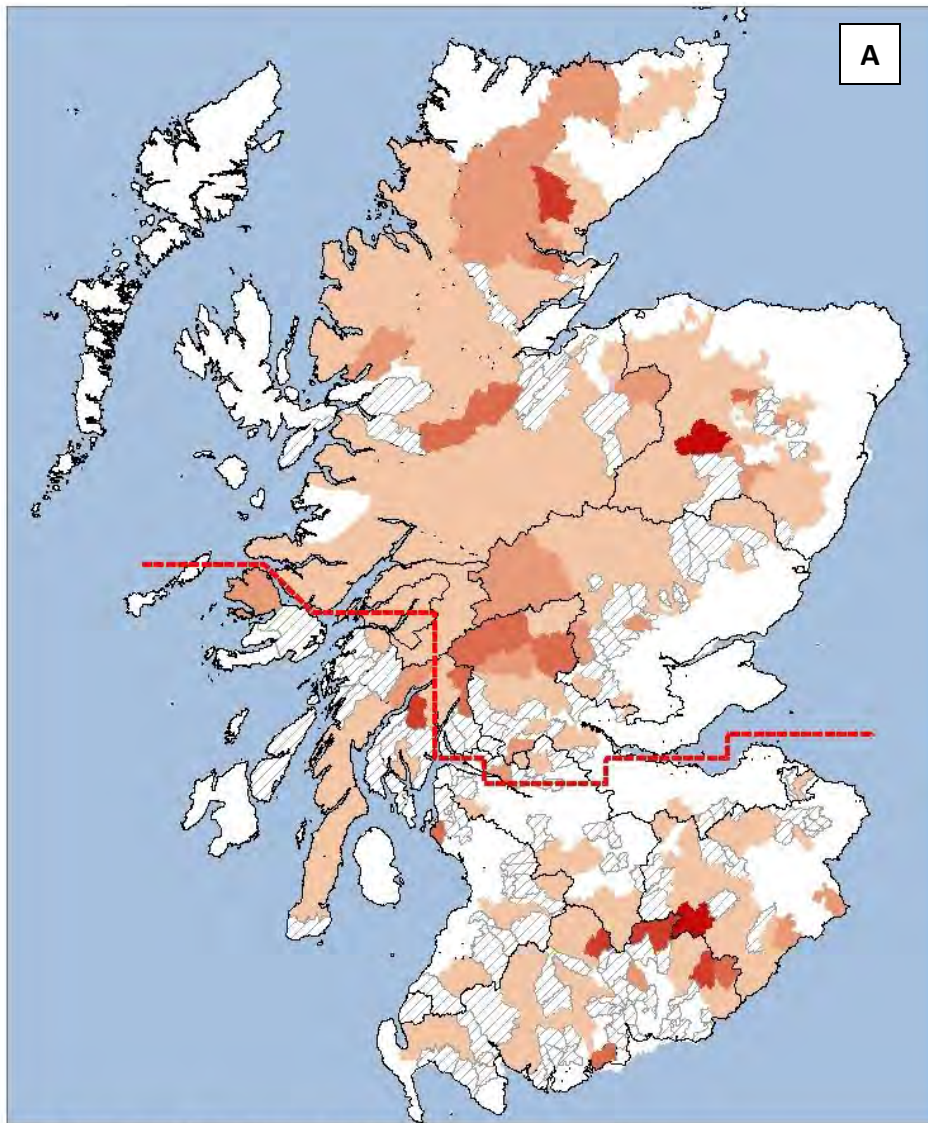
The distribution and concentration of RP spend differs between management scenarios (Table 4). The geographic distribution of seven management scenarios through RP, across occupied parishes, are summarised below. Please note, differences in per unit area spend between RPACs are not accurately comparable because average parish size varies between RPAC's (please refer to page 18 for a detailed explanation of this bias).

- Native woodland creation occurred largely across the North Scotland black grouse range, with large parts of the south also covered (Fig. 9A). The Borders received the highest concentration of capital investment, totalling £15.7 per ha. Ayrshire (£2.2 per ha) and Dumfries and Galloway (£3.3 per ha) received the lowest.
- Woodland management occurred throughout the range, with a large number of parishes receiving investment across both Northern and Southern populations (Fig. 9B). Dumfries and Galloway received the highest concentration of capital investment, totalling £5.2 per ha. The Clyde Valley (£0.9 per ha) and Argyll (£1.4 per ha) received the lowest.
- Scrub and ancient woodland pasture management is largely absent throughout the range, with a greater portion of the north covered relative to the south (Fig. 10A). Dumfries and Galloway received the highest concentration of capital investment, totalling £0.5 per ha. The Borders (£0.1 per ha) and the Clyde valley (£0.1 per ha) received the lowest.
- Moorland management occurred throughout the range, however, relative to the south a larger portion of Northern parishes received capital investment (Fig. 10B). The Borders received the highest concentration of capital investment, totalling £5 per ha. Forth (£0.7 per ha) and Dumfries and Galloway (£1 per ha) received the lowest.
- In-bye management occurred through large parts of the Northern and Southern range (Fig. 11A). Gaps in spend are evident within the Highlands, Dumfries and Galloway, the Borders, Tayside, and Ayrshire. Grampian received the highest concentration of capital investment, totalling £7.6 per ha. Tayside (£1.6 per ha) and the Highlands (£2.5 per ha) received the lowest.

- Predator control has occurred locally throughout the both the Northern and Southern range, with significant gaps within most RPACs (Fig. 11B). The Borders received the highest concentration of capital investment, totalling £1.12 per ha. Dumfries and Galloway (< £0.1 per ha) and the Highlands (£0.1 per ha) received the lowest.
- Bracken control occurred sporadically throughout the range. Large gaps in spend were evident across Ayrshire and the Clyde Valley (Fig. 12B). The Borders received the highest concentration of capital investment, totalling £2.7 per ha. Grampian (£0.1 per ha) and the Clyde Valley (£0.3 per ha) received the lowest.

Table 4: Committed RP spend (£/ha), overall and for seven management scenarios, summarised across all occupied parishes within nine RPACs

| | Total | Native woodland creation | Woodland management | Scrub and ancient wood pasture management | Moorland management | In-bye management | Bracken control | Predator control |
|-----------------------|--------------|---------------------------------|----------------------------|--|----------------------------|--------------------------|------------------------|-------------------------|
| Argyll | 19.98 | 12.38 | 1.36 | 0.43 | 1.69 | 2.76 | 1.12 | 0.19 |
| Ayrshire | 13.14 | 2.20 | 1.78 | 0.12 | 4.03 | 4.04 | 0.73 | 0.20 |
| The Borders | 36.78 | 15.71 | 5.05 | 0.05 | 5.02 | 6.55 | 2.47 | 1.12 |
| Clyde Valley | 16.28 | 6.68 | 0.92 | 0.08 | 1.38 | 6.74 | 0.28 | 0.14 |
| Dumfries and Galloway | 16.81 | 3.34 | 5.21 | 0.52 | 0.99 | 5.36 | 1.25 | 0.00 |
| Forth | 18.12 | 10.36 | 2.47 | 0.17 | 0.66 | 3.02 | 0.81 | 0.17 |
| Grampian | 23.52 | 8.93 | 4.12 | 0.14 | 1.84 | 7.58 | 0.10 | 0.80 |
| The Highlands | 18.75 | 12.63 | 2.01 | 0.11 | 1.16 | 2.45 | 0.29 | 0.07 |
| Tayside | 16.55 | 10.40 | 1.40 | 0.20 | 1.97 | 1.67 | 0.75 | 0.16 |



Rural Priorities: (Woodland creation):
Total committed spend (£/ha) within parishes
of known black grouse occupancy

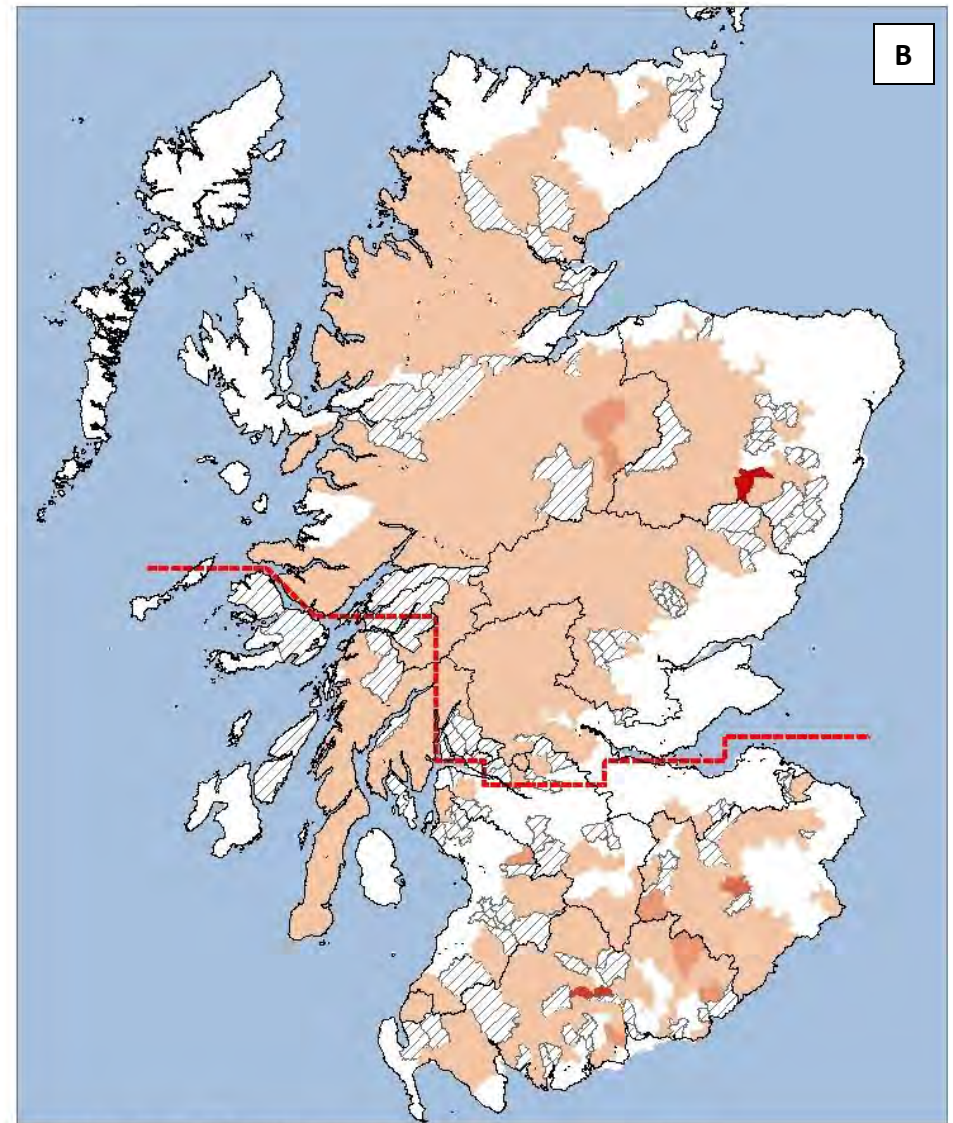
0 50 100
Km

Created by Robert Hawkes and Paul Britten, 14 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend



Rural priorities: (Woodland management)
Total committed spend (£/ha) within parishes
of known black grouse occupancy

0 50 100
Km

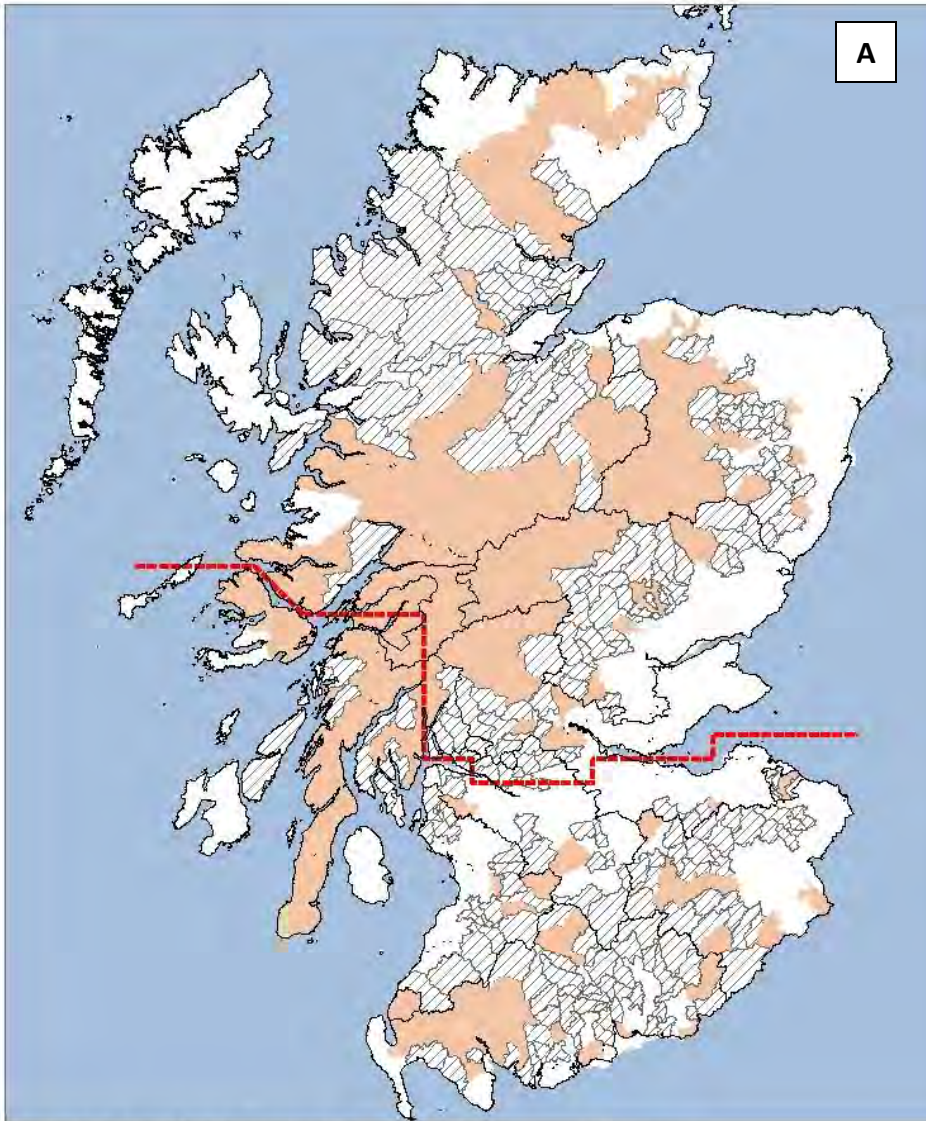
Created by Robert Hawkes and Paul Britten, 15 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend

Figure 9: Committed RP spend (£/ha) across all occupied parishes: A) woodland creation, B) woodland management



Rural priorities: (Scrub and ancient woodland management)
Total committed spend (£/ha) within parishes
of known black grouse occupancy

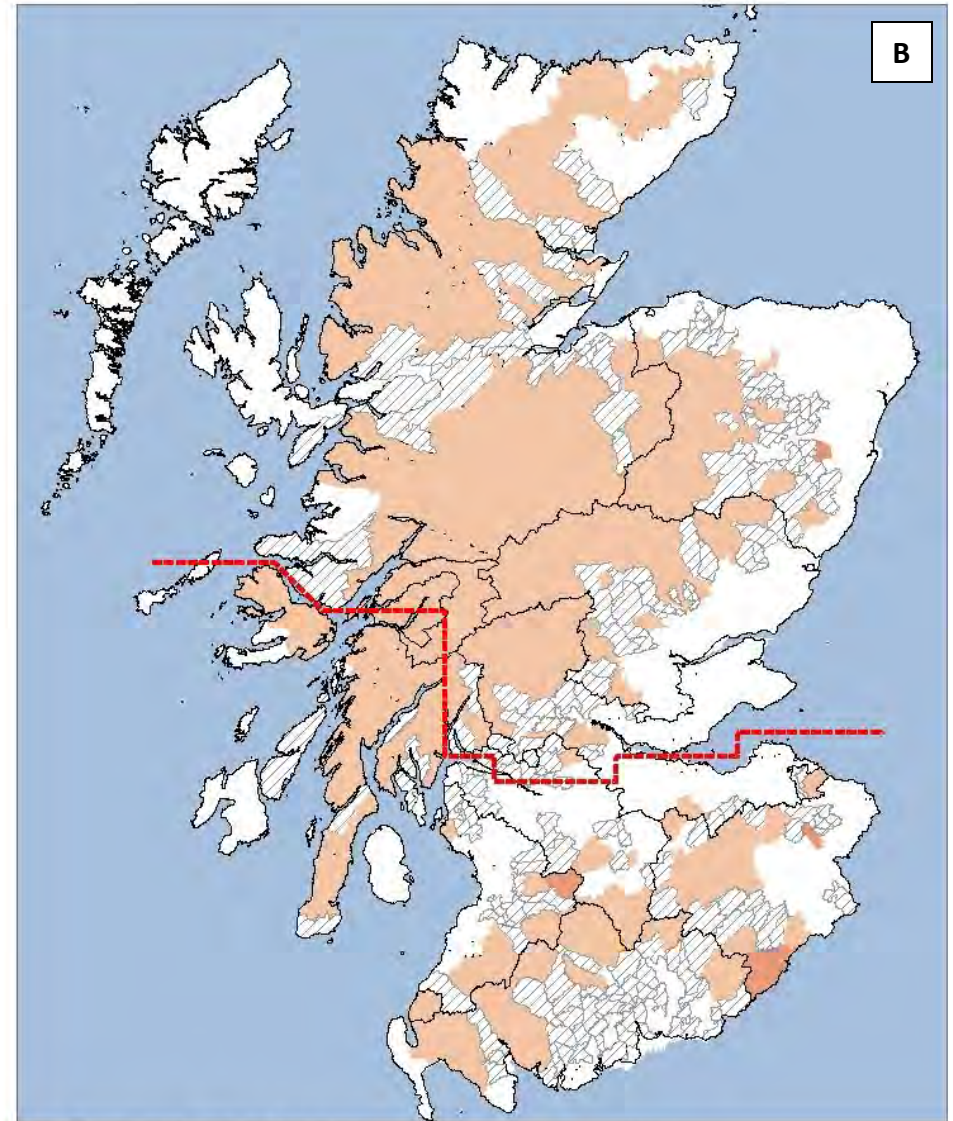
0 50 100
Km

Created by Robert Hawkes and Paul Britten, 15 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend



Rural Priorities: (Moorland management):
Total committed spend (£/ha) within parishes
of known black grouse occupancy

0 50 100
Km

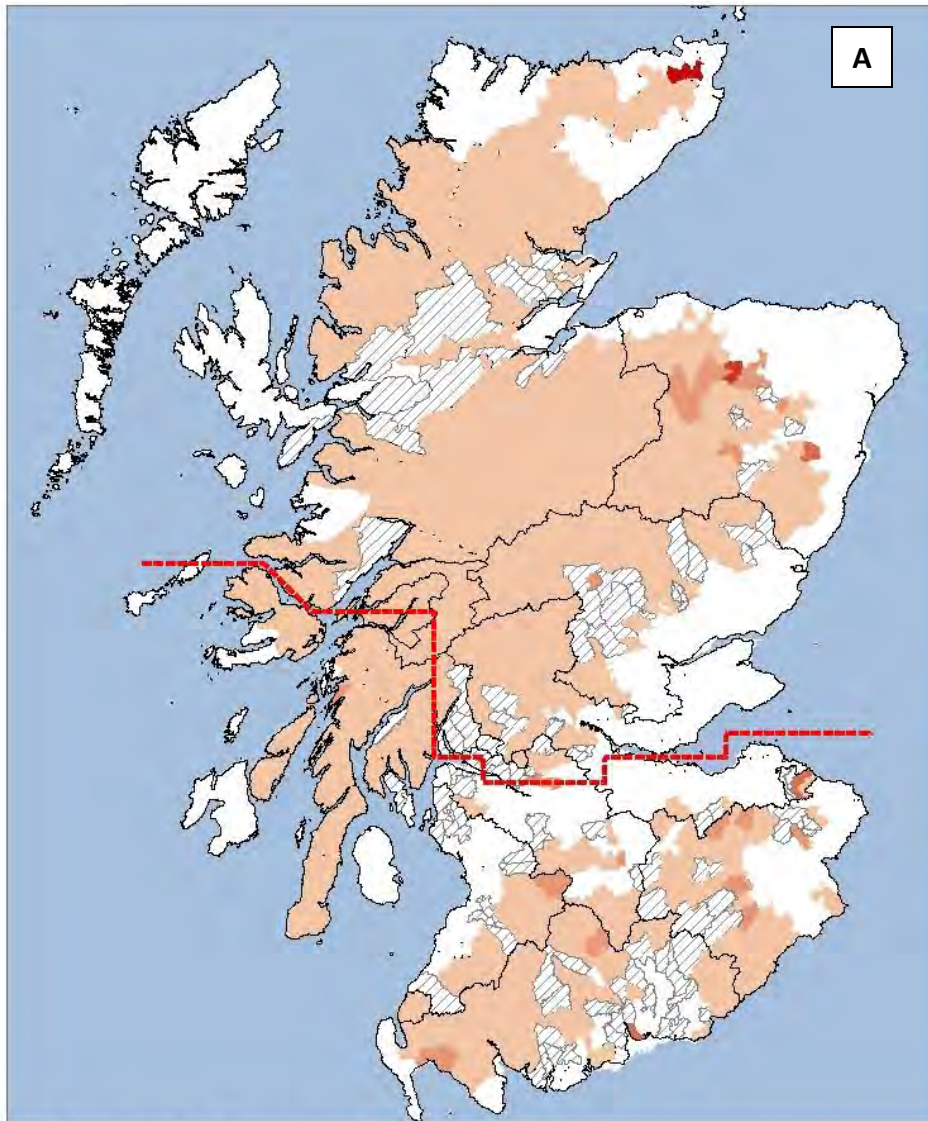
Created by Robert Hawkes and Paul Britten, 14 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend

Figure 10: Committed RP spend (£/ha) across all occupied parishes: A) scrub and ancient woodland management, B) moorland management



Rural Priorities: (In-bye management):
Total committed spend (£/ha) within parishes
of known black grouse occupancy

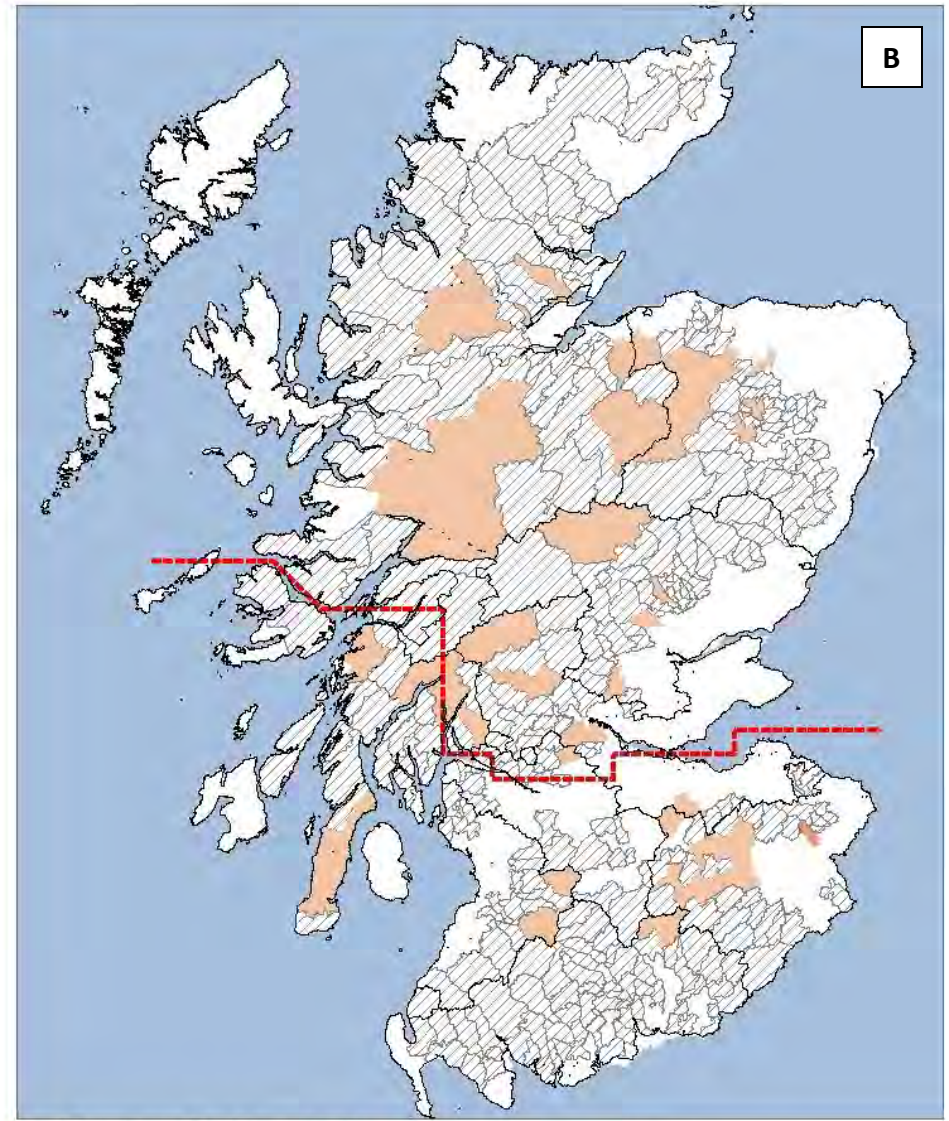
0 50 100
Km

Created by Robert Hawkes and Paul Britten, 14 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend



Rural Priorities: (Predator control):
Total committed spend (£/ha) within parishes
of known black grouse occupancy

0 50 100
Km

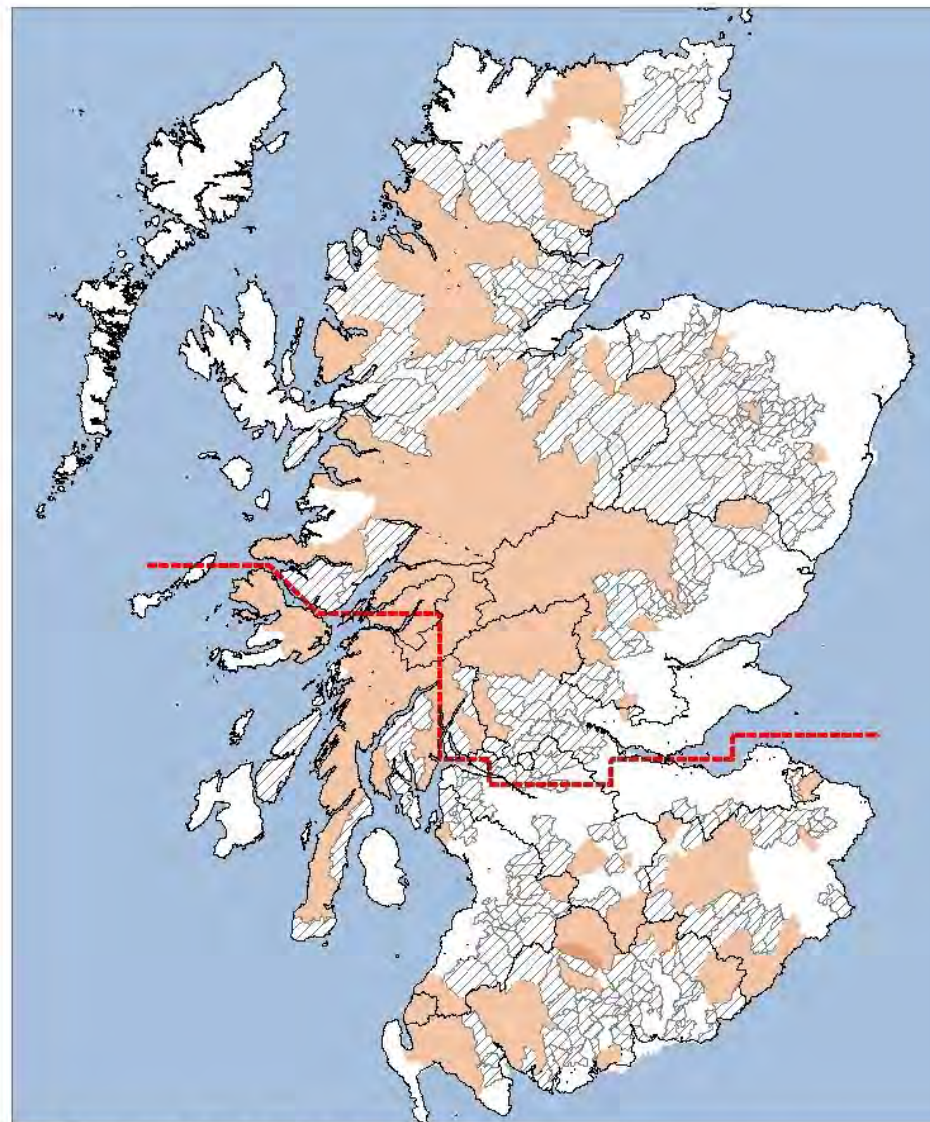
Created by Robert Hawkes and Paul Britten, 14 March 2012



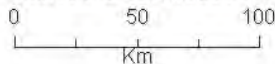
Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend

Figure 11: Committed RP spend (£/ha) across all occupied parishes: A) in-bye management, B) predator control



Rural Priorities: (Bracken control):
 Total committed spend (£/ha) within parishes
 of known black grouse occupancy



Created by Robert Hawkes and Paul Britten, 14 March 2012



Legend

- North/ South divide
- Occupied parish with no spend
- Very low spend
- Low spend
- Medium spend
- High spend
- Very high spend

Figure 12: Committed RP spend (£/ha) on bracken control across all occupied parishes

4) Discussion

4.1 Prescription delivery

In Scotland, upland heath, species rich grassland and new native woodland habitats have the potential to provide the right resources to meet the foraging, nesting, and brooding demands of black grouse (Haysom 2001, Owen 2011, Pearce-Higgins *et al.* 2007, Starling-Westerberg 2001, Warren *et al.* 2012a) throughout the year (Beeston *et al.* 2005). Predator control can enhance local productivity through improving survival (Summers *et al.* 2004). Through RP these options are primarily supported through three management scenarios: native woodland creation, moorland management, and predator control. It is worth noting that other management techniques have the potential to deliver for black grouse (e.g. in-bye management and woodland management.)

Principally encouraged to meet forestry expansion targets, new native woodland creation has occurred throughout the range. Woodlands of a suitable structure, age and quantity are an important black grouse resource (e.g. Haysom 2001, Owen 2011), with recent research highlighting a correlation between woodland cover and over-winter survival during long periods of exposed snow (Warren *et al.* In press). Although new plantations can provide suitable habitats, research in Perthshire has shown a positive correlation between forest maturation and local black grouse declines (Pearce-Higgins *et al.* 2007). Other forms of young woodland and restocking are also useful to black grouse, but native woodland creation is generally expected to have more long lasting benefits due to its more open canopy structure and native tree composition. As such, woodland creation grants not considered by this report may have benefited black grouse.

Moorland management has occurred throughout the range. Black grouse utilise moorland habitats (tall stands of heather, wet flushes, herb rich pastures and meadow) throughout their life cycle (Beeston *et al.* 2005, Starling-Westerberg 2001, Warren *et al.* 2012), even where suitable new native plantations are available (GWCT unpublished data). Where appropriate moorland management has been implemented, in Northern England, studies have shown

population level benefits (Baines 1996 and Calladine *et al.* 2002). Moorland management expenditure has been low or absent across parts of south west Scotland. It is of note, however, that much of this region is part of the National Forest Estate and therefore not eligible for SRDP funding.

Beyond the Borders, predator control has only occurred locally throughout the range. Monitoring at Abernethy forest has demonstrated a correlation between productivity and spring lek counts the following season (Summers *et al.* 2010). Low breeding productivity is often the principle driver limiting population growth, particularly within the south (Baines *et al.* 2007). Predator control, alongside targeted habitat management and favourable spring climates, can increase productivity (Summers *et al.* 2004, RSPB *unpublished data*). Considering the severity of recent declines within South West Scotland (Sim *et al.* 2008) higher capital commitments towards predator control within parts of the north is perhaps worrying.

Across occupied parishes native woodland creation (£53,197,754) has received more than moorland management (£13,653,626) or predator control (£1,583,002). As each option offers a different payment rate these figures cannot be used to interpret their relative coverage.

Positive black grouse management through SRDP has been delivered through an applicant led approach, with measures implemented where land managers/ advisors believe is best. This has the advantage of allowing practitioners to recommend potentially beneficial measures acceptable to the applicant. However, there is currently a lack of common agreement and research defining the location and scales which key options should be delivered.

4.2 Targeting

Through reducing the suitability of black grouse habitats, land-use change has been the principle driver of black grouse declines across Britain (Grant *et al.* 2009, Pearce-Higgins *et al.* 2007). To deliver the objectives of the black grouse SBAP group management should focus upon the drivers of decline whilst targeting populations where a positive response is likely (Cole *et al.* 2012). Black grouse remain a conservation concern across Southern Scotland (Höglund *et*

al. 2007, *Sim et al.* 2008) whilst current guidelines advocate conservation delivery around well connected leks hosting 4+ males.

Over £100 million has been committed through RP options of potential benefit to black grouse, with over £8 million of this total from the black grouse package. Not all of this money will be beneficial, SRDP is an applicant led process designed to meet a number of environmental objectives. Conversely, other RP options beyond the black grouse package, excluded from this analysis, may be of benefit (e.g. Mixed Conifer/Broadleaved woodland creation). Inferences of 'black grouse package only' spend provides a more accurate account of how investment targeted directly for black grouse has been spent.

Over £1 million (16%) of black grouse package spend occurred within parishes with no black grouse occupancy (between 2005-10). As lek records used to infer black grouse presence were collected from a single dataset (BCTP), interpretation of this figures requires caution. Because the BCTP does not collect lek data from every available source, and only spans from 2005-09 (with validated records from 2010 also included), black grouse range, as interpreted by this report, may be an underestimate. It is therefore possible that some of this money may have actually been invested within occupied areas. It is also worth noting that case officers, land managers and advisors may have used older targeting maps (e.g. 1991 breeding bird atlas or older lek records from previous targeting guidelines or regional lek maps), which may have led to investment within historically occupied areas. Some of this £1 million has been spent adjacent to occupied parishes, which could potentially benefit black grouse by encouraging range expansion.

The Northern population received more money through RP overall, whilst the Southern population received more through the black grouse package itself. Encouragingly regional variations in per unit area spend appear to partially reflect population trends. The area of greatest conservation concern (South East Scotland) received the greatest capital commitments (per unit area) through RP and the black grouse package. Conversely, black grouse package expenditure was lower within South West Scotland, where black grouse have suffered significant recent declines, compared to the more stable northeast region (*Sim et al.* 2007).

Here, large areas of well connected lek sites in Dumfries and Galloway and Northern Ayrshire have received no black grouse package investment. Although this may infer a low level of conservation action, other forms of positive management, outwith SRDP (e.g. on the NFE), have occurred (Hawkes 2013). It is also worth noting that per unit area expenditure estimates in parts of North Scotland are probably an underestimate, due to the presence of larger parishes.

During periods of population decline lek size is correlated with lek longevity (Geary *et al.* 2012). Targeting stronghold leks may therefore help to maintain numbers and facilitate range expansion. Parishes containing at least one lek of 4+ males have received more money through the black grouse package. However, per unit area, an inverse pattern is observed. Parishes containing no lek or a record with 1-3 males, relative those with 4+ males, received more money. However, because the majority of leks with 4+ males occur in the North, where parish size is generally larger, this compassion is biased. Larger parishes typically contain a greater amount of area unsuitable for black grouse, skewing any estimate of per unit area spend.

From this review it is evident that black grouse SRDP spend has been targeted effectively in certain areas and less well within others. As SRDP is an applicant led process, designed to deliver a range of rural objectives beyond black grouse conservation, this observation is not surprising. This report is unable to assess the actual benefits of SRDP as black grouse responses to agri-environment management are yet to be measured. However, previous studies have recorded local population rises in response to targeted management (e.g. Baines 1996, Calladine *et al.* 2002, Grant *et al.* 2009).

Black grouse occupy transitional habitats which require continued intervention (e.g. grazing control) or good long term planning (e.g. native woodland creation). If these conditions are not maintained over a landscape scale populations can face widespread declines (Pearce-Higgins *et al.* 2007). Thus far this has been delivered through agri-environment uptake, often facilitated by recovery projects and advisory officers. Given the need to influence management practices across multiple land-use sectors, future SRDP will require effective targeting and long term planning to deliver the Scottish SBAP targets.

4.3 Potential factors influencing the geographic distribution of SRDP spend

RP delivery is driven by many objectives. Expenditure generally occurs where options can be implemented easily and fit in well with the existing farm business and local landscape (Corrigan 2012). Land use probably has a significant influence upon option uptake; for example, across the Borders where large quantities of sporting estates exist, higher rates of predator control were observed. National and regional targets (e.g. woodland expansion, or predator control within capercaillie core areas), alongside varied financial returns, may have also influenced the uptake of key options. The availability of good local advice is a key mechanism for delivering the right measures to assist black grouse recovery (Corrigan 2012, Hawkes 2013).

5) Conclusion

Between 2007 to November 2011, over £8 million has been committed through the black grouse package, with a further £92 million committed through RP options of potential benefit to black grouse. Although black grouse are known to respond to management, the actual benefits of this support are unclear. According to the data presented within this report, the targeting of black grouse package spend has been mixed. The majority of expenditure has occurred within the region of greatest black grouse declines (South East Scotland) alongside higher capital commitments in parishes containing priority lek sites (4+ displaying males). Conversely, over £1 million has possibly been spent beyond the known range, as interpreted by the BCTP. However, because a completely accurate picture of black grouse range is currently not available, care must be taken when interpreting this last figure. Through RP overall, capital commitments towards key management options varies, with native woodland creation (£53,197,754) receiving more than moorland management (£13,653,626) and predator control (£1,583,002).

SRDP is an applicant led process, therefore, it is not surprising that some investment has not been targeted effectively. Nether the less, agri-environment grants remain the most important funding mechanism for delivering black grouse conservation across the wider landscape. Specialist advisory support, backed up by good monitoring information, has probably been a key mechanism for ensuring the right options are encouraged within the right areas. In light of likely cutbacks to agri-environment subsidies, future resources must be targeted effectively if the Scottish BAP targets are to be met.

6) Recommendations

This section outlines a number of recommendations to the black grouse SBAP steering group

6.1 Targeting agri-environment support

The issue: SRDP expenditure through the black grouse package has, in part, been spent opportunistically. Over £1 million has possibly been spent outside the existing range according to the BCTP dataset, whilst large areas of well connected lek sites are yet to receive money.

Relevance to SBAP objectives: Targeting areas and populations where the benefits of management can be maximised will help deliver population recovery and range expansion.

Potential solution:

1. Revise targeting guidelines amongst SBAP partners, identifying areas where SRDP delivery is a priority.
2. Provide up to date monitoring information (e.g. lek distributions) and targeting guidance to advisory staff and case officers.
3. Set up recovery projects within areas of conservation concern.
4. Input targeting guidelines in advisory documents.
5. Feed targeting guidelines into future SRDP discussion.
6. Utilise monitoring to periodically update targeting guidance.

6.2 Delivering key options effectively

The issue: Some key options (moorland management and predator control) have lacked investment within certain areas. This is partially due to a lack of understanding of where key options are beneficial alongside issues with the structure, capital returns and scoring potential of certain RP options.

Relevance to SBAP objectives: To maximise the effectiveness of SRDP agri-environment support needs to target key options within the right locations (Cole *et al.* 2012, Corrigan 2012).

Potential solution:

1. Identify which key options are delivering for black grouse, between regions.
2. Update guidelines in response to new information.
3. Feed option guidelines into advisory documents.
4. Feed options guidelines into future SRDP
5. Find ways to fit option guidelines into other environmental objectives (e.g. woodland expansion).

6.3 Monitoring agri-environment success

The issue: The benefits of black grouse management through SRDP have not been assessed.

Relevance to SBAP objectives: An understanding of the SRDP benefits would provide a useful indicator for assessing the effectiveness of targeted management towards SBAP targets.

Potential solution:

1. Assess the effectiveness of SRDP management.
2. Feed findings into targeting guidance and future SRDP.

7) Acknowledgments

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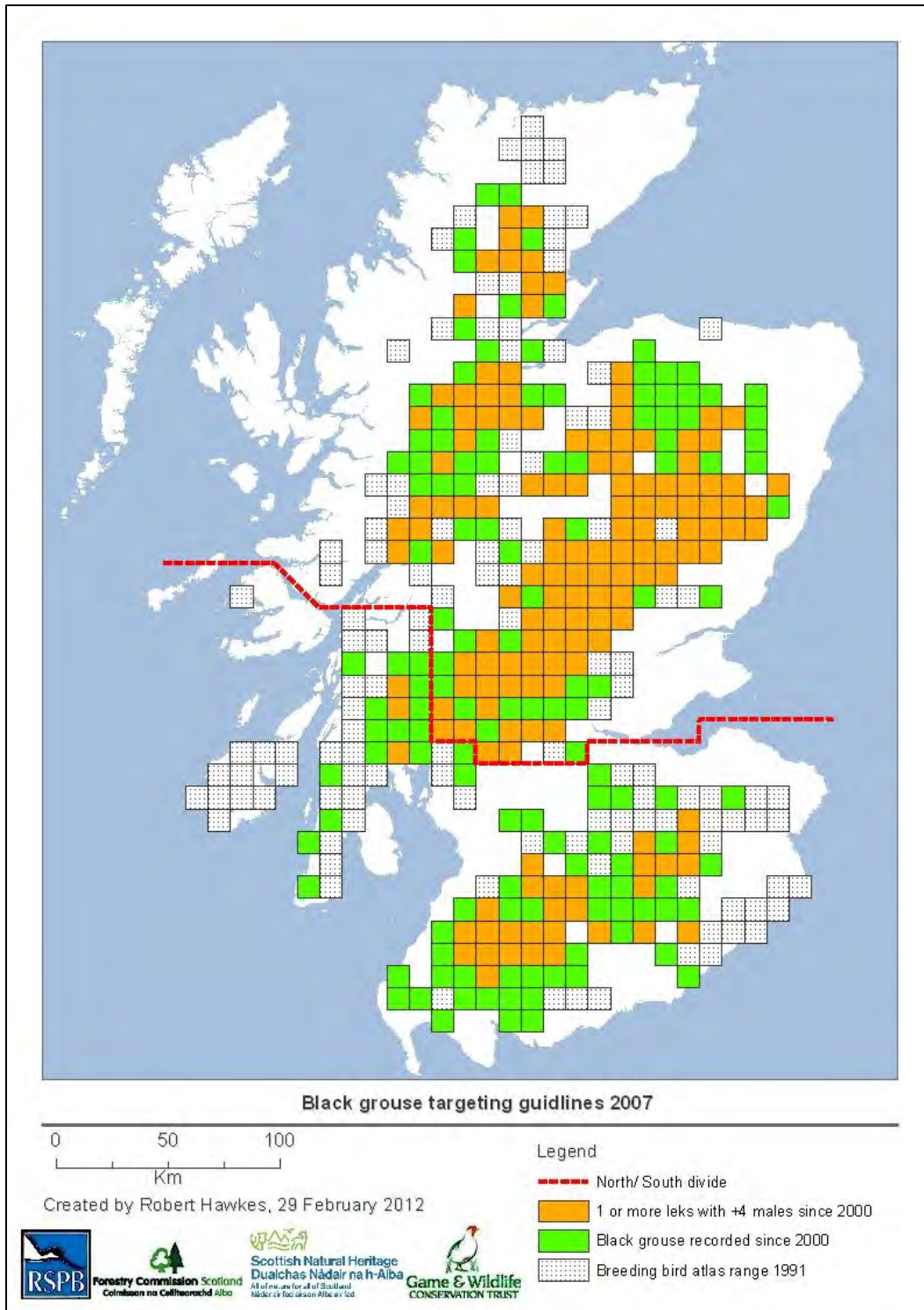
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Appendix



The location of priority (containing a lek with 4+ males between 2000-07), occupied (containing a lek between 2000-07), and previously occupied (according to the 1991 breeding bird atlas range) 10 km² tetrads