Development of Best-Practice Guidelines for Red Grouse on Irish SAC Raised Bogs

NATIONAL ASSOCIATION OF REGIONAL GAME COUNCILS

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Contents

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Introduction

The Red Grouse (*Lagopus lagopus hibernicus*); known in Gaelic as *Cearc Fraoigh* – 'the Heather Hen' is one of Ireland's most iconic native game-birds. It is characteristic of heather-dominated moorland and feeds mainly on a diet of Ling heather (*Calluna vulgaris*), which is crucial in the life cycle for the bird. Red Grouse require tall heather for nesting and shelter as well as young heather shoots, flowers and seeds for food. Berries such as bilberry and some insects are also eaten. Mineral grit is also required to assist the breakdown of heather in the gizzard.

The results of the most recent Red Grouse survey (2006-2008) show a dramatic decline in the population over the last 40 years. The 2008 survey (in the Republic of Ireland) estimated that the breeding range has declined by 50% with the current (spring) population estimated at 4,200 adult birds (Cummins *et al*., 2010).

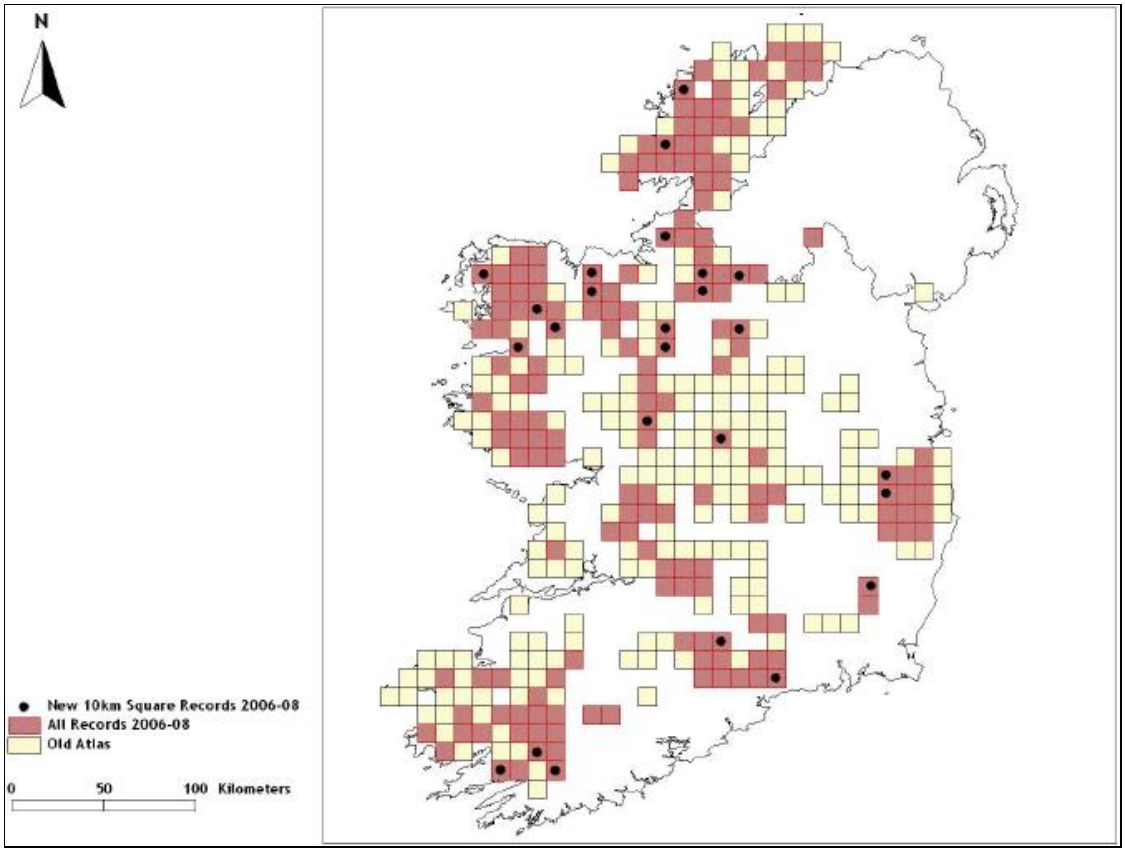


Figure 1. Change in the range of Red Grouse in the last 40 years. Source: Cummins *et al.* (2010)

The National Red Grouse Survey also showed that most Red Grouse in Ireland are found on upland blanket bog, with the numbers on raised bogs[1] regarded as being extremely low, i.e. at only 2% of the national figure. From a total extent of 310,000 hectares of raised bog habitat, it is estimated that only 18,000 hectares of this habitat of 'conservation value' remains (Derwin and MacGowan, 2000). If all of this area was suitable for Red Grouse, then the potential population on these areas of raised bog (of conservation value) would be 85 birds (95% C.L.: 50-146), which is only marginally

[1] Raised bogs are accumulations of deep acid peat (3-12 m) that originated in shallow lake basins or topographic depressions at the end of the last glaciation - 10,000 years ago. The name is derived from the elevated surface, or dome, that develops as raised bogs grow upwards from the surface. They occur throughout the midlands of Ireland and are characterised by low-growing, open vegetation dominated by mosses, sedges and heathers, all of which are adapted to waterlogged, acidic and exposed conditions (IPCC, 2015). The original extent of raised bog in the Republic of Ireland was 308,742ha according to the Peatland Map of Ireland drawn by Hammond in 1979.

greater than the figure estimated for the national survey - 71 birds (95% C.L.: 48-111) (Cummins *et al*., 2010).

Threats to Red Grouse:

The primary causes of decline in Irish Red Grouse are:

- Habitat loss, particularly of heather-dominated landscapes, from under/over-grazing, afforestation as well as commercial and, in cases, domestic peat extraction;
- Lack of active traditional habitat management – Red Grouse need a variety of different ages of heather, offering habitat for shelter, nesting and feeding;
- Predation – as a ground-nesting bird, Red Grouse are susceptible to mammalian and avian predation.
- Genetics – Red Grouse populations are deemed to be affected by poor genetic diversity.

Unfortunately, much of Ireland's raised bog habitat has been dramatically reduced in size, with less than a quarter remaining in relatively intact condition (Foss *et al*., 2001). Declines in the midland region, in particular, can be largely attributed to large-scale mechanical peat extraction, which has seen the conversion of huge areas of once suitable raised bog, to cutaway bogs (Foss *et al*., 2001).

Other factors include drainage, turf-cutting, forestry activities and agricultural reclamation. These activities have resulted in a significant decrease in the area of active bog in most of these sites and the loss of smaller areas of degraded bog capable of restoration, principally through turf-cutting (RBC, 2015). It is estimated that only 25,189ha (8%) of raised bog remains relatively intact. Notwithstanding, raised bogs are extremely rare in global terms and many are sites of European and international importance.

Irish Raised Bogs: Issues and Management

In the Republic of Ireland, the NPWS (of the Department of Arts, Heritage and the Gaeltacht) is the Government agency responsible for the conservation of raised bogs. Between 1997 and 2002, Ireland nominated a total of 53 raised bog sites for designation as Special Areas of Conservation (SACs) under the Habitats Directive.

According to EU law, Ireland must protect, manage and restore these sites to ensure they achieve their objective of conserving raised bog habitats and species. In addition, 75 raised bogs were designated as Natural Heritage Areas (NHAs) in 2004 under the Wildlife Amendment Act (2000).

People who have exercised legally held property rights, through land ownership or turbary rights, have sourced their domestic fuel from raised bogs for many years, and in some cases for several generations. In this regard, the designation process has resulted in major conflicts with landowners who retained their right to cut turf on these sites. These issues are still ongoing.

In terms of management, the focus of NPWS and semi-state agencies such as Bord na Mona and Coillte has been on bog restoration. The objective is to improve the poor conservation status of raised bogs. Many of the site-specific management works on raised bogs focus on rewetting. These projects essentially aim to restore the hydrology of sites, which requires drain blocking and sometimes other engineered actions. In 2004, Coillte received funding from the EU LIFE Nature Programme to actively restore 571 hectares of raised bog habitat on 14 midland sites in counties Galway, Roscommon, Longford, Westmeath, Meath, Cavan and Laois.

Another Coillte's LIFE Project "Demonstrating Best Practice in Raised Bog Restoration in Ireland" (LIFE09 NAT/IE/000222) is a nature conservation project jointly funded by EU DG Environment, the Department of Arts, Heritage and the Gaeltacht and Coillte (The Irish Forestry Board) under the EU LIFE Nature Programme. From 2016-2020, NPWS will be managing the restoration of active raised bog habitat on 12 SAC project sites, which is being funded by LIFE.

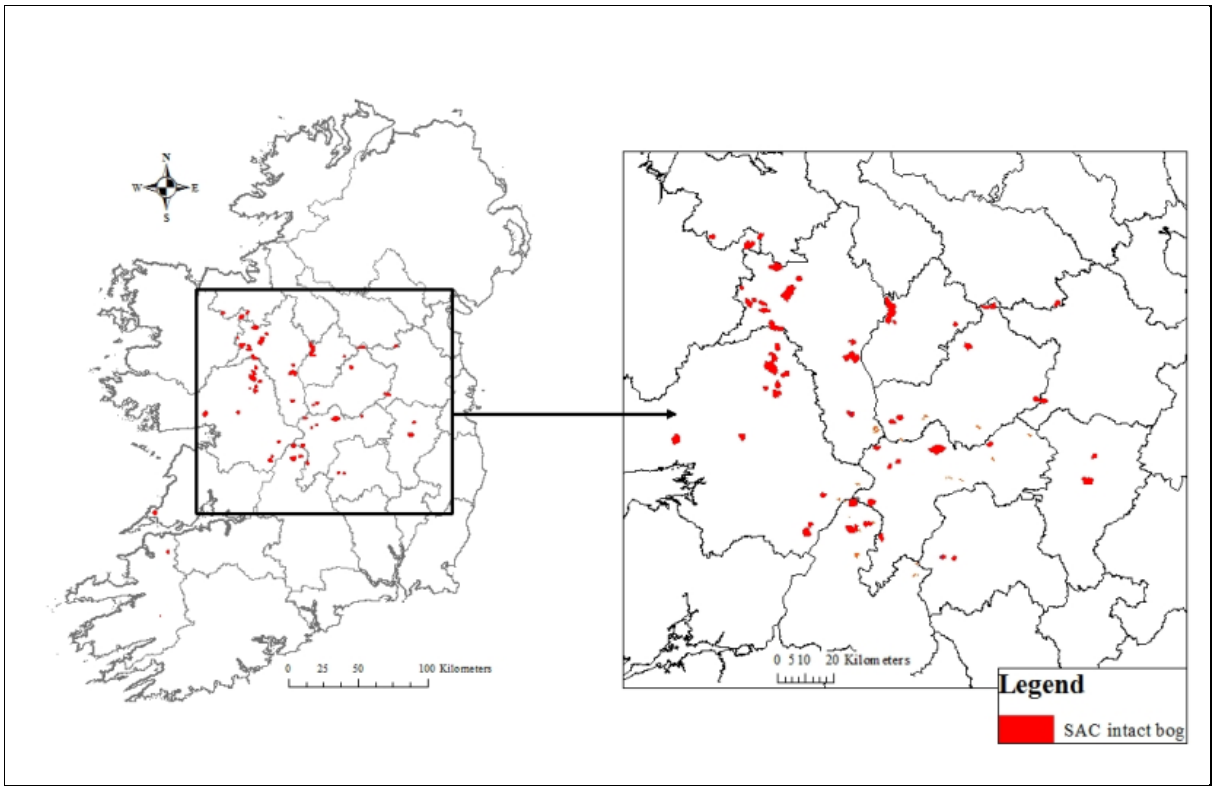


Figure 2. Ireland's 53 SAC Raised bogs. Source: NPWS.

Purpose of Project

The project sets out to identify and develop best-practice guidelines for Red Grouse on Irish SAC raised bogs. It aims to achieve this in a manner that promotes the needs of nature conservation obligations, wildlife and local communities, specifically with regard to economic, social and cultural needs. These guidelines/recommendations have the potential to benefit the designated habitats and Red Grouse as well as other red-listed species (e.g. breeding curlew) in compliance with requirements of the Habitat Directives.

In order to achieve this, the project had three objectives:

1. Interrogate established ecological and biological data sets and undertake a series of community-based questionnaires to identify the most suitable sites for Red Grouse conservation initiatives.

2. Undertake case studies on selected sites within the SAC network to determine their potential for Red Grouse and to identify the limiting factors affecting Red Grouse.

3. Define a range of Red Grouse measures/recommendations that are compatible with SAC conservation interests on typical raised bog sites, while meeting nature conservation obligations and with regard to national and local economic, social and cultural needs.

Methodology

There were a variety of meetings with various stakeholders linked to the development and implementation of this project. The main meetings included:

- 18th February 2015 – Meeting with NPWS, NARGC, IGPCT, BnM, Co. Offaly.
- 22nd August 2015 – Heritage Week presentation, Ballydangan, Co. Roscommon.
- 25th August – Meeting with NARGC Red Grouse Sub Committee, Co. Westmeath.
- 26th August – Meeting with Irish Red Grouse Association, Co. Offaly.
- 26th September 2015 – Project presentation at NARGC Red Grouse Conference, Co. Leitrim.
- 24th October 2015 – Presentation by NARGC to the Irish Red Grouse Species Action Plan Delivery Group, Co. Westmeath.

A literature review of relevant reports and studies on Irish raised bogs was undertaken. The main reports reviewed included:

- Fernandez *et al*. - Raised Bog Monitoring Project (2004-2005)
- NPWS report - Raised Bog Monitoring and Assessment Survey (2013)
- NPWS report - Draft National Peatlands Strategy (2014)
- NPWS report - Draft National Raised Bog SAC Management Plan (2014)
- NPWS report - Review of Raised Bog Natural Heritage Area Network (2014)
- EPA report - BOGLAND: Sustainable Management of Peatlands in Ireland (2012)
- Cummins *et al*., - National Red Grouse Survey (2006-2008)
- Irish Red Grouse Species Action Plan (2013)
- Scallan, D. - The Ballydangan Bog Red Grouse Project Management Plan (2010-2015)
- Scallan, D. - The Carrownagappul Bog Red Grouse Management Plan (2008)
- Fallon *et al*. - Raised bog restoration in Ireland in tandem with community led Red Grouse restoration (2015)

Site suitability indicators:

In order to assess the most suitable 53 raised bog sites for Red Grouse, various criteria were agreed. It was decided to assess site suitability under the following criteria in order of importance:

1. Level of local support – it was agreed that local support for a project was key in terms of maintaining populations into the future and ensuring local buy-in.
2. Presence of Red Grouse currently or in recent history with priority given to sites where grouse have become extinct more recently.
3. Size of the bog – this is key in order to maintain viable populations.
4. Access to the bog – bogs with more state-owned land should be prioritised.
5. Breeding curlew on the site – it was agreed that any management for Red Grouse would also benefit breeding curlew and that bogs with this species should be prioritised.

Questionnaire survey:

In order to acquire these data, it was decided to design and distribute a detailed community-based questionnaire to establish information on the presence or otherwise of Red Grouse (and breeding curlew) on the SAC raised bogs; the current situation with regard to management, and the potential interest in future local community management. In May/June 2015, this survey was sent to 965 NARGC Gun Clubs and other Red Grouse enthusiasts (e.g. Irish Red Grouse Association); NPWS Conservation Rangers, and other stakeholders.

Site Visits:

After the responses were analysed, it was decided to undertake five site visits. Four sites were chosen that had known populations of Red Grouse and one site was chosen, which did not have Red Grouse present for some time (i.e. Clara Bog). The site visits were undertaken by Dr. David Scallan and Mr. John Carslake, NARGC Grouse-keeper and Boleybrack Project Manager. The visit to Clara

Bog was undertaken by John Carslake, Colm Malone (NPWS), P.J. Rosney and Padraig O'Donnell (NPWS).

During the site visits, sampling points were randomly chosen in areas containing representative habitat characteristics. Within each sampling site, the following observations were taken:

Heather quality score:	Ranging from 1 (poor) to 5 (pristine/excellent)
Predators:	Signs of predators were noted
Heather height:	5 measurements were taken
Sward height:	5 measurements were taken
Heather cover:	Estimated visually
Heather age:	% pioneer; % building; % mature; % degenerate
Evidence of past burning:	Recent or historical
Management options:	e.g. heather strimming, predator management.
Heather beetle damage:	Present / absent
Evidence of grouse:	Via droppings, feathers, visual or other.
Local interest:	Whether a local group is interested in management
Notes:	Any other observations


Red Grouse feather


Single dropping and feather


Roost pile (dropping)


Single droppings

Results

Desk-top study:

With regard to Red Grouse on raised bogs, the National Red Grouse Survey found that in the midland region, all sites surveyed were on raised bogs (both exploited and intact). However, there were few records of Red Grouse with most occupied sites being SAC raised bogs located in northeast County Galway, east County Mayo and County Roscommon (Cummins *et al*., 2010).

The NPWS Raised Bog Monitoring reports also provided similar Red Grouse records on SAC raised bogs to the National Red Grouse Survey (data provided by Fernando Fernandez).

The questionnaire data largely complemented the records from both the National Red Grouse Survey and the NPWS Raised Bog Monitoring reports.

Site Visits:

Based on the ecological records and the results from the questionnaire survey, five sites were selected to visit. These were:

1. Kilsallagh Bog SAC, Co. Galway
2. Lough Lurgeen Bog/ Glenamaddy Turlough SAC, Co. Galway
3. Carrownagappul Bog SAC, Co. Galway
4. Camderry Bog SAC, Co. Galway
5. Clara Bog SAC, Co. Offaly

The east Galway raised bogs all supported Red Grouse from either the National Red Grouse Survey (2006-2008), NPWS Raised Bog Monitoring reports or from the questionnaire. Clara Bog had Red Grouse up until 15-30 years ago.

In general, the National Red Grouse Survey (2006-2008) found that raised bogs, which had not been totally exploited for peat or that had old cutover with regenerating heather, can support good numbers of Red Grouse, with in suitable areas with highest counts of nine birds recorded in a 1km square in east Galway (Cummins *et al*., 2010).

It was evident from the site visits to the east Galway raised bogs that the historical areas of cutover appeared to have the most suitable heather cover, quality and diversity for Red Grouse. Typical raised bog-cutover habitat was mainly dominated by Ling heather (*C. Vulgaris*).

The Table on the following page outlines the current situation with regard to raised bogs and Red Grouse in Ireland.

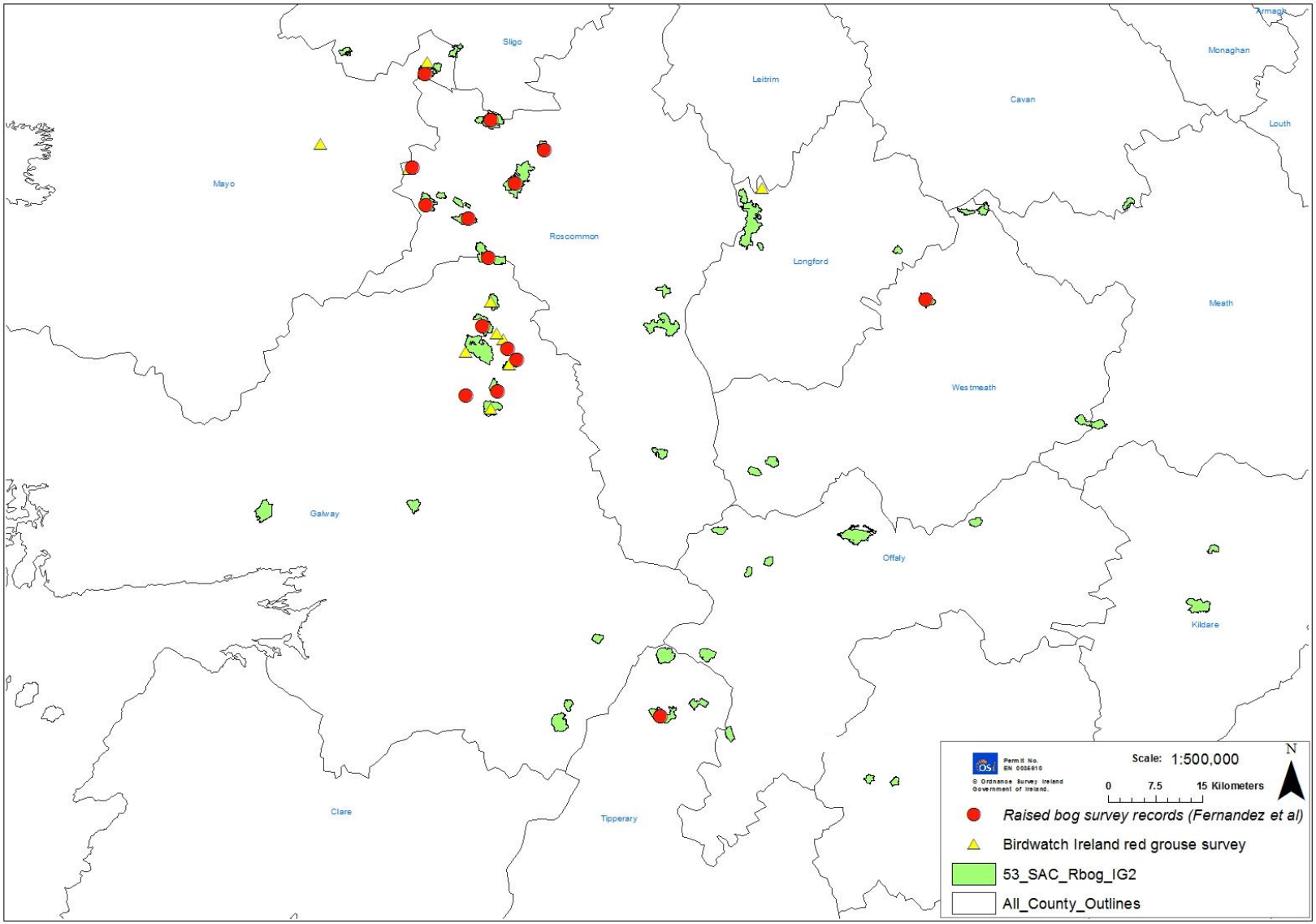
The abbreviated codes in the table indicate data from the following sources:

- Mtr.: NPWS Raised Bog Monitoring Reports records
- N.S.: National Red Grouse Survey (2006-2008) records
- Quest.: Records from the questionnaire survey
- *: Indicates the presence of 'local interest' in managing SAC bogs for grouse

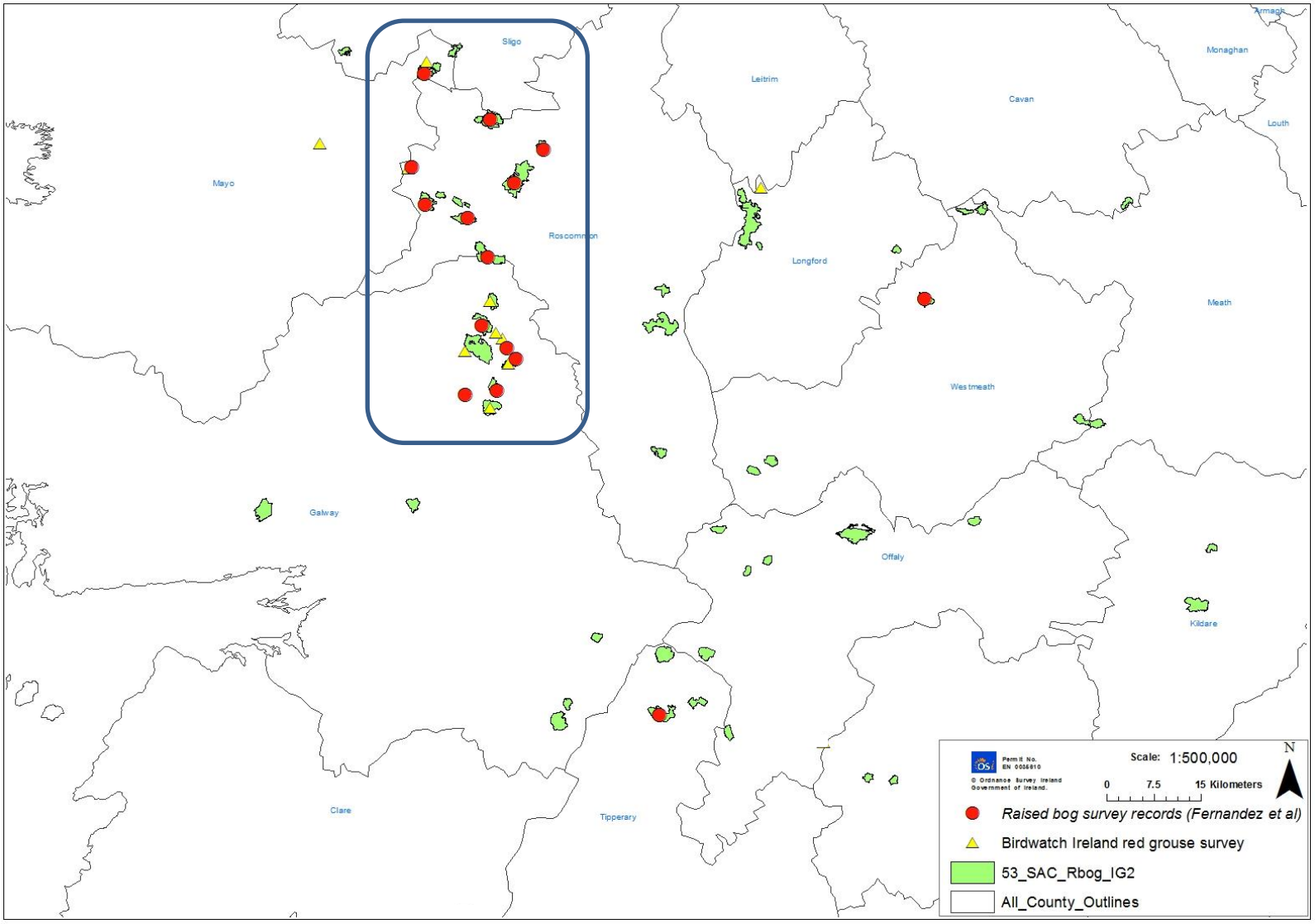
Further, the colours on the site names indicate the following:

Yellow	Records of Red Grouse
No colour	No records of Red Grouse
Green	Potential: Need for site visit/survey
Purple	Grouse no longer present

Name of SAC Raised Bog	County/Counties	Club	Mtr.	N.S.	Quest.
Killyconny Bog (Cloghbally)	Cavan/Meath				
Tullaher Lough and Bog	Clare				
Barroughter Bog	Galway				
Cloonmoylan Bog	Galway				
Kilsallagh Bog	Galway	*			
Lisnageeragh Bog and Ballinstack Turlough	Galway	*			
Lough Lurgeen Bog/ Glenamaddy Turlough	Galway	*			
Shankill West Bog	Galway	*			
Carrownagappul Bog	Galway	*			
Camderry Bog	Galway	*			
Curraghlehanagh Bog	Galway	*			
Monivea Bog	Galway				
Ardgraigue Bog	Galway				
Lough Corrib	Galway/Mayo	*			
Corliskea/Trien/Cloonfelliv Bog	Galway/Ros				
Sheheree (Ardagh) Bog	Kerry				
Moanveanlagh Bog	Kerry		Conduct survey		
Ballynafagh Bog	Kildare				
Mouds Bog	Kildare		15 years ago		
Coolrain Bog	Laois				
Knockacoller Bog	Laois				
Ardagullion Bog	Longford		Conduct survey		
Brown Bog	Longford				
Clooneen Bog	Longford		20 years ago		
Lough Forbes Complex	Longford/Ros	*			
Tawnaghbeg Bog	Mayo				
River Moy	Mayo/Ros/Sligo	*			
Derrynabrock Bog	Mayo/Roscommon				
Flughany Bog	Mayo/Sligo				
Moneybeg and Clareisland Bogs	Meath/Westmeath				
Mount Hevey Bog	Meath/Westmeath				
All Saints Bog and Esker	Offaly				
Clara Bog	Offaly		15-30 years ago		
Ferbane Bog	Offaly				
Mongan Bog	Offaly		50-60 years ago		
Moyclare Bog	Offaly				
Raheenmore Bog	Offaly				
Sharavogue Bog	Offaly				
Lough Ree	Ros/LD/WM				
Bellanagare Bog	Roscommon	*			
Carrowbehy/Caher Bog	Roscommon				
Cloonchambers Bog	Roscommon	*			
Derrinea Bog	Roscommon	*			
Cloonshanville Bog	Roscommon	*			
Callow Bog	Roscommon				
Drumalough Bog	Roscommon				
Ballynamona Bog and Corkip Lough	Roscommon				
Corbo Bog	Roscommon				
Tullaghanrock Bog	Roscommon				
Ballyduff/Clonfinane Bog	Tipperary				
Kilcarren-Firville Bog	Tipperary				
Redwood Bog	Tipperary		25-30 years ago		
Garriskil Bog	Westmeath				
Carn Park Bog	Westmeath		Conduct survey		
Crosswood Bog	Westmeath		Conduct survey		



Source: NPWS SAC data; BirdWatch Ireland (2006-2008) grouse data; NPWS Raised Bog Monitoring grouse data. Map produced by David Fallon.



Source: NPWS SAC data; BirdWatch Ireland (2006-2008) grouse data; NPWS Raised Bog Monitoring grouse data. Map produced by David Fallon. Rectangle outlines the best biogeographical region of SAC raised bogs for Red Grouse.

Case Study: Carrownagappul Bog, Co. Galway

Carrownagappul Bog is a large raised bog (490ha) situated about 3 km north of Mountbellew, in east Co. Galway. Numerous bog roads, tracks and drains extend into the centre of the site. Peat extraction occurs frequently along the margins of the site and along the bog roads. The site has been managed by Mountbellew-Moylough Game Preservation Association for 15 years and it arguably the most productive raised bog for Red Grouse in Ireland (see Scallan, 2008).

Habitat quality score:	4.5. (excellent quality heather)
Predators:	Some corvids and foxes evident
Heather height:	20cm
Sward height:	30cm
Heather cover:	50%
Heather age:	50% pioneer; 50% building
Evidence of past burning:	Yes 2011 – entire site
Management options:	Heather strimming, predator control, grit provision, public awareness, remove conifers
Heather beetle damage:	Suspected past attack
Evidence of grouse:	Several droppings observed
Local interest:	Yes, project already in place
Notes:	Project managed by Mountbellew-Moylough Game Preservation Association for 15 years; Progress slowed after large fire in 2011; Heather needs time to regenerate after the fire.

Carrownagappul Bog: OSI Map viewer

Photo taken in 2009 before fire

Carrownagappul 2015 – post fire

Heather strimming machine used by Gun Club

Follow link to see NPWS site synopsis

Case Study: Lough Lurgeen Bog/ Glenamaddy Turlough, Co. Galway

The Lough Lurgeen Bog/Glenamaddy Turlough site covers almost 1,200 ha and is situated east of the town of Glenamaddy, Co. Galway. It consists of a large turlough, over 170 ha in extent, and an expanse of over 1,000 ha of typical, intact, western raised bog. A small lake occurs on top of the bog. Water from the bog feeds into the lake, which in turn is linked to the turlough, and thus the three habitats are in close association. This leads to quite a unique ecosystem which is of high conservation value.

Habitat quality score:	3 (good quality heather)
Predators:	All generalist predators, including badgers evident
Heather height:	25cm
Sward height:	30cm
Heather cover:	60%
Heather age:	5% pioneer; 20% building; 70% mature; 5% degenerate
Evidence of past burning:	yes
Management options:	Heather strimming, predator control, grit provision, public awareness,
Heather beetle damage:	Yes
Evidence of grouse:	Yes, in centre and on cut over at edge of site
Local interest:	Yes
Notes:	Forestry nearby – suitable predator habitat; Habitat condition not ideal; Nice coverage of heather on cut-over.

Lough Lurgeen Bog/ Glenamaddy Turlough

Small lake occurs on top of the bog

Active raised bog

Follow link to see NPWS site synopsis

Case Study: Camderry Bog, Galway

The site comprises a relatively large raised bog that includes both areas of high bog and cutover bog. The northern and western margins of the site are bounded by the Shiven River, the eastern margin is bounded by a mineral ridge and those to the south by roads. The site is part of the Coillte LIFE project – Restoring Raised Bogs in Ireland.

Habitat quality score:	3 (good quality heather)
Predators:	All generalist predators evident
Heather height:	15cm
Sward height:	20cm
Heather cover:	60%
Heather age:	5% pioneer; 5% building; 70% mature; 20% degenerate
Evidence of past burning:	yes
Management options:	Heather strimming, predator control, grit provision, public awareness,
Heather beetle damage:	Suspected past attack.
Evidence of grouse:	Yes (1 roost pile and several droppings)
Local interest:	Yes
Notes:	Hares present

Camderry: OSI Map viewer

Part of the Coillte LIFE project

Raised bog

Roost pile of droppings

Follow link to see NPWS site synopsis

Case Study: Kilsallagh Bog, Co. Galway

Kilsallagh Bog is a large raised bog, with a largely intact dome, situated about 7 km north of Glenamaddy in Co. Galway. It is set in a peat basin which is almost completely surrounded by mineral soil.

Habitat quality score:	2 (poor quality heather)
Predators:	All, including badgers
Heather height:	20cm
Sward height:	40cm
Heather cover:	40%
Heather age:	5% pioneer; 10% building; 60% mature; 20% degenerate
Evidence of past burning:	yes
Management options:	Heather strimming, predator control, grit provision, public awareness, remove conifers
Heather beetle damage:	Yes, suspected
Evidence of grouse:	Yes, on cut over at edge
Local interest:	Yes.
Notes:	Forestry nearby - foxes
	Habitat condition diverse, but not great

Kilsallagh Bog: OSI Map viewer


Cutover bog


Cutover bog (with poor quality heather)

Raised bog

Follow link to see NPWS site synopsis

Case Study: Clara Bog, Co. Offaly

Site observations by Mr. John Carslake (NARGC Grouse-keeper, Boleybrack Project, Co. Leitrim):

- Very wet and dominated by cross-leafed heath rather than more suitable ling heather;
- Universal age of heather species and little variation for birds to establish territories;
- Evidence of heather beetle damage on the site;
- Natural seeding of conifers on site provide roosts and vantage points for avian predators such as grey crows – evidence seen;
- No visual sign of a grouse, feather or foil during the site visit despite looking in more suitable places near some of the cut away which is drier, drained, dominated by ling heather, which has a variety of age structures and allows for natural intake of grit;
- Extensive evidence of badger (possibly passing through the site rather than actively hunting it). Some evidence of fox and pine marten (faeces of both);
- Extensive evidence of corvids (grey crow, rook, magpie, jackdaw) using the site and the peripheries. Conifer seedlings being used as perches. All of these species will predate on eggs and the former will predate on young chicks;
- Some scope for heather regeneration through cutting to break up the monotony of mature heather;
- It is the conclusion of John Carslake that Clara bog, as a site for a Red Grouse restoration, is not suitable at present. Significant work would need to be put in place for it to be nearing suitable. The absence of any grouse or sign of grouse on the day of the visit, together with the NPWS staff confirming the absence of grouse for some years is quite telling.

OSI Map viewer


Clara Bog


Photo: Offaly Tourism


Clara Bog

Follow link to see NPWS site synopsis

Recommendations

This project has identified the key remaining SAC raised bog sites for Red Grouse in Ireland. Several sites are deemed to hold populations of Red Grouse. These are predominantly in east Galway/Roscommon. The questionnaire survey also indicated that significant local interest exists in establishing Red Grouse conservation projects on many sites that contain Red Grouse. Note: See Appendix 1 for recommendations for Gun Club wishing to manage these sites.

Recommendation 1: Red Grouse management by local communities

All stakeholders should aim to prevent any further contraction in the range of Red Grouse on raised bogs. This should be achieved via the establishment of community-based conservation projects to maintain and improve existing populations via, for example, habitat management and predator control. Mechanisms to financially support local communities in operating Red Grouse conservation projects on raised bogs should be established.

Recommendation 2: Policy

Promote the re-establishment of suitable raised bog habitat for Red Grouse. This will require action from several key stakeholders (e.g. NPWS, Bord na Mona, Coillte, landowners, turf cutters, Department of Agriculture, Food and the Marine). For example, where opportunities arise, corridors could be created between suitable sites to encourage movement between populations. Note: It is important to acknowledge that positive steps have been taken by state/semi-state agencies in managing and restoring raised bogs (e.g. NPWS, Bord na Móna and Coillte in conjunction with local communities).

Recommendation 3: Introductions of Red Grouse

Emerging taxonomic evidence supports the re-classification of Red Grouse in Ireland as a distinct sub-species (*Lagopus lagopus hibernicus*) separating the Irish population from its counterpart (*L. l. scoticus*) in the UK (McMahon *et al*., 2012). Whilst it is recognised there are some projects that have used use non-Irish Red Grouse for restocking, it is desirable from both a genetic heritage and bio-security perspective to move towards a situation where birds are sourced from within the island of Ireland (National Red Grouse Steering Committee, 2013).

Recommendation 4: IUCN Guidelines for Translocations

McMahon *et al*. (2012) suggest that small isolated populations of Red Grouse in Ireland could be augmented with transplanted birds from a larger population. Any translocation would have to be in line with the IUCN Reintroduction Guidelines (IUCN/SSC, 2013). Extreme care is needed to ensure that any stock is taken from healthy viable populations that can support the removal of young birds. A risk assessment would also be necessary in line with the IUCN guidelines (See Appendix 2).

Recommendation 5: Site protection

Site protection policies that incorporate the biological and ecological requirements of Red Grouse should be included in national and local raised bog (and other) Biodiversity Action Plans. It is essential that raised bogs should be safeguarded from inappropriate developments. Future plans and conservation projects on raised bogs should consider how Red Grouse could be accommodated.

Recommendation 6: Research

More research is required into the ecology of Red Grouse on raised bogs, in particular, on breeding success, habitat use, carrying capacity, predation and survival in low density populations. It should be ascertained whether Red Grouse can be used as a 'raised bog habitat quality indicator' for the conservation status of raised bogs. Research should be undertaken into the effects of Red Grouse management on other species of conservation concern (e.g. breeding curlew) on raised bogs. Any feathers of Red Grouse on raised bogs should be sent for DNA analysis to ascertain the genetic viability of remaining populations. A standardised system should be put in place to achieve this.

Recommendation 7: Notifiable Actions and Appropriate Assessment process

Sensitive Red Grouse management can be compatible with the conservation of raised bogs and can increase local community support for these sites. Local communities, however, should work with local NPWS staff with regard to potential Notifiable Actions and, where necessary, must follow the Appropriate Assessment process under Article 6 of the Habitats Directive (See Appendix 3).

Curlew. Photo: John Carey/BirdWatch Ireland

Heather management on Ballydangan Bog

Recommendation 8: Monitoring

Annual spring and autumn monitoring (of remaining populations) of Red Grouse on raised bogs should be carried out in conjunction with key stakeholders. A standardised system of monitoring Red Grouse on raised bogs should be developed to guide efforts.

Recommendation 9: Dissemination

The establishment of future conservation projects will require consultation with a range of relevant stakeholder groups. The importance of raised bogs for birds should be promoted via the design of primary and secondary school educational material (e.g. lessons plans, quizzes, site visits to Red Grouse conservation projects).

Recommendation 10: Consider raised bogs sites that are not SACs

Further assessments of Red Grouse on non-SAC raised bogs should be undertaken. For example, there are records of Red Grouse and projects in place on the Clonboley complex (e.g. Ballydangan Bog) and Kileglan complex (sites owned by Bord na Mona). Some Natural Heritage Area (NHA) raised bogs also have Red Grouse present.

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Appendix 1: Guidelines for Gun Clubs

In Ireland, community-based projects have shown that the application of Red Grouse management strategies can lead to improved productivity for a variety of bird species (e.g. Red Grouse and breeding curlew).

A Raised Bog Red Grouse Conservation Project should set out to limit the specific factors affecting the local Red Grouse population in a manner that supports a diversity of wildlife species and human uses. More specifically, a project should aim:

1. To increase the Red Grouse population on the site to a stage where it is able to sustain itself and is no longer in decline;
2. To increase other species dependent on the upland habitats such as sky lark, snipe, golden plover, meadow pipit, hen harrier, merlin and hares as a by-product of Red Grouse management;
3. To reduce and manage the predators of Red Grouse on the site i.e. fox, grey crow, magpie and mink;
4. To provide the necessary conditions for new Ling heather growth alongside older heather.
5. To liaise with NPWS and other stakeholders of the site on an ongoing basis in relation to the development of the site as suitable Red Grouse habitat.
6. Monitoring will be an important part of the project's plan, and adjustments to the conservation actions depending on how the population responds to management.

Hunting:
If your red grouse population is small, it might be wise to put a moratorium on grouse shooting.

1. Population Assessment
Annual monitoring of Red Grouse and other bird species on the project site will be essential to assess the impact of the proposed management practices. Spring counts will establish the number of breeding pairs in the area and autumn counts will establish how well (or not) the same pairs have produced. The autumn counts will therefore establish a ratio of young–old birds for that year. Early morning (i.e. dawn chorus) surveys are also useful to monitor (i.e. by listening to) the Red Grouse population. When carrying out population assessments, it is important for the Gun Club to use the same methods over the same area of ground and at the same time of year. It is always beneficial to take note of other birds and mammals during monitoring. Records should also be kept of all casual observations of Red Grouse and other species of conservation concern on the site.

Actions:

- Spring Dog Count: late February/early March annually using pointing dogs
- Autumn Dog Count: late July/early August annually using pointing dogs
- Casual reporting of all species of conservation concern

2. Preservation of Habitat
The project site may not have a vast amount of nutritious heather for grouse due to past uncontrolled/illegal burning. Furthermore, raised bogs generally support less heather cover that wet/dry heath and research confirms that less heather will equal fewer grouse. The key priority in terms of habitat preservation should be to prevent future uncontrolled fires, so that the heather present is given a chance to regenerate. In time, areas of medium aged, mid-length heather could be broken up with strimming. Burning should not take place on raised bogs due to the peat depth and the botanical diversity.

Potential Action:

- Design and implement a threat response plan to prevent future fires affecting the project site. This should include a notification system (e.g. text alert) whereby the fire can be managed either by Club members or by the Fire Service.

Heather strimming on a raised bog

Managed area on a raised bog

3. Predator and Pest Control

Research has shown that predation is, and has always been, a major cause of Red Grouse mortality. Predation during nesting and early brood-rearing has the greatest influence on Red Grouse populations (GWCT, 2005). Nest predators include fox, grey crow, magpie and mink. Reducing predation rates can lead to increases in Red Grouse productivity.

Controlling predation is most likely to be effective when undertaken over a wide area, hence requiring cooperation with numerous farmers. Remember that it is only legal to trap/kill certain predator species: fox, mink and some corvid species.

Foxes can have a significant impact on Red Grouse numbers as they will take nesting hens in the breeding season and broods of young, as well as adults, in winter. Hooded crows and magpies are the main corvid species that are likely to reduce Red Grouse breeding success as they will feed on Red Grouse eggs. Reducing the number of crows can be achieved by shooting and by using ladder/larsen traps. As crows are highly territorial in spring, trapping has proved to be most effective after the crows established their territorial pairs (from spring-late summer). Outside of this period, the use of larsen traps is of little value.

Red Grouse. Photo: Fiona Wheeldon

Golden Plover are vulnerable to predators

Timing:

To be effective, predator control should be undertaken when it confers the greatest benefit, i.e. mainly spring and early summer. Hence, control efforts should be concentrated in the period

February to July to remove the key predators just before nesting and during the chick-reading period (GWCT, 2005).

A predator control strategy should address the following:

- the species to be controlled;
- the scale of control;
- the season and length of control;
- methods to be used;
- ways of evaluating results.

For the vast majority of Gun Clubs, it remains a challenge to put in place systematic predator control programmes. This is because gun Clubs are mostly reliant on the good-will of their members that also work full-time jobs. In this regard, predator control is frequently implemented in a more casual manner and is often reliant on a small number of motivated and interested members (Scallan, 2016).

Potential actions:

FEBRUARY TO SEPTEMBER Set/Check Large Crow Traps: • Feed\water call birds • Remove captured birds • Maintain traps as required	FEBRUARY TO SEPTEMBER Set/Check Larsen Traps: • Feed\water call birds • Remove captured birds • Maintain traps as required	ALL (REDUCE MAY TO AUGUST) Set/Check Mink Traps: • Remove captured mink • Bait traps as required • Maintain trap as required
ONLY COLD WINTER WEATHER Set/Check Fox Traps: • Remove captured foxes • Bait traps as required • Maintain traps as required	ALL YEAR Lamping; Set/Check Snare Lines: • Remove captured foxes • Reset snares as required	ONLY COLD WINTER WEATHER Set/Check fox middens: • Use only in cold weather • Check snares daily • Refresh bait frequently


Foxes need year round control


Magpies are nest predators

4. Public Relations

As Red Grouse are mostly threatened by human influences, education is an important accompanying measure in Red Grouse conservation programmes. Public awareness and education can greatly improve the success of conservation efforts. In general, farmers, the general public and decision-makers require better education on habitat requirements, threats and ecology of the species on their land and under their responsibility.

As a community-based venture, the Project should aim to engage with the local community and create awareness within the wider general public about the importance of Red Grouse conservation. Some of the educational and public awareness activities could include the development of educational material, hosting school visits and disseminating the project's outcomes through local media.

University students visiting Ballydangan Bog


Heritage Week 2015: Ballydangan Bog

Increased community awareness about this project can be put in place via the erection of several signs.

Potential Actions:

- Develop and implement a communications plan that identifies the audience and the message;
- Develop and provide educational materials to the public describing the Red Grouse project effects (brochure, newsletters, etc.);
- Ensure that all landowners are aware of the Red Grouse conservation project by promoting and disseminating to them the significance and conservation value of the project;
- Develop links with the other organisations involved in managing Red Grouse projects in the Republic of Ireland and Northern Ireland;
- Disseminate the outcomes and effects of the management project to the general public and interested stakeholders through the publication of annual reports and accompanied site visits.

5. Provision of Grit

Coarse/angular grit should be placed in multiple locations on the project site to allow easy access to an essential dietary requirement as well as offering suitable high points. Each grit station should be recorded by GPS to allow the project team to regularly monitor their use.

Remember that:

- Grouse require grit in their diet and will travel considerable distances to source it;
- The angular grit or small stone is eaten and acts as a pestle and mortar in the birds' gizzard to help digest the fibrous, low nutrient value heather that forms almost 90% of their diet;
- Natural grit is often found on road sides or where exposed stone is found;
- Providing grit for Red Grouse may encourage birds to establish territories. It should be placed on a high point that can be used as a vantage point for Red Grouse to look out for predators and for the cock bird to survey his territory.

Grit station

Grit station on Ballydangan bog

Actions:

- Erect several grit stations (well-space apart) on the project site using the design of the Ballydangan grit station (see above).

6. Prevention of Parasites

The nematode worm (*Trichostrongylus tenuis*), which causes the disease Strongylosis, is widespread in grouse populations in Britain and it is believed that high levels of infection can reduce grouse breeding success and also cause direct mortality.

Research and management in the north of England using worm-killing drugs has shown that this parasite can cause cyclical fluctuations in grouse numbers on moors in that region. However, there is little information on the status of these (or other) diseases in the Republic of Ireland. The other parasite commonly known to affect grouse is the Sheep tick (*Ixodes ricinus*).

Strongyle Worm:

- The larvae of the worm are found on heather and are ingested by the grouse;
- The worm develops into an adult within the birds' blind ended gut or caeca;
- Eggs produced by the worm are passed by the grouse in the caecal dropping;
- The larvae go through two progressive moults;
- The adult larvae is then ingested by the grouse and the cycle repeats itself.

All grouse will have Strongyle worms at some stage in their life, but it is only when the worm burden in a bird becomes too high that grouse are affected.

Actions:

Be aware of the following symptoms of disease in Red Grouse on the project site:

- Poor flight
- Poor body condition
- Dull plumage
- Fingery tail feathers

Appendix 2: Translocations and IUCN Guidelines

Context

Genetic diversity is an important component of biodiversity (Humphries *et al*., 1995) and affects population characteristics such as extinction risk and evolutionary potential (Frankham *et al*., 2002). It is widely acknowledged that isolation poses a significant threat to the genetic viability of bird populations. Small population size may lead to lower average fitness of individuals through the effects of inbreeding depression (Keller and Waller, 2002). Declines in genetic diversity are frequently associated with declines in fertility and egg hatchability, thus, poorer reproductive success. The results of a recent study by McMahon *et al*. (2012) indicate that the Irish Red Grouse, as predicted from low population size and fragmented habitat structure, have a low level of genetic variability.

Maintaining genetic diversity is important for the evolutionary long-term survival of small and fragmented populations. It is also recognised by the IUCN (International Union for Conservation of Nature) as a global conservation priority. Successful translocations have produced increases in population fitness in fish, birds, mammals and reptiles (see Evans, 2007 and references therein). McMahon *et al*. (2012) suggest that small isolated populations of Red Grouse in Ireland could be augmented with transplanted birds from a larger population. In addition, the same study infers that for translocations, populations that have small or declining populations or ranges, and/or high probabilities of extinction, may be primary candidates (McMahon *et al*., 2012).

Justification for Translocation

IUCN Guidelines for Translocations recommend that there must be strong evidence that the threats have been correctly identified and removed or sufficiently reduced prior to translocation. Hence, any proposed conservation translocation must be justified by first considering past causes of severe population decline or extinction.

Red Grouse translocations have taken place before in Ireland. For example, the Ballydangan Bog Red Grouse Project planned, in conjunction with the Boleybrack Grouse and Upland Conservation Group, a Red Grouse translocation to improve the genetic vigor of the Ballydangan Bog Red Grouse population. However, before any translocation took place, it was determined that the main limiting factors were correctly identified and/or reduced prior to undertaking the translocation exercise.

Consider the following Licenses when undertaking translocations:

1. Wildlife Acts 1976-2012 - Sections 9, 22 and 34: License to Capture Protected Birds
2. Wildlife Acts 1976-2012 - Sections 9 and 32: License for Ringing/Marking
3. Wildlife Acts 1976-2012 - Section 35: for the use of Tape Lure (to muffle sound when approaching grouse).

Contact the NARGC for further information: www.nargc.ie

Appendix 3: Notifiable Actions and the Appropriate Assessment process

Notifiable Actions

In cases, certain red grouse management strategies on designated raised bogs (e.g. heather management) will require permission from NPWS in advance. These permissions, called Notifiable Actions, are activities or operations that might be damaging to a designated site and vary depending on the type of habitat present.

The activities listed in the Notifiable Actions are not prohibited; however, local communities managing red grouse projects on raised bogs should consult with their local NPWS Conservation Ranger regarding what activities might require consent.

If certain activities require consent, a short application form will have to be completed with details of the operation/activity for which the permission is sought (and in cases with a map outlining where it is proposed to undertake the operation/activity).

Appropriate Assessment process

A 'Project' that has the potential to result in likely significant effects to the integrity and conservation interests of European Sites must go through the Appropriate Assessment (AA) process.

The EU Habitats Directive provides legal protection for habitats and species of European importance. Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making process for 'plans' and 'projects' likely to affect Natura 2000 sites (i.e. SACs and SPAs).

Articles 6(1) and (2) of the Habitats Directive set out provisions for the conservation management of European Sites. Articles 6(3) and 6(4) of this Directive describe procedural steps to be following to determine whether or not a 'plan' or 'project' is likely to affect an N2K site. Article 6(3) also establishes the requirement for the AA process:

> "*any plan or project not directly connected with or necessary to the management of the (Natura 2000) site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implication for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*".

The objective of an AA report is to conclude whether or not (in this case - a Grouse Project) will adversely affect the integrity of European Sites. Such a conclusion will be arrived at by assessing the implications of this project for the relevant European Sites' 'qualifying interests' (i.e. those Annex I habitats and Annex II species of SACs and Annex I birds of SPAs) and associated conservation objectives.

The AA process is underpinned by the 'precautionary principle'. Therefore, if the risk of adverse impacts to the conservation objectives of a European Site cannot be ruled out, it is assumed that an adverse impact may exist. Where such uncertainties are identified during the assessment, measures will be proposed to avoid or mitigate the risk of adverse impacts occurring.

Where no significant impacts are likely to occur, a finding of 'no significant effects' is concluded and the proposed project can move directly to the relevant authorisation body (i.e. NPWS) and may proceed. Where significant negative effects on the integrity of European sites are identified, other procedures must be followed (see 'NPWS Guidance on the Appropriate Assessment Process').