Hen Harrier Conservation and the Agricultural Sector in Ireland

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Preface

Directive 2009/147/EC or the Birds Directive provides a comprehensive scheme of protection for all wild birds naturally occurring in the European Union (EU). The Directive instructs Member States to maintain the populations of wild bird species at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements. In light of this requirement Ireland, along with other Member States, shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for its wild bird species.

The Directive also requires the classification of suitable areas as Special Protection Areas (SPAs) for the protection of certain bird species, including the Hen Harrier. Under Article 6 of the Habitats Directive, which applies to SPAs, Ireland is obliged to prevent the deterioration of these SPAs (as suitable areas for the species) and only to consent to projects where there is clear scientific evidence that such projects will not lead to an adverse impact on the integrity of the SPA or qualifying features. The Court of Justice of the European Union, in a number of its findings regarding the interpretation of these Directives, has emphasised the importance of scientific understanding of the impact of proposed interventions, and where there is scientific doubt as to the potential impacts on the species, the precautionary principle must apply.

This report specifically examines the interactions between the agricultural sector and Hen Harrier conservation in Ireland. The purpose of this report is to inform the Hen Harrier Threat Response Plan (HHTRP) with a view to integrate the agricultural related findings with those from other relevant sectoral pressures, e.g. forestry and wind farm development, in order to prescribe a collaborative way forward for the conservation of this species.

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CHAPTER 1 INTRODUCTION

Background

The National Parks and Wildlife Service (NPWS) at the Department of Arts, Heritage and the Gaeltacht are responsible for co-ordinating the conservation of natural habitats and species and the protection of biological diversity in Ireland.

Under regulation 39 of the European Communities (Birds and Natural Habitats) Regulations 2011 provision is made to develop and implement appropriate threat response plans. The purpose of such a plan would be to cease, avoid, reduce or prevent threats, pressures or hazards that may be having an adverse effect on the conservation status of a species of bird referred to in Article 1 of the Birds Directive and/or causing the deterioration of the habitats of species for which a European Site has been classified pursuant to the Birds Directive.

The Hen Harrier *Circus cyaneus* is listed on Annex 1 of the Birds Directive (Directive 2009/147/EC) and is Amber listed on the Birds of Conservation Concern in Ireland (Colhoun & Cummins, 2013). In 2007, six European Sites (Special Protection Areas) were designated for the conservation of this breeding species. Hen Harriers are also listed at a further two SPAs that support important roost sites outside the breeding season. A survey of breeding Hen Harrier in 2010 recorded 128 to 172 breeding pairs (Ruddock et al., 2012) which was broadly similar to the totals recorded in the previous survey in 2005 (Barton et al., 2006). However notable declines were recorded in some of the strongholds sites that were designated as SPAs for this species (Ruddock et al., 2012).

Recent research raised the possibility that this species may be subject to an ecological trap due to its habitat preferences in Ireland. This coupled with concerns that the extent and rate of change to the Hen Harrier's habitat including continued afforestation and an increase in the rate of wind farm development and agricultural intensification among others were linked to the recently recorded declines led to the decision to develop a Hen Harrier Threat Response Plan (HHTRP). This document forms part of the overall HHTRP process and focuses on reviewing the interactions of the agriculture sector and the conservation of the Hen Harrier population in Ireland.

The Hen Harrier in Ireland

The Hen Harrier is a widespread but patchily distributed breeding bird across much of northern and central Europe (Cramp & Simmons, 1980; Simmons, 2000) a breeding range, which equates to less than one quarter of this Harrier species global range. The European breeding population is considered to be relatively small (estimated at 9,261 – 13,157 breeding pairs (Eionet, 2015). As the Hen Harrier underwent a large decline during the period 1970 – 1990 its European conservation status is regarded as 'unfavourable' (BirdLife International, 2004).

This species is migratory in the northern parts of its range in north and northeast Europe, Asia and North America; and partially migratory and dispersive in the rest of its breeding range (del Hoyo et al., 1992).

O'Donoghue (2004) described the modern landscape of the Irish breeding Hen Harrier as upland, typically above 100m above sea level (asl) and dominated by pastoral based livestock farming with holdings often covered in rushes and bordered by hedgerows; active and degraded peatland; scrub; and, commercial plantations of different ages. Breeding Hen Harriers in Ireland typically avoid agriculturally improved land for nesting (Wilson et al., 2009), although the species will forage along hedgerows and linear features (Madders, 2000; 2003a). Hen Harrier populations in Ireland are now breeding predominantly in forested landscapes (Barton et al., 2006; O'Donoghue, 2010; Ruddock et al., 2012) which have replaced open heath-dominated upland habitats (O'Flynn, 1983). Conversely in the UK the Hen Harrier is recorded more frequently nesting in moorland (Redpath et al., 1998; Sim et al., 2007; Hayhow et al., 2013).

The foraging habitat preferences of Hen Harriers in Ireland are generally biased towards moorland, grassland mosaics and prethicket forest habitats (see O'Donoghue, 2004; 2010; Barton et al., 2006; Irwin et al., 2012). Open habitats support greater numbers of the Hen Harriers' preferred prey species, such as Meadow Pipit (*Anthus pratensis*) and Skylark (*Alauda arvensis*). Hen Harrier breeding numbers are typically correlated with the abundance of small mammals in the UK (Redpath et al., 2002a; 2002b; Thirgood et al., 2003), however this relationship does not appear to exist in Ireland perhaps due to the absence of short-tailed vole (*Microtus agrestis*) (see O'Donoghue, 2010). Preferred prey species in Ireland are Meadow Pipit, Wood Mouse (*Apodemus sylvaticus*) and other small passerines during the breeding season whilst wintering thrushes (e.g. Redwing & Fieldfare), granivourous passerines (e.g. Chaffinch, Reed Bunting & Linnet), Meadow Pipit, and Brown Rat (*Rattus norvegicus*) predominate in winter (O'Donoghue, 2010).

A history of the Irish Hen Harrier population (1800s – 1980s)

From the earliest documented records in the 1850s, Hen Harriers were generally distributed throughout Ireland with breeding strongholds in Kerry, Wicklow and the Tipperary/Waterford border in the south, Derry and Antrim in the north (Thompson, 1849). The Hen Harrier was also found breeding in Connemara (Shawe-Taylor in Watson, 1977). By 1900, the Hen Harrier was recorded in counties Kerry, Cork, Limerick, Tipperary, Waterford, Wicklow, Dublin, Offaly, Laois, Galway, Mayo, Fermanagh, Donegal, Derry, Antrim and Down, however it was noted that the population was in decline and no longer present in some historical breeding areas (Ussher & Warren, 1900). At this time Hen Harriers were considered to have been widely persecuted in Ireland (primarily through the destruction of young and eggs) throughout the latter half of the 19th century (Usher & Warren, 1900; O'Flynn, 1983) and the Hen Harrier was considered by some to have become extinct as a breeding species in Ireland altogether by the early 1950s (Kennedy et al., 1954; Bannerman & Lodge, 1956), however small numbers had continued to breed in a few areas such as the Slieve Bloom Mountains in Laois, the Tipperary/Waterford border and the Cork/Kerry border (Watson,

1977). There is no accurate historical estimate of Ireland's total breeding population during the early 1950s. However it is considered that the Irish population was at historically low levels with regard to numbers and breeding distribution.

It is considered that a recovery in the population started in the 1950s (Andrews, 1964). In 1956 breeding pairs were found in Waterford, south Kilkenny and Cork (O'Flynn, 1983), re-colonising Wicklow soon after, with seven breeding pairs recorded in the county in 1961 (Scott, 1995). By 1964 at least 35 pairs were known to be breeding in six southern counties (O'Flynn 1983). In the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) an all-Ireland breeding population estimate of 200 – 300 pairs is given with confirmed or probable breeding records from 17 counties. The distribution was based on fieldwork which was undertaken during the period 1968 – 72. A slightly increased estimate of 250 – 300 pairs is reported for the period 1973-75 (Watson, 1977).

O'Flynn (1983) considered that the recovery of the Hen Harrier breeding population from the 1950s onwards appeared to have been due to an increased availability of secure nest sites and passerine prey species. O'Flynn (1983) cites the government's adoption of long-term afforestation plan in 1947 (*c*.400,000ha to be planted over 40 years) as the likely driver for the increase in nesting and foraging opportunities.

In the latter half of the 1970s O'Flynn (1983) suspected that the population was no longer increasing and after further investigation considered that the population had declined significantly in some areas (e.g. Wicklow from over 20 pairs in 1965 to two or three pairs in 1982) with apparent local extinctions occurring in other areas (e.g. Slieve Aughty Mountains, the Ballyhoura Mountains, hills of north Tipperary, hills of south Kilkenny and the Comeragh Mountains in Waterford). O'Flynn (1983) noted that by the mid-1970s the earlier planted conifer forests had grown to maturity resulting in a direct negative impact on the availability of suitable prey. Coincident changes to open non-afforested habitats in Hen Harrier breeding areas were also occurring at this time and partly attributed to Ireland's entry into the European Economic Community (EEC) in 1973 and the subsequent changes in land use initiated by significant investment through the Common Agricultural Policy (CAP). O'Flynn (1983) considered that tracts of scrub and gorse covered marginal land which had provided a productive hunting habitat for the Hen Harrier were cleared and transformed into improved grassland. The combination of the maturation of the forest estate and the clearance of marginal land was considered by O'Flynn (1983) to be the main reason for the Hen Harrier breeding population decline of the late 1970s.

Recent population trends

The second Atlas of Breeding Birds in Britain and Ireland undertaken between 1988-91 estimated an all-Ireland population of 180 breeding pairs, assuming an average density of two pairs per 10km square where breeding was probable or confirmed (Gibbons et al., 1993). The first national Hen Harrier survey in the Republic of Ireland was conducted during the breeding seasons of 1998 - 2000 and estimated a breeding population of 102 - 129 pairs (Norriss et al., 2002).

A second national survey was undertaken in 2005 and established a national population estimate of 132 – 153 territorial pairs. This represented an increase of over 18% from the first national survey; an increase partially explained by increased survey coverage in 2005 (see Barton et al., 2006). Combining the results with comparable surveys undertaken in Northern Ireland (Sim et al., 2001; Sim et al., 2007), Barton et al. (2006) established all-Ireland estimates of 130-167 and 190–221 territorial pairs in 1998–2000 inclusive and 2005 respectively, equivalent to an apparent increase of over 24% in that period.

The third national survey undertaken in 2010 estimated a breeding population of between 128 to 172 territorial pairs occurring in sixty nine 10km squares (Ruddock et al., 2012) (Figure 1). A separate survey in Northern Ireland estimated 59 proven and probable territorial pairs (Hayhow et al., 2013), providing an all-Ireland estimate of 158 to 205 pairs (Ruddock et al., 2012). These survey results indicated that the Hen Harrier population appeared to be stable however the precision of comparing the 2005 and 2010 national estimates was complicated due to more than double the surveyor effort in the 2010 survey (Ruddock et al., 2012). The coverage of the 2010 national survey included a subset of the 10km squares also surveyed in 2005 and therefore a more accurate estimate was derived by Ruddock et al. (2012) by comparing the number of breeding pairs in this subset. Analysis of 113 10km squares surveyed in both years calculated a population decrease of 6.4% over that period.

A similar sub-sample approach for 84 10km squares surveyed during respective surveys undertaken in 1998-2000 and 2010 showed a short term national population decline of 11 – 16% and 6% reduction in breeding range over this period (Eionet 2014). The most recent Atlas of Breeding Birds in Britain and Ireland 2007 – 2011 (Balmer et al., 2013) presents the breeding distribution of Hen Harrier within ninety nine 10 km squares in Ireland but differences in survey methodology and survey effort complicate comparisons between the national survey data. A large proportion of the records submitted to the atlas project were derived from the 2010 national survey data.

Particular concerns were raised on the basis of the observed declines in the abundance of breeding birds in the Hen Harrier strongholds several of which are designated as SPAs (Ruddock et al., 2012). Six sites have been designated as SPAs for breeding Hen Harriers in Ireland (Figure 2). The combined breeding Hen Harrier populations within these SPAs during the 2010 national survey (Ruddock et al., 2012) recorded between 55 and 77 territorial pairs, a decline of 18.1% compared to the results of the 2005 survey. These six areas comprise a combined area of approximately 167,117 hectares (ha) and consist mainly of non-native coniferous plantation forests, open upland peatland habitats, and a spectrum of improved and extensively farmed grasslands (NPWS, 2007). Approximately 9% of the total land area in the SPA network designated for breeding Hen Harrier is high to medium intensity managed grassland (Moran & Wilson-Parr, 2015).

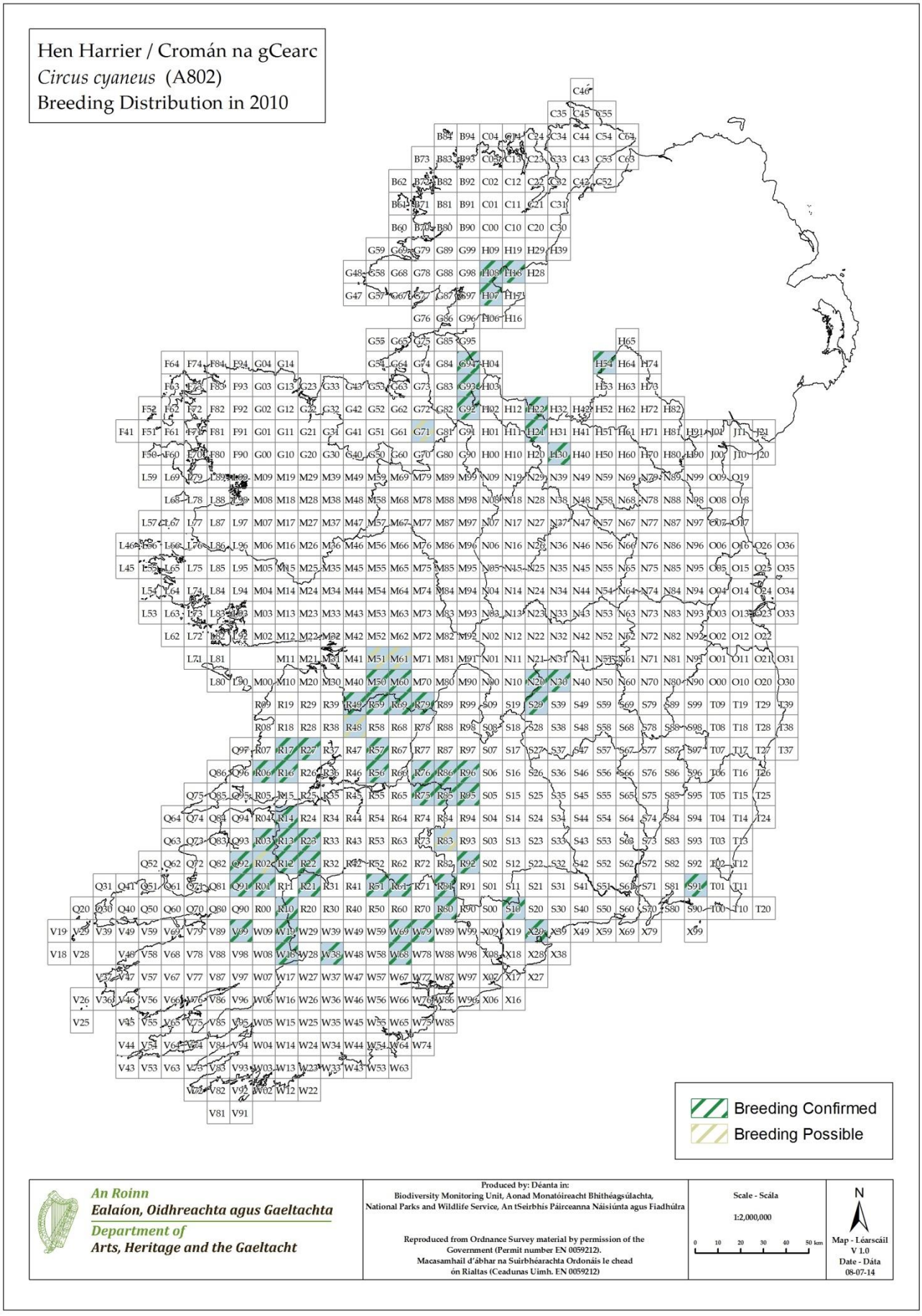

Figure 1. Distribution of Breeding Hen Harrier in 2010

Outside the Breeding Season

The winter distribution of Hen Harriers in Ireland significantly differs from that during the breeding season (Figure 3). Outside of the breeding season (i.e. approximately mid-August to mid-March) Hen Harriers may disperse from the breeding sites with the majority of marked young birds born in Ireland re-sighted within 150km of their natal site (O'Donoghue, 2010). O'Donoghue's (2010) work indicated that Irish Hen Harriers were largely resident with a minority of the re-sighting data of Irish bred birds from Britain. There are evident links between Ireland and Britain with records of Scottish bred birds re-sighted in Ireland but the level of interchange of birds during the breeding and non-breeding periods has yet to be established with certainty (Etheridge & Summers, 2006; O'Donoghue, 2010).

Hen Harriers tend to utilise wintering grounds which are typically lowland sites below 100m (Clarke & Watson, 1990; 1997; O'Donoghue, 2010). Outside the breeding season Hen Harriers gather at communal roost sites at night (Watson & Dickson, 1972). Hen Harrier roost sites can be communal (frequently used by several individuals and other raptor species) or solitary (used by individual birds regularly and/or infrequently) (see Clarke & Watson, 1990). Hen Harriers select sites with suitable cover, low ambient levels of disturbance and presumably close to suitable foraging areas to roost (O'Donoghue, 2010). In Ireland the majority of roosts are located in reedbeds, heather/bog and rank grassland but also fen, bracken gorse and saltmarsh (Watson, 1977; O'Donoghue, 2010). Approximately 20% of known roost sites in Ireland occur within close proximity to known nesting areas. The numbers of individual wintering birds occupying each roost site are highly variable and patterns of roost site use are poorly understood. In 2014, approximately 96 confirmed winter solitary and communal roosts are known in Ireland, estimated to support between 219 – 313 individuals (B. O'Donoghue, pers comm).

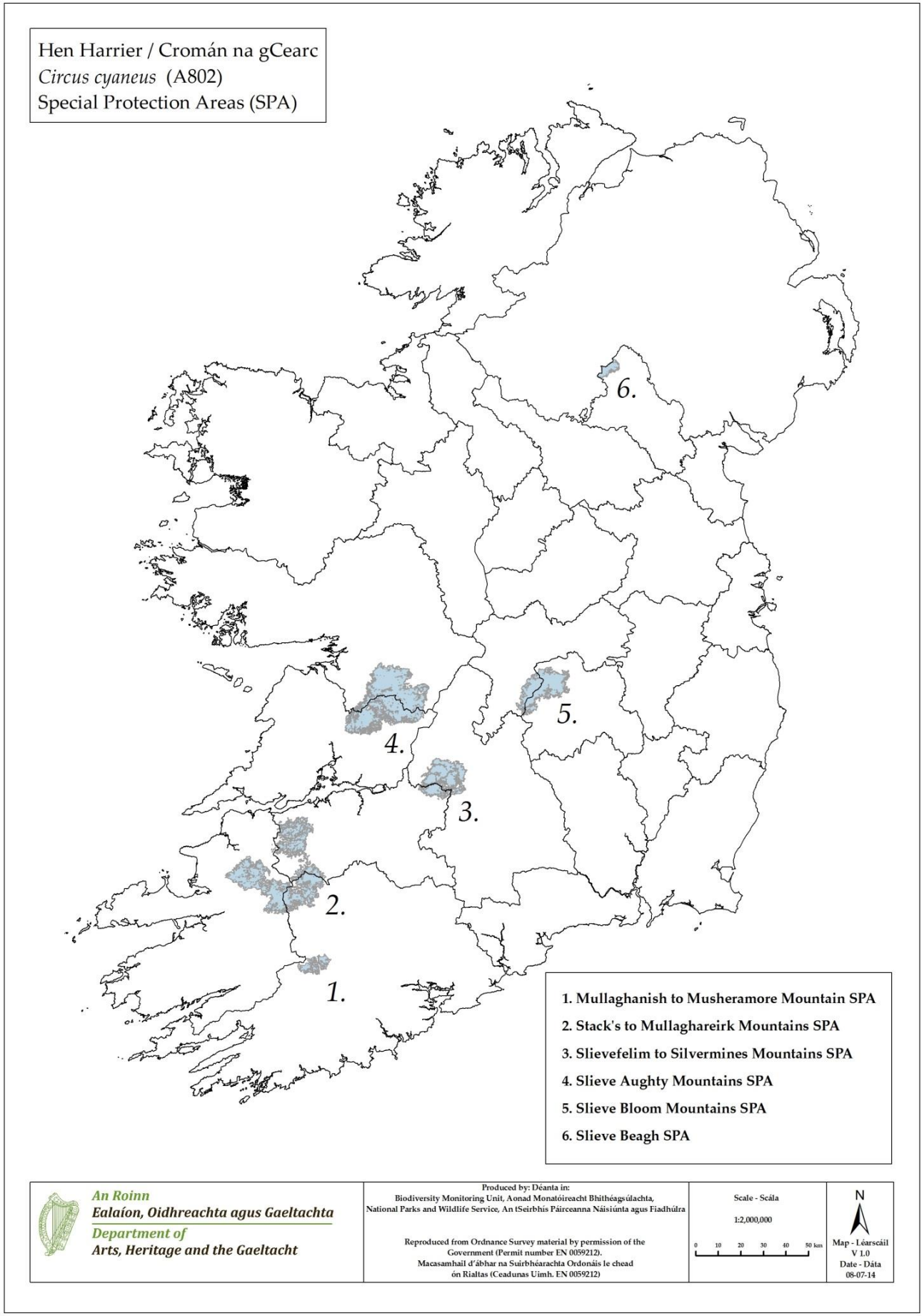

Figure 2. The SPA Network for breeding Hen Harrier

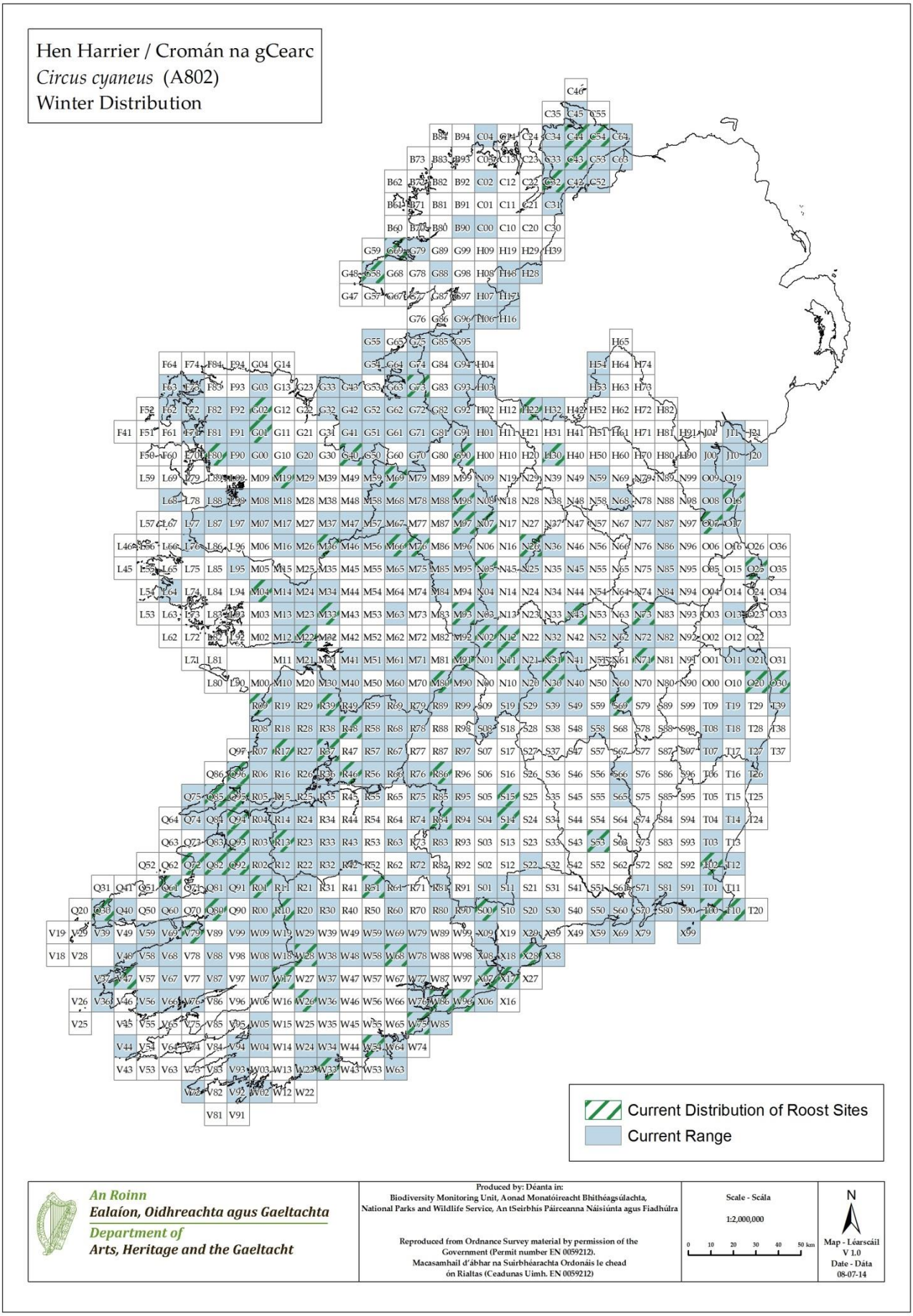

Figure 3. The Distribution of wintering Hen Harrier

The Agricultural Sector in Ireland

Ireland has a long history of habitat and landscape modification driven by changing human population growth and demands for resources. The Irish landscape has been continually altered by the necessity to house, feed and organise a changing population. Industrial, technological and political advancement has resulted in major changes to Ireland's post glacial land cover (Stevenson & Thompson, 1993). Woodland clearance, drainage and modification for farming have had the greatest influence on landscape structure and composition (Mitchell & Ryan, 1998).

Two thirds of the Irish population (over 685,300 farm holdings) were dependent on farming as a livelihood prior to the Famine of the 1840s. Approximately 45% of these farms were under 2 hectares (ha) in size, with only a small proportion over 20ha (Commins et al., 1999). Reduced agricultural pressure on land after the Famine led to the sale of estates by absentee landlords (Curtis, 1980). The reduced viability of small farms in upland marginal areas often led to abandonment and depopulation (Parnell, 1880). The implementation of the Land Acts between 1870 and 1909 produced owner-occupied farms too small to be economically viable and farm sizes gradually increased as more land became available to rent or purchase (Guinnane & Miller, 1996; 1997). The large contiguous land parcels and merged field boundaries seen at present are a result of relatively modern changes to land propriety during the late twentieth century. Land consolidation also led to the development of farm standardisation and specialisation (Beames, 1975).

The Department of Agriculture, Food and the Marine (DAFM) is responsible for ensuring the development of agricultural sector within Ireland in a manner and to a scale that maximises its contribution to national socio-economic well-being (DAFM, 2014d) on a sustainable basis that is compatible with the protection of the environment (DAFM, 2011).

The Common Agricultural Policy (CAP) established in 1962, is one of the oldest policies of the EU and the first fully combined policy shaping Europe's socio-economic integration. The economic benefits of the EU CAP and subsequent range of agricultural schemes and payments were a catalyst for Ireland's membership to the then European Economic Commission (EEC) in 1973. By the early 1970s a considerable proportion of the European budget was allocated to CAP. CAP policy has been reformed on many occasions, eventually paving the way for an EU single market 30 years later in 1992 (Grant, 1995; Patterson, 1997; Brouwer & Lowe, 2000).

Before Ireland's membership of the EEC and access to CAP schemes, funds for land improvement and drainage for agriculture were provided by the Exchequer through the Land Project up until 1976. This initiative subsidised the conversion of approximately 1,025million hectares (ha) of land for agriculture, equivalent to 14% of Ireland's land area. Additional components of the project grant aided improvement of a further 74,000ha through the Fertiliser Credit Scheme, Mountain Fencing and Grazing Scheme (DoA, 1976). In 1968, the Mansholt Plan was the first significant blueprint for the reform of the CAP and proposed a socio-structural scheme that defined measures to make farms larger, more efficient and productive to compete in the global agri-market (Mansholt, 1970).

Agricultural Schemes and Payments I (1970 – 1990s)

The divided opinion engendered by the Mansholt Plan largely discouraged further CAP reform in the 1970s, resulting, as predicted, in a growing structural over-supply of agricultural produce. During the 1970s and 1980s agricultural schemes were supported through the CAP Guidance Fund. Farmers in less productive areas availed of the EEC Headage Payments Scheme which provided an important provision against rural socio-economic decline (Beard & Swinbank, 2001). CAP funded development measures in Ireland included The Western Drainage Scheme, the Programme for Western Development ('Western Package'), the Cross-Border Drainage Scheme and the Farm Modernisation Scheme replaced subsidies from the Land Project (Commins, 1995). An EEC and National Interest Subsidy scheme ran from 1981 to 1983 to assist farmers in on-farm development (Heritage Council, 1999).

The Farm Modernisation Scheme was replaced by the Farm Improvement Scheme under the Agricultural Structures Regulation (EEC, 1985) in 1986. Land improvement was subsidised on a huge scale through the Western Package during the 1980s (Heritage Council, 1999). The predominant types of open habitat in Ireland reclaimed for agriculture consist of peatland habitats, notably cutover and cutaway raised bog habitat; blanket bog and fen habitats (Mitchell ,1976; 1987; Baldock et al., 1984; Mitchell & Ryan,1997). By 1990, 8,873 plans for mountain and hill pasture reclamation; 34,564 lowland reclamation plans had been approved; and, 835 commonages subject to land improvement, all grant aided to a cost of £43.039 million (Heritage Council, 1999). A limited number of environmental conditions were developed to address the major impacts of agricultural intensification on upland and farmland bird species (Crowley, 2003), for instance, only a minority of grant applications were refused on environmental grounds through provisions of the Areas of Scientific Interest (ASI) process.

Market policy and prices were 100% funded by the EEC with the larger share of resources for structural measures provided by Ireland. Direct payment schemes from the CAP Guarantee Fund were introduced in 1980 and 1981 for the Suckler Cow Premium and Ewe Premium respectively (Heritage Council, 1999) resulting in increased numbers of suckler cows and sheep (Harte, 1992; Power & Roche, 1996). Thus these premiums provided incentives for increased grazing intensity which resulted in over grazing in certain areas. The Ewe Premium in particular had a marked negative effect on the condition of open upland and marginal habitats across large expanses of Commonage in Western Ireland (Murphy & Lally, 1998; Walsh et al., 2001; O'Rourke & Kramm, 2009; O'Rourke et al., 2012; Fahey, 2014).

The apparent resurgence in Irish agriculture was however short-lived due to CAP measures designed to curtail over production (Sheehy, 1983; O'Hara, 1986). EC agricultural policy shifted in the late 1980s with reform of the EC Structural Funds in 1988, and the designation of Ireland as an Objective 1 region, allowed Ireland to obtain a greater share of EC funds for agricultural structural measures (Laffan, 1988; Payne et al., 1997; Bailey & Propris, 2002; RodrÍguez-Pose & Fratesi, 2004). The significant land use change, modernisation and intensification of agricultural practices driven by increasing influence of farm development schemes had subsequent impacts on biodiversity and the environment (McLaughlin & Mineau, 1995; Donald et al., 2001; Donald et al., 2006). The impacts of large scale land

improvement on biodiversity are largely unquantified in Ireland (Heritage Council, 1999). However, CAP funded schemes across Europe are recognized to have had major negative environmental impacts on wetlands, marginal grassland and peatlands through widespread drainage, land reclamation, and scrub and hedge clearance (Tilman et al., 2001); the type of land use changes associated with bird population declines (Newton, 2004).

EC Policy change reflected an increased awareness of the negative environmental impacts of agricultural practices and the integration of environmental management in rural development (Commins, 1990; Whatmore, 1990). In 1985 Voluntary EU Environmentally Sensitive Areas (ESA) agri-environment scheme was introduced through Article 19 of the EEC Regulation 797/85 to achieve a combined reduction in agricultural production; increased conservation of natural habitats; while, providing income for farmers (Latacz-Lohmann & Hodge, 2003).

Pressure from countries outside the EC to reduce barriers to food imports; pressure within the EC to reduce the costs of supporting agriculture; and, protection of the environment stimulated the CAP reforms of 1992 (MacSharry CAP Reforms) (Kay, 1998). The MacSharry CAP Reform cut production in beef and arable sectors to restore confidence in trade and budgetary stability (Dillon et al., 2008). As a result farmers with over 15.1ha of arable crops were required to set aside a proportion of land annually in return for compensatory payment (Arable Aid Scheme) (Keeney, 2000). Increased Special Beef Premium and Suckler Cow Premium were to be paid on condition that farmers adhered to stocking density limits to curb intensification and limit beef production. Sheep quotas were also introduced to stem increases in sheep numbers in the EC (Cardwell, 1997).

The increasing concern over the environmental impact of agriculture in Europe led to the introduction of agri-environment schemes (Kleijn & Sutherland, 2003). Agri-environment schemes compensate farmers financially for any loss of income associated with measures that aim to benefit the environment or biodiversity (Baldock et al., 1996). In 1994, Ireland introduced the Rural Environment Protection Scheme (REPS), under Council Regulation 2078/92 and was to run initially for a 5 year period (Emerson & Gillmor, 1999). The stated objectives of the scheme were:

- The establishment of farming practices and production methods which reflect the need for environmental conservation and protection.
- The protection of wildlife habitats and endangered species of flora and fauna.
- The production of quality food in an extensive and environmentally friendly manner.

The REPS programme was open to participants who were farming three or more hectares or one hectare in the case of small scale organic or vegetable produce. The farmer had to include all of the farmed land in the REPS plan. By late 1999, about 43,000 Irish farmers were participating in the scheme covering an area of approximately 1.5 million ha (31% of agricultural land) (Gorman et al., 2001).

CAP – the Agenda 2000

Regulations governing the financing of the CAP provided for the creation of two new funds in 2007, each financing one of the two pillars of the CAP, namely:

- the European Agricultural Fund for Guarantee (EAFG) for Pillar 1
- the European Agricultural Fund for Rural Development (EAFRD) for Pillar 2

These Agenda 2000 reforms which were agreed on March 1999 introduced single Rural Development Regulation, designed to improve and strengthen the economic and social situation of all rural areas (Shucksmith et al., 2005; Swinnen, 2008). All structural measures were combined into a single programming framework. A separate and specific EU rural development policy became operational in 2000 when the CAP was reorganized into two pillars. The CAP's first pillar covers direct payments and market measures and the second CAP pillar covers multi-annual Rural Development Programmes (RDPs) (Henke & Stortis, 2005). The two CAP pillars are complementary.

In June 2003, the Mid-Term Review of Agenda 2000 provided for the full decoupling (removal of the link between the receipt of a direct payment and the production of a specific product) of livestock, milk production and arable crops (Gohin, 2005; Swinnen, 2008). Partial decoupling options were provided for Member States that did not wish to decouple fully. The 2003 reform provided farmers with income stability through a greater market-orientated response to consumer demand (Gorton et al., 2008). Decoupled payments, known as the Single Payment Scheme (SPS) were conditional on the farmers' compliance with a range of environmental, food safety and animal welfare standards.

Under the 2007-2013 rules based on Council Regulation (EC) 1698/2005 on support for rural development from the European Agricultural Fund for Rural Development (EAFRD) of the CAP, farmers received payments for implementing rural development measures including agri-environment schemes.

The single Rural Development Regulation brought progress both on policy content and delivery in a manner which was complementary to Pillar I. The existence of a single fund for rural development EAFRD and a single set of programming, financing, reporting and controls simplified delivery of rural development policy. Rural development policy for 2007 to 2013 was structured along three thematic axes and one horizontal axis:

- Axis 1 - Improving the competitiveness of the agricultural and forestry sector;
- Axis 2 - Improving the environment and the countryside;
    - 80% of expenditure under the RDP comes within this Axis which provides for compensatory payments to farmers who farm in Less Favoured Areas, Natura 2000 payments in respect of designated SACs/SPAs and agri-environment payments under the Rural Environmental Protection Scheme (REPS).
- Axis 3 - The quality of life in rural areas and diversification of the rural economy; and,

- Axis 4 – LEADER ('Liason Entre Actions pour le Development d'lEconomie Rurale') where funding is administered by local companies known as Local Action Groups (LAGs).

The main items of expenditure at end of 2013 under the 2007-2013 RDP included:

- Farm Modernisation – Some €90 million has been spent to date on a range of supports for on farm capital investments;
- Agri-environment schemes – some €2 billion has been spent on schemes such as REPS and AEOS;
- Less Favoured Areas – some €1.44 billion has been spent on the Less Favoured Areas Scheme (also known as the Disadvantaged Areas Scheme).

Measure 213 – Natura 2000 payments and payments linked to Directive 2000/60/EC (Water Framework Directive)

Programmed total public expenditure, 2007-2013 €95,038,738 (of which €53,777,896 EAFRD contribution). Ireland allocated to Measure 213 €528 million (total public expenditure) providing support to approximately 10,900 holdings, corresponding to an agricultural area of 258,473ha; 86% of Ireland's national target for the programming period. The remaining funding was re-allocated to other Axis II measures i.e. Agri-environment and Disadvantaged Area Schemes.

Measure 214 – Agri-environment payments

Agri-environmental instruments are needed to support the sustainable development of rural areas and to respond to society's increasing demand for environmental services. The payments granted under this measure were to encourage farmers and other land managers to serve society as a whole by introducing or continuing to apply agricultural production methods compatible with the protection and improvement of the environment, the landscape and its features, natural resources, the soil and genetic diversity. For the period 2007-2013 €1.919billion total public expenditure has been programmed for Measure 214, out of which €1.116 billion is the EAFRD contribution and €0.803 billion the National/Regional contributions. Measure 214 was the only compulsory measure.

The NPWS Farm Plan Scheme

The NPWS Farm Plan Scheme was launched in 2006 for a term of five years and offered a mechanism for engaging with individual farmers in a joint conservation effort within certain Natura 2000 Sites. The scheme was not a compensation payment for designation, rather an entirely voluntary programme of incentivised mandatory land management prescriptions. Prescriptions were specifically relevant to the qualifying features for which the Natura 2000 Site(s) has been designated. As of the end of 2014, 728 NPWS Farm Plans have been approved. Up to 10% of these plans were audited annually. The NPWS through the Agri–Environment Unit provide conservation guidelines, ensure consistency of approach and administer the scheme. The regional staff of NPWS provided local support and site based advice to planners and farmers.

NPWS Farm Plans contained a description of the designated lands; its habitats and species; commonage (if present) and current farming activity; future management commitments to be upheld by the farmer; and, a calculation of payments to be paid by NPWS. Relevant information on conservation objectives and how these were to be achieved were outlined fully in the plans (for e.g. farming and grazing regimes; habitat management; outputs; and training if required). Cross compliance obligations, such as Nitrates Directive Regulations and GAEC requirements were compulsory for participants of the NPWS Farm Plan.

NPWS Farm Scheme for Pro-active Hen Harrier Habitat Management

The Hen Harrier Farm Plan Scheme (HHFPS) commenced in 2008 with an aim to ensure that appropriate management of grassland, scrub and bog created favourable habitat mosaics for Hen Harrier in SPAs. The management prescription focused on the provision of suitable nest sites and improving the value of farm holdings as foraging resources with retention of important habitats over the period of the plan. Land parcels with permanently improved grasslands (avoided by Hen Harrier) were not eligible for payment. The scheme required inclusion of the entire farm into the scheme, with an option to utilise up to 20% of the farm as permanently improved grassland. Land parcels comprising wet grassland were eligible for payment as rough grassland dominated by rushes provides favourable foraging habitat for Hen Harrier. Management of these habitats focused on maintaining a suitable grazing level that encouraged sward and vegetation deep enough (e.g. ≥40 cm) to provide attractive nesting or roost sites. Appropriate grazing regimes varied from site to site but guideline stocking rates of between 0.25 LU/ hectare and 0.6 LU/ hectare were recommended.

Woody scrub (e.g. Gorse, Willow etc.) is one of the most beneficial habitats in pastoral landscapes for Hen Harriers, providing ideal conditions for prey species (e.g. passerines, small mammals). The plan aimed to retain existing areas of scrub and hedgerow and in open areas where the extent of scrub/ hedgerow was limited, habitat was required to be created or conditions managed to facilitate the expansion of natural woody scrub cover. Habitat enhancement through new hedgerow establishment was typical; however in cases where this measure was not possible, alternative enhancement measures were required to be agreed with NPWS.

The prescriptions for the management of habitats for the Hen Harrier were mandatory and likewise there were certain activities that were not compatible with the Statutory Instruments for designated sites and required NPWS input before proceeding (Actions Requiring Consent (ARCs) (previously Notifiable Actions).

Payments for eligible lands located within Hen Harrier SPAs were previously paid at three rates. The land parcels included in the plan were required to be managed in accordance with the Hen Harrier prescriptions. Payments were made at the following rates:

- Eligible areas up to 40 hectares are paid at a rate of €350 per hectare;

- Eligible areas from 40 hectares to 120 hectares are paid at a rate of €25 per hectare; and,
- Eligible areas in excess of 120 hectares are paid at a rate of €5 per hectare.

The Property Registration Authority; the Land Parcel Identification System (LPIS); and, the Forest Inventory (FIPS) managed by the DAFM were used to identify landowners and land users within Hen Harrier SPAs that could potentially participate in the scheme.
A total of 4,439 notifications were issued to landowners and land users. A total of 378 farm plans were approved for the HHFPS, however more landowners in SPAs could have been eligible for REPS/AEOS payments. Funding mechanisms for the HHFPS did not come from CAP (Figure 4), and all funds were drawn from the Exchequer. Budgetary constraints in 2010 meant that NPWS were unable to accept any further applicants into the HHFPS, however did honour previous FPS agreements. In excess of €13million has been issued by NPWS for the HHFPS up until 2013.

Agricultural Policy & Biodiversity

Most environmental legislation relating to agriculture originates from EU Directives transposed into Irish law. Addressing the threats to biodiversity from agricultural policy and practices, including pressures driving species decline is a key responsibility of DAFM, in co-operation with DAHG through existing EU legislation and policies to protect the environment.

Wildlife Acts 1976-2012

The Wildlife Acts are the principal national legislation providing for the protection and conservation of wildlife in Ireland including the regulation of certain activities that may affect habitats and species, e.g. Wildlife (Amendment) Act 2000.
http://www.irishstatutebook.ie/2000/en/act/pub/0038/index.html

The European Communities (Birds and Natural Habitats) Regulations 2011

The Habitats Directive was originally transposed into Irish law by the European Communities (Natural Habitats) Regulations 1997, which were amended twice (in 1998 and 2005). These regulations have since been superseded by The European Communities (Birds and Natural Habitats) Regulations 2011, which also fully transposes the Birds Directive.
http://www.irishstatutebook.ie/2011/en/si/0477.html

European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011

These regulations (S.I. No. 456 of 2011) provide for a screening and consent system for on-farm activities that may have impacts on the environment.
http://www.irishstatutebook.ie/2011/en/si/0456.html

The EIA (Agriculture) Regulations, implemented by DAFM, apply to three different types of activities; (i) Restructuring of rural land holdings (ii) Commencing to use uncultivated land or semi-natural areas for intensive agriculture (iii) Land drainage works on lands used for agriculture. The Planning and Development Regulations 2011 apply in relation to reclamation, infill or drainage of wetlands. Where a farmer intends to undertake any of these activities and

the proposed works exceed certain thresholds for screening set out in the Regulations the farmer must make an application to DAFM for screening giving details of the works (or to the local planning authority in the case of drainage of wetlands). Where any such activities are proposed in Natura 2000 sites (e.g. Hen Harrier SPAs) the National Parks and Wildlife Service are consulted as part of the screening process, thus any potentially sensitive activities negatively impacting on Natura 2000 sites can be identified, with the relevant concerns factored into the decision.

Land Eligibility & Cross Compliance

To receive a payment under the Basic Payment Scheme participants must follow environmental regulations, and obligations to public health, animal health, plant health, animal welfare and land maintenance. This system is known as Cross Compliance. These regulations are called Statutory Management Requirements (SMRs) and are concomitant with EU legislation Directives and Regulations (including the EU Birds and Habitats Directives) http://www.agriculture.gov.ie/farmerschemespayments/crosscompliance/statutorymanagementrequirementssmrs/

Under the Single Farm Payment system, now replaced by the Basic payment system from 2015 onwards, all agricultural land applied on by an applicant must be farmed in compliance with the Good Agricultural and Environmental Condition (GAEC) standards. The land characteristics of each hectare must be maintained in a state eligible to draw payment by the applicant. An agricultural activity is the production, rearing or growing of agricultural products including harvesting, milking, breeding animals and keeping animals for farming purposes or such actions as are required in maintaining the land in an eligible state each year, which may be achieved by mowing or topping. Areas not eligible for payment include: land under dwelling houses and gardens, farm buildings; yards, roadways; recreational areas; or land not being farmed or fenced-off to exclude livestock. All ineligible areas must also be deducted from the payment area, and red lined out or excluded on the BPS mapping system. Invading scrub must be controlled annually under the GAEC requirements to prevent them spreading into agricultural areas. EU legislation now provides for a pro-rata system to determine the payable area of parcels where areas with reductions exist within the parcels. The system will be applaied by DAFM to determine a payable area for each parcel being claimed. Where up to 10% scattered ineligible features (e.g. scrub, gorse) present in a parcel no reduction is required (see http://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/basicpaymentscheme/LandEligibility2015Booklet010515.pdf).

Hedgerows, drains and ditches are designated as landscape features and thus protected under the GAEC provisions, and are included as part of the payment area. Hedgerows cannot be removed between 1 March and 31 August pursuant to the Wildlife Act 1976 (as amended 2000). In the case of land designated as SAC or SPA, hedgerows or drains cannot be removed without the prior approval of the National Parks and Wildlife Service http://www.npws.ie/faq/natura2000

Certain types of marginal lands, which may include both privately owned and commonage land, can sometimes present eligibility issues. While grass and heather are normally the dominant species on such lands, difficulties can arise where areas of bracken and rushes have become the dominant species through a combination of inherent site specific constraints and insufficient grazing practices. This leads to consequential reductions in the area eligible for payment (see above weblink to Eligibility booklet).

In March 2013, the European Commission clarified the meaning of "permanent pasture" as it applies to the new Basic Payment Scheme (or continuation of the Single Area Payment Scheme). Under Article 4 (1)(h) of Regulation (EU) No. 1307/2013, "permanent grassland and permanent pasture" includes "… land used to grow grasses or other herbaceous forage naturally …" It could include, where Member States so decided, "land which can be grazed and which forms part of established local practices where grasses and other herbaceous forage are traditionally not predominant in grazing areas." Under Article 7(b) of the supplemented regulation to No. 1307/2013 (11.3.2014, C(2014) 1476 final), "established local practices" include "practices which are important for the conservation of habitat covered by Directive 2009/147/EC of the European Parliament and of the Council [i.e. the Birds Directive]."

The Rural Development Programme 2007 – 2013

Total public expenditure on the agri-food sector by the DAFM was approximately €2.4 billion in 2013. DAFM payments to farmers in 2013 totaled €1.8 billion, including Single Farm Payments, Rural Development, Structural and Agricultural payments. The 2014 scheme year was the last year in which the then Single Payment Scheme was applied and entitlements expired on the 31 December 2014. The Single Payment Scheme is being replaced by new set of entitlements in 2015 to those eligible for an allocation under the Basic Payment Scheme.

In December 2013, the EU enacted the reformed Common Agricultural Policy (CAP) for 2014–2020, allocating almost 40% of the EU's budget and influencing management of half of its terrestrial area. From 2015 there will be some compulsory payments: a new Basic Payment Scheme (or continuation of the Single Area Payment Scheme), a 'greening' payment and an additional payment for young farmers.

Ireland's Rural Development Programme 2007-2013 featured three highly successful and popular measures, namely; Measure 121 the Less Favoured Areas Scheme (LFAs), Measure 214 the Rural Environment Protection scheme (REPS) and Measure 213 Natura 2000 linked to the REPS scheme. DAFM can choose to offer two additional components of direct payments, to farmers with land in Natura 2000 sites, and coupled payment to environmentally, economically or socially important types of farming that are facing difficulties. As an alternative to all these payments a much simpler direct payment scheme can be set up specifically for small farmers.

The 'green payment' for agricultural practices beneficial to climate change and the environment comprises three measures with which most farmers entitled to Pillar 1 direct payments must comply: maintenance of permanent grasslands, and (in relation to arable

land) crop diversification and Ecological Focus Areas (EFA). Farmers in Natura 2000 areas will only have to implement the greening practices that are deemed to be compatible with Natura 2000 objectives. Member States (or regions) must allocate 30 percent of their budget for Pillar 1 direct payments to this new 'green payment'. To protect permanent grasslands within Natura 2000 areas Member States must designate environmentally sensitive grasslands which need protection, including those on peat and wetlands. For farmers in these areas the 'greening' requirement is to not convert or plough the grassland. Member States can choose to apply similar designations and protection to other environmentally important grasslands outside Natura 2000 areas. The requirement at the national level is the maintenance of the ratio of permanent grassland to the total agricultural area (compared to the reference year of 2012) and it must not fall by more than 5% as per Article 45 Regulation No.1307 of 2013 (DAFM, 2015a).

The Rural Development Programme 2014 – 2020

The Basic Payment Scheme is operated on the basis of payment entitlements allocated to farmers in the first year of application of the scheme and activated each year by farmers. Eligibility for the Basic Payment Scheme is a precondition for farmers to receive other direct payments such as the green direct payment, the redistributive payment, the payment for areas with natural or other specific constraint and the payment for young farmers.

The agreement on the Multiannual Financial Framework (MFF) provides for a total allocation of €2.19bn over 7 years or €313 million per year to Ireland under Pillar 2 of the CAP for a new Rural Development Programme (RDP) for the period 2014-2020. This must be co-funded by the Exchequer. EU co-funding rates vary from 53% to 100% for different measures under the RDP. Support for the new RDP, 2014-2020 will be co-funded by the European Union via EAFRD and the national Exchequer. While an EU allocation of €2.19 billion is available to Ireland, €2.037 billion of this is allocated to measures to be delivered via the DAFM. The remaining €153 million of the EU funding is allocated to the Department of the Environment, Community and Local Government (DECLG) for the delivery of measures via the LEADER mechanism. The new RDP moves away from the Axes structure, and is instead based on six priority areas for rural development. These priority areas are:

1. Fostering knowledge transfer and innovation
2. Enhancing competitiveness
3. Promoting food chain organisation and risk management in agriculture
4. Restoring, preserving and enhancing ecosystems
5. Promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy
6. Promoting social inclusion poverty reduction and economic development in rural areas

G.L.A.S. (Green Low-Carbon Agri-Environment Scheme)

GLAS specifications were published on the 14th of April 2015 (DAFM, 2015b). GLAS adopts an integrated approach to achieving objectives under Articles 28 and 30 of the Rural

Development Regulation and ties in with the green vision for Irish agriculture as contained in Food Harvest 2020 and as promoted by Bord Bia in the Origin Green campaign. The inclusion of an agri-environment climate measure is compulsory under the Rural Development Regulation.

To contribute to the mitigation of the environmental impacts of Food Harvest 2020, GLAS will aim to deliver overarching benefits in terms of the rural environment whilst addressing the issues of climate change mitigation, water quality and the preservation of priority habitats and species. GLAS aims to work within the framework for environmental sustainability as set down by the following EU Directives and national and international targets:

- The EU Climate Change and Renewable Energy Package and the Kyoto Protocol.
- The Water Framework Directive, the Groundwater Directive and the Nitrates Directive
- The Habitats Directive, the Birds Directive and the European target of halting the loss of biodiversity by 2020.

GLAS is based on tiered entry requirements. Tier 1 Priority will be given to farmers who choose at least one action from a priority list of prescriptions in order to join the scheme. Actions for upland conservation will require that farmers farm to a single commonage framework plan. A selection process will determine the entry order for all tiers where necessary. It is currently proposed that a maximum payment of €5,000 would apply, with the scheme building up to the inclusion of some 50,000 farmers. An additional GLAS+ ceiling of up to €2000 is in place for a limited number of farmers who take on particularly challenging actions which deliver an exceptional level of environmental benefit. Farmers with one of the seven priority bird actions, which include the Hen Harrier action, as well as farmers with more than one priority environmental asset may be eligible for this additional celling. These farmers can choose additional actions from the Priority list and/or the General list to achieve maximum payment of €7,000.

Planners will be required to advise farmers to select actions most suitable for their farms and which deliver the greatest environmental dividend. More precise targeting of the scheme through the use of selection criteria may be needed in the event that the scheme's budget is over-subscribed.

Where required, selection of beneficiaries will be based on a scoring matrix, based on achieving best environmental return. The principles to be followed will include:

- Inherent environmental value of the actions chosen
- Relative environmental value of the actions to any notified themes
- Complementarity of the actions with each other
- Targeting existing environmental needs/potential of the farm
- Achieving regional balance, taking account of existing intake
- Achieving balance in holding size, taking account of existing intake
- Achieving balance in operational direction of participating holdings

The relative scoring may change from tranche to tranche, to ensure the best mix of projects overall. The process will be transparent, notified in advance of any tranche, identifying the

required 'pass-mark' and ranking all eligible projects thereafter. Selection criteria will always be applied to candidates seeking to join GLAS via Tier 3, and may also be applied to candidates in Tier 1(b), and Tier 2.

Hen Harrier GLAS

Table 1 shows the Hen Harrier GLAS prescriptions issued by DAFM to agricultural planners and consultants on 14th April 2015 (DAFM, 2015b). This is a mandatory action for applicants having owned or leased parcels within one of the six Hen Harrier SPAs as well as certain identified important non-designated breeding areas. GLAS prescriptions aim to balance the needs of farm production and viability while improving and increasing the extent and quality of habitats that optimise nest site availability and prey species density for the benefit and conservation of the Hen Harrier.

Table 1. Requirements under the DAFM Hen Harrier GLAS Scheme 2015.

1.	Produce a suitable sward. This may include heather and/or scrub where that is currently and continues to be eligible for payment, under the Basic Payment Scheme. This heather and/or scrub must continue to be managed appropriately to optimise structural diversity for the benefit of the Hen Harrier in the parcel or field
2.	The action can be delivered on full or split LPIS parcel(s). Where the action is on a split parcel, it must be digitised out and marked on the map submitted. Parcels must be fenced and stockproof from the commencement date of the GLAS contract.
3.	Traditional grazing practices that promote and maintain the development of tall and tussock vegetation (>10cm high) throughout the parcel must be undertaken. The parcel(s) cannot be grazed intensively by sheep.
4.	Maximum chemical nitrogen usage is 40 kg N per ha per annum on parcels in receipt of the GLAS Hen Harrier Payment
5.	Noxious and invasive weeds must be controlled by spot spraying or mechanically.
6.	Parcels with rush cover are valuable to the Hen Harrier. Therefore where rushes are present within a Hen Harrier parcel and grazing does not prevent them exceeding approximately 70% of the area of the parcel, they must be cut rotationally by cutting no more than 50% of the area of rushes in a parcel on an annual basis.
7.	Hedgerows on Hen Harrier parcels cannot be cut between 1st March and the 1st October.

Other relevant complementary measures can be selected with the Hen Harrier action, including:

- Farmland Habitat (Private Natura) which sets stocking levels that avoid eutrophication, overgrazing, undergrazing and erosion; and

- Laying of Hedgerows action to rejuvenate overgrown hedgerows, increase biodiversity.

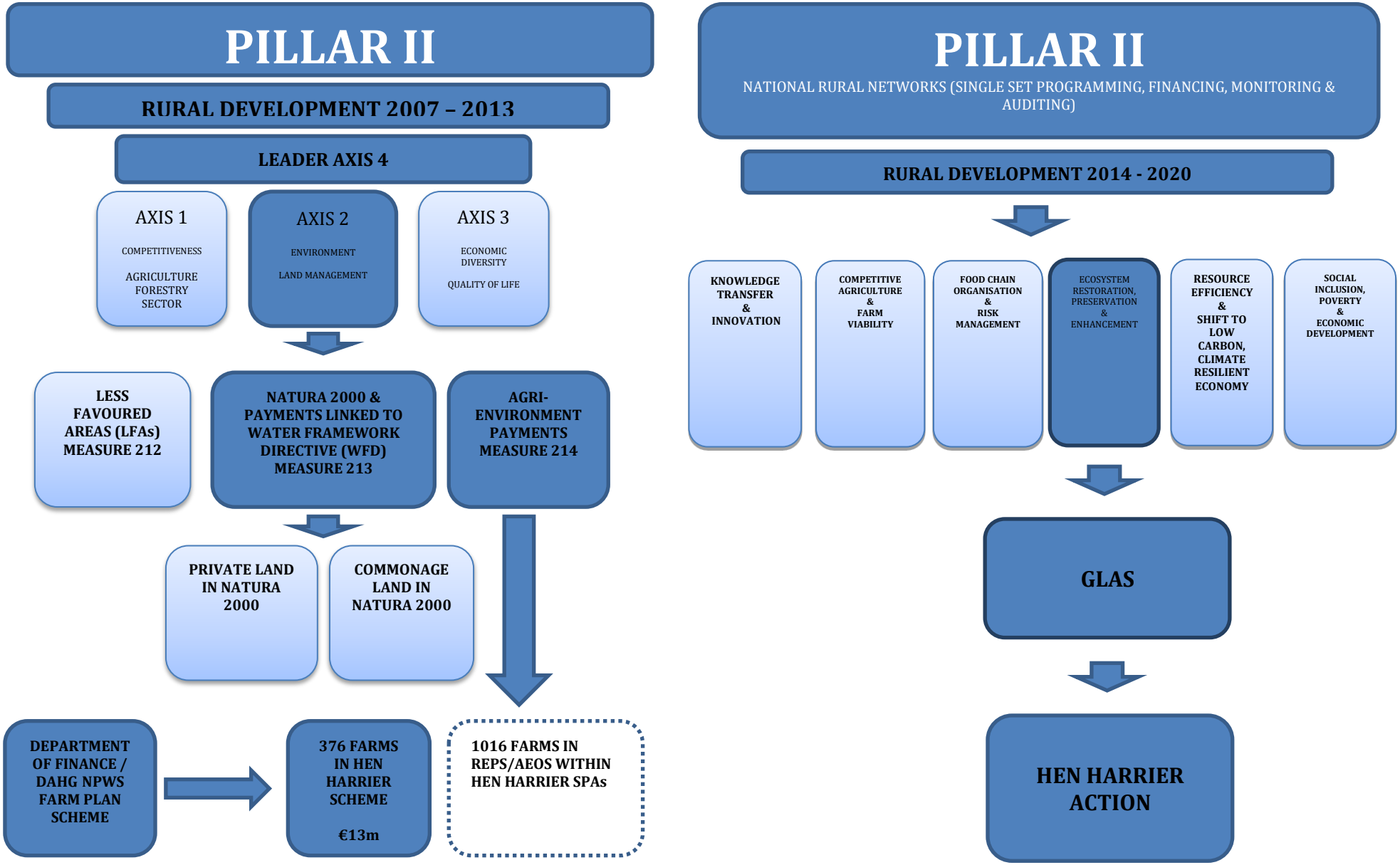

Figure 4. EAFRD Framework and relevant funding mechanisms for Hen Harrier Conservation in previous and current RDPs

Recent Agricultural and Rural Socio-economic Dynamics in Ireland

Despite CAP reforms increasingly developing new measures to address wider environmental issues borne from agricultural intensification, conversely, land abandonment in response to CAP has become a widespread problem in Europe over the last 20 years (Sua´rez-Seoane et al. 2002; Sirami et al. 2008). Small and medium sized enterprises (SME) make up 92% of businesses driving the rural economy in Ireland (CEDAR, 2013b). The 2012 National Farm Survey (NFS) undertaken by Teagasc estimated that average farm income (excluding off-farm income) decreased by 15% and that 50% farm holders had an off-farm job, down from 51% in 2011 (DAFM, 2014). The economic downturn in Ireland in recent years has resulted in an increase in rural unemployment by 192% compared to those rates in urban areas of 114%. Employment in rural areas remains concentrated in sectors that continue to decline (CEDRA, 2013b). The commercialization of agricultural practices through CAP has been directed towards increasing productivity on more fertile and accessible land. Subsequently, this has led to a decline in traditional farming practices on marginal land. The socio-economic, agricultural and environmental consequences of land abandonment are complex and unpredictable, however generally are considered to have undesirable environmental effects (MacDonald et al., 2000).

CHAPTER 2 INTERACTIONS OF AGRICULTURAL RELATED ACTIVITIES & THE HEN HARRIER IN IRELAND

Introduction

This chapter deals with the potential interactions between agricultural related activities and the Hen Harrier in Ireland. It aims to provide an overview of such interactions on both the breeding and non-breeding aspects of the Irish Hen Harrier population and for areas within and outside of the SPA Network. This review is based on scientific publications and reports, the majority of which are from peer reviewed sources.

Nesting Habitat

There is no precise historical estimate of Ireland's total breeding population during the early 1950s. However it is considered that the population was at historically low levels with regard to numbers and breeding distribution. Before the onset of extensive afforestation in Ireland during the 1950s the Hen Harrier would have traditionally nested in open heather moorland and scrub. As a result of the afforestation programme from the 1950s onwards and the marked increase in the national sheep and cattle herd since Ireland joined the EEC/EU in 1973 much of the marginal and upland areas, including those areas important for breeding Hen Harrier, have been increasingly afforested (see NPWS Foresty Review) and overgrazed (ECJ, 2002). Currently, 11% of Ireland's land area is managed for forestry, however the breeding Hen Harrier SPA network (which makes up *c.*2% of the Ireland's land cover) currently comprises *c.*52.3% forest (Moran & Wilson-Parr, 2015). The breeding Hen Harrier population in Ireland has increasingly shifted from open moorland habitats to selecting early pre-thicket plantation forest growth stages for nesting, particularly second rotation pre-thicket as shown from the national surveys (Norriss et al., 2002; Barton et al., 2006; Wilson et al., 2009; Ruddock et al., 2012). The selection of pre-thicket forest habitat is likely to be a response to increased availability of deep cover that develops within fenced plantation blocks in the absence of grazing pressure during the first ten or twelve years of forest growth (Madders, 2000; 2003; O'Donoghue, 2004). O'Donoghue, (2010) found that three main habitat categories were used by Hen Harriers for nesting, notably restock forest (46.7%), heather/bog (29.9%), and scrub (23.4%). Habitat analysis on data collected as part of the 2010 national survey also found that even in heavily forested upland areas heather cover (heath/bog; 23%) and scrub (8%) were still important habitats for nesting Hen Harrier (Ruddock et al., 2012). Hen Harrier will also often nest in rides (typically in heather) between forest plantation blocks or in open lacunas within mature plantations where there is a suitable dense growth of mature heather or scrub (Ruddock et al., 2012).

In Ireland, Irwin et al. (2012) analysed the foraging behaviour and breeding success of Hen Harriers in heavily forested landscapes and noted that Hen Harrier actively avoid improved agricultural grassland for foraging and nesting. Other studies have shown that agricultural land classes comprising cereals, fodder and root crops are associated with an absence of breeding Hen Harrier (Fielding et al., 2011; Sim et al., 2001; 2007; Ruddock et al., 2012). In continental Europe, Hen Harriers have been recorded breeding in cereal fields (Garcia &

Arroyo, 2001; Millon et al., 2002), however the difference in breeding habitat selection between continental Europe and Ireland is likely a result of the absence of the common vole *Microtus arvalis* in Ireland but which can occur at high densities in agricultural areas in Europe (Anderson et al., 2009; Koks et al., 2007; Salamolard et al., 2000).

Foraging habitat during the breeding season

As described above, Hen Harriers in Ireland show a preference for nesting in pre-thicket forest habitats (Barton et al., 2006; Wilson et al., 2009) and can forage in pre-thicket until forest canopy closure. A number of studies show that more permanent and stable habitats such as heath bog and low intensity grazed farmland (rough grassland) with well-established hedgerows and areas of scrub are the main open non-forest habitats used by foraging Hen Harriers within their breeding range (Irwin et al., 2012; O'Donoghue, 2012).

There is substantial Irish based evidence that shows even in Ireland's heavily forested upland landscapes both moorland habitats and low intensity managed grasslands are important for foraging Hen Harrier, for example:

- Barton et al. (2006) analysed observations of foraging Hen Harrier recorded during the 2005 survey and found heath/bog had the highest selection ratio and was the preferred habitat for hunting. Pre-thicket forest and scrub were important habitats with rough grassland having a lower selection ratio. Improved grassland had the lowest frequency of use by Hen Harrier;
- Ruddock et al. (2012) found that 49% of foraging events observed by surveyors recorded as part of the 2010 survey were associated with moorland, acid grassland, rough grassland and scrub;
- O'Donoghue, (2012) recorded habitat use from observed hunting events in the Duhallow region of north County Cork and east County Kerry. Scrub/hedge was the habitat category that Hen Harriers were most commonly seen hunting in (25%). Use of habitats associated with some level of agricultural practice in descending order were moorland (23%) and rough grassland (11%). Pre- thicket forest (both first and second rotation) together formed 25% of the foraging observations. Intensively managed grassland and mature forest were habitats rarely used by foraging Hen Harrier in the study comprising less than 2% of observations; and
- based on an analysis of foraging spatial data derived from the remote tracking of three individuals from one study site (The Ballyhouras of south-east County Limerick and north-east County Cork) Irwin et al. (2012) found that *c*.35% of hunting tracks were in non-forest open habitats by foraging birds. The greater availability of the forest habitats in the study areas around the nest sites in this study may have influenced the frequency of habitats used for foraging.

Heath / Bog & Mosaics of Wet and Acid Grassland

Hen Harriers select areas with mosaics of heather and rough grass which contain high densities of both Meadow Pipits and small mammals for foraging (Smith et al., 2001; Vanhinsbergh & Chamberlain, 2001; Palmer, 2002; Amar and Redpath, 2005; Pearce-Higgins & Grant, 2006; Wheeler, 2008); both important prey species for Hen Harrier during the breeding season (Redpath et al., 2002; Robinson, 2010; O'Donoghue, 2010; Arroyo et al., 2014). In a study of Hen Harrier in Northern Ireland, Robinson, (2010) found that the availability of Meadow Pipits within foraging habitats was found to strongly increase the probability of Hen Harrier breeding success and the number of chicks fledged.

Male Hen Harriers in Orkney, Scotland showed a preference for hunting on rough grassland (Amar et al. 2008). This study also recorded a significant positive association between the proportion of rough grassland surrounding a nesting area and productivity. In Ireland the Hen Harrier diet is more restricted than that of birds in Britain due to the absence and sparse distribution of some small Irish mammal prey species (O'Donoghue, 2010) therefore comparisons between Ireland and elsewhere need to be undertaken with caution.

Hedgerows& Linear Features

Hen Harriers foraging in modified marginal pastoral landscapes show preferences for foraging along intact, dense structured hedgerows preferably/particularly between three and four metres wide (Irwin et al., 2012). Taller, wider hedgerows support a greater diversity and abundance of birds and provide greater nest security against avian predators such as the Hen Harrier. A dense vegetation cover at and around hedgerow bases increases bird diversity and abundance by providing a combination of nest sites and increased abundance, availability and accessibility of invertebrate food sources. Hedgerow and linear features in modified agricultural landscapes are distinct from the foraging value of open mosaics of heath and grasslands to the Hen Harrier as they support different assemblages of prey species, (e.g. finches and buntings) while Skylarks and other species, for instance will avoid areas with a high density of hedgerows and trees (Wilson et al. 1997).

Roosting Habitat

Hen Harrier frequent roost sites outside the breeding season for shelter, as a prey resource and for social function (Watson, 1977; Clarke & Watson, 1990; O'Donoghue, 2010). Roosts serve as bases for the Hen Harriers to radiate out and forage in the local landscape (O'Donoghue, 2010). Currently two SPAs are listed for non-breeding Hen Harrier and based on the published data available the majority of the known roost sites occur outside of the SPA Network (see O Donoghue, 2010). O'Donoghue (2010) notes that the single most popular roosting habitat type is reedbed. He further notes that the habitats around the roosts were often mixed mosaics and it was not uncommon to have a combination of heath/bog, rank grassland and Bracken grouped together. Based on provisional analyses on the most up-to-date data available on wintering Hen Harrier agricultural habitats comprise the dominant land use at 43% of known roosts (n= 109) (B. O'Donoghue, pers comm).

Foraging habitat during the non-breeding season

The non-breeding period comprises the majority of the Hen Harrier's annual cycle (approximately mid-August to mid-March). There is generally a marked separation between the upland breeding areas (majority of nests recorded between 150m asl – 250m asl) and the lowland wintering regions selected by Hen Harrier in Ireland (<100m asl) (O'Donoghue, 2010). Satellite tracking studies of Hen Harrier in Ireland and Britain show that in the non-breeding season individuals can forage up to 20km or more from roost sites selecting both lowland farmland and upland habitats in which to forage (B. O'Donoghue, pers comm; S. Murphy pers comm).

Passerine bird species were identified to be far the most frequently recorded prey item in the winter diet of Hen Harriers in Ireland (O'Donoghue, 2004; 2010). However the diet did vary geographically with more wading birds and small mammals recorded in Hen Harrier diet associated with the lowlands of southern and eastern areas (O'Donoghue 2010). Although studies examining foraging habitat preferences of Hen Harriers in Ireland in winter are limited, tillage and stubble fields are considered important winter farmland habitats for Hen Harrier (O'Donoghue, 2010). Improved grassland appears to be a sub-optimal habitat for many of the granivourous farmland prey bird species (McMahon & Whelan, 2005; McMahon et al., 2013). Therefore it is likely that intensively managed grasslands, which is actively avoided by foraging Hen Harrier during breeding season, does not constitute a feeding resource during the non-breeding period.

Agricultural Related Activities

Newton (2004) distinguished the main agricultural land use changes in Britain (however considered applicable to the same bird species in Ireland) driving bird population declines into four main categories, each affecting a wide range of species: (1) weed-control, mainly through herbicide use; (2) the change from spring-sown to autumn-sown cereal varieties, and the associated earlier ploughing of stubbles and earlier crop growth; (3) land drainage and associated intensification of grassland management; and (4) increased stocking densities, mainly of cattle in the lowlands and sheep in the uplands. An extensive body of research is available that provides evidence of how these changes have reduced the amounts of habitat and/or food available to many species associated with agricultural systems across Europe (Chamberlain et al., 2000; Donald et al., 2001; Robinson & Sutherland, 2002; Donald et al., 2006). Other activities, such as use of pesticides and herbicides; the removal of hedgerows; 'rough patches' can affect a wide range species (Newton, 2004).

Based on Newton's (2004) work the following agricultural pressures are considered to be of most relevance to the ecology and conservation of the Hen Harrier in Ireland.

Changing patterns of cereal farming in Ireland

Crop stubbles rich in waste grain and seeding weeds support high densities of granivourous birds (Hancock & Wilson, 2003; McMahon, 2005). Changes in the annual cycle of management of tillage (preparation of soil by mechanical agitation of various types, such as digging,

stirring, and overturning) crops can have dramatic negative effects on their value for farmland bird species (Siriwardena & Stevens, 2004; McMahon, 2005). Winter cereals are harvested as early as late summer (barley and wheat) with modern harvesting techniques which leave little spilled seed resources for farmland birds persisting into autumn and winter. Fields may be ploughed and new seedbeds prepared within days of harvesting, with no period of stubble as a valuable food source for granivourous bird species. Post harvest spraying of stubbles with herbicides can also reduce the availability of any weed seed that remains (Bright et al, 2008).

Replacement of spring-sown cereals with winter-sown varieties and the consequent loss in extent of winter stubbles have been implicated in reduced winter survival and the decline of granivourous farmland bird species (Donald, 1997; Taylor & O'Halloran, 2002). Changes in crop cycles have been considered to be a major factor driving declines in farmland birds in several British studies (Siriwardena et al. 1998b; Peach et al. 1999) and have the potential to affect predatory species that hunt on farmland (Amar & Redpath, 2005).

Reclamation of Open Habitats (Unenclosed)

Agricultural reclamation usually results in the total elimination of existing open habitats or scrub vegetation for improved grazing or cultivation. The process of reclamation typically involves drainage, vegetation, re-seeding and fertilisation. Butet & Leroux (2001) showed that conversion of extensive wet grasslands to intensively managed and drained agricultural land in western France reduced the nesting population of Montagu's Harrier (*Circus pygargus*) due to decreased availability of small mammals, the birds main prey species.

Agricultural improvement of enclosed grasslands

The improvement of enclosed grassland typically involves the sowing of preferred ryegrasses and clovers as forage for grazing stock. Intensive management of the land maintains the established sward for productive grazing with higher stocking levels obtained through drainage, the use of herbicides and application of fertiliser. There are three main mechanisms by which agricultural improvement has effected bird species: (1) change from single cut hay to multiple cut silage management on nesting grassland birds (Green et al., 1997; Vickery et al., 2001; Donald, 2004; Brown & Grice, 2005); (2) drainage and changes in grazing management on wading birds (Green, 1988; Kruk et al., 1996; Hart et al., 2002; Wilson et al., 2005); and, (3) combined effects of agricultural intensification on the food supply of nesting farmland birds (Wilson et al., 1999; Vickery et al., 2001; McCracken & Tallowin, 2004).

Land management influences the abundance, quality and distribution of food resources (Brotons et al., 2005). Constantini et al., (2014) suggests top predators, such as birds of prey, may be particularly vulnerable to current changes in agricultural practices. A number of studies have shown that agricultural intensification can negatively impact on the quality of foraging patches and thereby limiting food availability for raptors, leading to reduced breeding success (Donazar et al., 1993; Valkama et al., 1995; Catry et al., 2012). Intensively grazed areas support lower densities of Skylark (Wakeham-Dawson et al., 1998) and Meadow Pipits (Evans et al., 2005b; 2006) and so loss of habitat heterogeneity and limited food

supplies can similarly explain why Hen Harriers in Ireland avoid improved grasslands (Irwin et al., 2012).

Upland Grazing

Livestock grazing is a major driver of ecosystem change and has been associated with significant declines in various bird species worldwide (Fuller & Gough, 1997a; 1997b; Pain & Pienkowski, 1997; Fuller 2000; Newton, 2004; Martin et al., 2005). Studies have shown that both over and under grazing adversely affect upland biodiversity (Grime, 1973, and, 1979; Ball et al., 1982; Grant & Armstrong, 1993; White & Wadsworth, 1994; Thompson et al., 1995; Hester, 1996;; Kramm et al., 2010; Anderson, 2012).

Over and under grazing are the dominant land pressures reported in an assessment of habitats in Ireland, as part of the EU Habitats Directive (NPWS, 2008; and, 2013b). Prolonged and increased sheep grazing in moorland dominated by heather can result in long term habitat loss (Anderson & Yalden, 1981; Bleasdale & Sheehy Skeffington, 1995; Fuller & Gough, 1997a; and, 1997b). Livestock grazing alters habitat structure and the suitability of vegetation for ground nesting and feeding birds (Vickery et al., 2001; McCracken & Tallowin, 2004). Habitats with a complex vegetation structure, as a result of herbivore grazing, can support a higher diversity of bird species (Martin & Possingham, 2005). Change to intensive grazing regimes can lead to the disappearance or degradation of the structurally diverse heath/bog and grassland mosaics that support nesting and foraging Hen Harrier (Amar & Redpath 2005; Amar et al., 2008; Haworth & Fielding, 2002).

Hen Harrier actively avoid managed grasslands with heavy grazing pressure (Irwin et al., 2012). However Hen Harrier have been shown to re-occupy areas were sheep have been removed (Haworth & Fielding, 2002). Reduced prey availability is related to grazing pressure. Amar et al. (2010) showed that a doubling in sheep numbers between the early 1980s and the late 1990s on Orkney was negatively correlated to Hen Harrier productivity which subsequently led to a population decline.

Scrub clearance & Agricultural burning

Scrub mosaics can support many bird species of conservation concern (Birdwatch Ireland, 2011). Scrub and the dense ground vegetation that develops within and around its base is an important foraging and nesting habitat for Hen Harrier in Ireland (O'Donoghue, 2010) and throughout the species range (Watson, 1977; Klaassen et al., 2006; Sim et al., 2007; Klaassen et al., 2007; Massey et al., 2008). Irish Hen Harriers have a propensity towards nesting in Bramble (*Rubus fruticosus*), particularly in scrub and restock forest, however Heather, Rush, Gorse and Bracken were recorded frequently within 2m of nests (O'Donoghue, 2010).

Anderson (2013) in a study on the effects of grazing management on breeding bird assemblages in Iveragh Peninsula, County Kerry found scrub cover had a positive effect on bird density until the proportion of scrub per farm reached 16%, after which bird density began to decline again. Similar findings have been clearly shown by Nikolov (2010) who found scrubland cover increased bird diversity within pastures, and that the maintenance of

habitat complexity can be achieved with the inclusion of approximately 15% scrubland cover in grazed farmland.

Prescribed agricultural burning in unenclosed lands (managed or controlled burns) is the deliberate burning of vegetation to create large areas of more palatable regenerating foliage for improved livestock grazing (Worrall et al., 2010) and forage productivity (Lance, 1983). Adverse effects on the main summer prey species for Hen Harrier, such as the Meadow Pipit (Smith *et al*. 2001) and other bird species (Tharme *et al*. 2001) arise from burning. Ruddock et al. (2012) showed that burning was the most frequent type of disturbance and/or suspected reason for nest failure reported by fieldworkers at Hen Harrier territories during the national survey undertaken in 2010.

In upland terrain where access to mechanical machinery for scrub removal is limited, burning is often used as a way to break up areas of closed over scrub and fire regimes are often applied as a management method of improving structural diversity in moorland landscapes (Davies, 2005; Vandvik et al., 2005; Davies et al., 2006; 2008). Despite the positive habitat management applications of contained burning; uncontrolled and illegal fires, particularly in spring (March –April) can potentially damage large areas of scrub; peatland habitats (blanket bog, raised bog or heath); and, pre-thicket forest supporting nesting and foraging Hen Harrier (O'Donoghue, 2010; Ruddock et al., 2012). Poorly planned or executed burning can cause long-term damage and negative impacts on vegetation, invertebrates, soil structure and hydrology, water quality and carbon storage (Tucker, 2003).

In Ireland burning is controlled by legislation. The Wildlife Acts prohibit the cutting, grubbing, burning or destruction of vegetation growing on uncultivated land or in hedges or ditches from 1st March to 31st August during the nesting and breeding season for birds and wildlife. The Minister for Arts, Heritage and the Gaeltacht is currently undertaking a review of the legislative controls set out in Section 40 of the Wildlife Acts 1976 to 2012, governing the control of burning and hedge cutting.

The cumulative negative impacts of overgrazing and burning are considered the most extensive and ecologically important management activity undertaken in upland peatlands (Yallop et al., 2006; Worrall et al., 2007; Holden et al., 2007).

Hedgerow & Linear Features

Hedgerows provide important habitat for nesting farmland passerines (Pollard, 1974; Arnold, 1983) and increase the functional connectivity of pastoral rural landscapes (Burel, 1996). The amalgamation of small fields into larger units more suitable for larger machinery and more intensive agricultural use has resulted in a decline of field margins in hedgerows and ditches over the last 50 years in the UK (Barr et al., 2003), this is also likely the case in Ireland.

Under the Wildlife Acts, hedgerows may not be cut during the period from 1st March to 31st August each year, coinciding with the bird-nesting season. However, there are some exceptions to this law such as: the removal or cutting of hedgerows during routine agriculture

or forestry practices; for public safety (such as roadside hedges); for the maintenance of watercourses (for fisheries); and, for development of land (such as building houses).

Direct disturbance

Disturbance at the nest site during the breeding season

Adult Hen Harriers begin to occupy breeding areas in the uplands during March with a view to pair bond and initiate a nest. In a two year study O'Donoghue (2010) recorded that the date of eggs were laid as early as the 16th of April and as late as the 10th of June with the median occurring in the first week of May. Incubation per egg is estimated to last 29 – 31 days (del Hoyo et al., 1992). O'Donoghue (2010) noted that the date when chicks fledged ranged from the 18-24th of June to the week of 6-12th of August with the fledging peak occurring during the 9th to the 22nd of July.

A disturbance event which causes the incubating female to flee the nest or which deters the return of provisioning parents can expose eggs and chicks to cold, rain or lack of food (Hamerstrom, 1969; Scharf & Balfour, 1971; Picozzi, 1980). Mammalian predators may follow tracks in vegetation and respond to human scent along trails (Whelan et al., 1994) and may be attracted to nests by visual cues such as presence of humans, trampling of vegetation, increased activity of parent birds in response to disturbance events and by olfactory cues (Skagen et al., 1999). Documented losses of ground nests caused by trampling are known from studies of grassland waders and are correlated to overall densities of sheep and cattle (Beintema & Muskens 1987; Green 1988; Shrubb, 1990). Trampling by livestock can therefore potentially result in losses of Hen Harrier nests; however there is no documented evidence of this in Ireland.

Disturbance at the roost site during the non-breeding season

Agricultural related activities that can cause direct disturbance to the roosting birds and their roosting habitat include: (1) Land reclamation and associated drainage (including scrub clearance) and (2) changes in grazing intensity which could lead to a change in vegetation structure and on its suitability as a roost site.

Land Eligibility & Cross Compliance

The loss of habitats for wild birds is a concern already highlighted by the European Court of Justice in a ruling against Ireland (European Court of Justice ruling in case C-418/04: Commission v. Ireland). One of the reasons put forward for the clearance of scrub habitats was the eligibility requirements to receive subsidy payments through the Common Agricultural Policy and the need to maintain land as "utilisable agricultural area" (see Chapter 1). In order to maintain the land in good agricultural and ecological condition (GAEC), stakeholders are obligated to remove expanding shrub vegetation from constantly used pastures. In some cases, failure to exclude scrub from lands in production could result in farmers being penalized after submitting a claim for subsidy payments.

EU legislation now provides for a pro-rata system to determine the payable area of parcels where areas with reductions exist within the parcels i.e. for scrub. This system will be applied by the Department of Agriculture to determine the payable area for each parcel being claimed. Where up to 10% scattered ineligible features present on a parcel no reduction is required. Furthermore, where areas have become ineligible and this is due to compliance with SPA or SAC management requirements or ecological objectives or the requirements of the Water Framework Directive, these areas will continue to be eligible for payment provided that:

- the newly ineligible area was due to compliance with SPA, SAC or WFD requirements/objectives;
- the area in question was declared on a 2008 SPS application form;
- the area was declared as eligible to draw down an SPS payment in 2008;
- the applicant who declared that land on a 2008 SPS application form was paid under the 2008 Single Payment Scheme.

An important dimension to the land eligibility issue in the current context is that the breeding Hen Harrier SPAs and upland and marginal pastoral landscapes in general are distinct, with environmental characteristics limiting production potential. For instance, spatial patterns of agricultural production and suitability for agronomic enterprise in Ireland are driven by environmental parameters such as soil capacity, soil moisture deficit and grass growth days (Fealy & Creamer, 2014). The interplay between these environmental factors results in a clear geographical divide in agronomic production potential in Ireland resulting in more intensive/productive/higher income lands to the South and East and contrasting with more extensive hill farming and forestry on the lower income acid and peat soils to the North and West (Commins and Frawley, 1996). Although these agri-ecosystems are less productive agronomically, they are of high conservation value. Marginal and low intensity pastoral farms with scrub features often correspond with areas of High Nature Value farming. Applying a blanket production-focused eligibility criteria to all physiographic and agricultural productive landscape types detrimentally impacts on high conservation value agri-ecosystems and comes into conflict with the legal objectives of EU birds and habitats directives.

Loss of Hen Harrier scrub nesting habitat and a subsequent reduction in prey availability may be in part attributed to scrub clearance for agriculture in order to qualify for Direct Payments through Pillar I of the CAP.

Areas retaining otherwise ineligible features (e.g. important Hen Harrier habitat such as heather or scrub) are eligible for payments under Regulation 1305/2013 Article 32(4) in cases where agricultural land faces natural and other specific constraints and where there is a justifiable environmental reason for retaining those features, for instance, in order to conserve or improve the environment (e.g. Natura 2000, Mountainous areas, High Nature Value farmland etc.), to maintain the countryside, to preserve the tourist potential of the area or to protect the coastline.

Land abandonment

Ireland's main farming system is grassland based livestock and dairy production with approximately 8% of land in tillage (DAFM, 2014). Most temperate grasslands require periodic clearing to control succession and grazing animals have a unique role to play by maintaining and enhancing structural heterogeneity of the sward (Rook & Tallowin, 2003; Fuller & Gough, 1999b). As a primary consequence of pasture abandonment, successional changes in vegetation structure can coincide with subsequent effects on bird populations through (1) the loss of preferred breeding sites; (2) alteration of food supplies; and (3) predation pressure (Fuller and Gough 1999a). Grassland abandonment is generally followed by an increase in woody vegetation cover and there is evidence (Preiss et al. 1997; MacDonald et al., 2000; Sua´rez-Seoane et al., 2002; Verhulst et al., 2004; Vallecillo et al., 2008) that birds associated with scrub and woodland vegetation benefit from land abandonment, while those tied to open habitats are negatively affected (but see Laiolo et al., 2004; Sirami et al. 2008).

Land abandonment should not be assumed to benefit wildlife conservation as many high priority bird species are associated with the semi-natural habitats produced by low intensity farming (Sua´rez-Seoane et al., 2002; Kati & Sekercioglu, 2006). Abandonment of grazing has significant effects on bird species diversity and abundance due to significant changes in vegetation structure (Ostermann, 1998; Laiolo et al., 2004; Sirami et al., 2008) habitat structural complexity is very important in influencing bird usage of grasslands (Atkinson et al., 2004; Benton et al., 2003). The positive relationship found between bird species richness and diversity on the one hand, and habitat heterogeneity and structural richness on the other, could be explained by the increase in ecological niches for birds (McCracken & Tallowin 2004). Overall, in terms of bird conservation objectives, large-scale abandonment of long-established pastoral habitats and their complete replacement with unmanaged scrub, or even forest, is likely to be detrimental (Laiolo et al., 2004).

Ostermann, (1998) showed that out of the 198 listed habitat types of the Habitats Directive in Europe, 28 (14%) could be threatened by the abandonment of low-intensity agricultural practices, confirming that rural decline and subsequent biodiversity loss is not a conservation issue restricted to Ireland.

CHAPTER 3 REDUCING THE RISKS OF NEGATIVE POPULATION LEVEL IMPACTS ON THE HEN HARRIER IN IRELAND DUE TO AGRICULTURAL RELATED ACTIVITIES

Introduction

The previous chapter described the nature of overlap between the ecology of the Hen Harrier and the broad range of activities related to the agricultural sector. This chapter explores how agricultural activities are influencing the current population. It also sets out how aspects of such agricultural activities, both within the SPA Network and in the wider countryside, can be modified to significantly reduce the risks of negative population level effects on this species in Ireland.

The previous chapters outlined the features of pastoral and unenclosed landscapes which are of importance to Hen Harrier, especially lightly grazed heath/bog and structurally diverse scrub for nesting. Lowland tillage, in combination with open heath/bog and rough grassland is important in winter for both foraging and roosting. Low intensity managed grasslands and hedgerows are also important, providing foraging networks throughout the species annual cycle. Hen Harrier use different habitat components for different purposes, both within seasons and between seasons. The availability and quality of these various habitats are of primary importance in supporting the Irish Hen Harrier population. Arroyo et al. (2002b) and Limiñana et al. (2006) both emphasise the importance of protecting natural habitats (e.g. intact open semi-natural and natural habitats) at a national scale in order to conserve Harrier species. The maintenance, improvement and increased extent of these natural and semi-natural habitats in the case of the Hen Harrier is considered a conservation priority in Ireland (O'Donoghue, 2010).

Agriculture accounts for about 62% of Ireland's land area (DAFM, 2013a). Due to the intensification of agricultural methods there has been a significant change in the farmed landscape since the second half of the last century. This has impacted negatively on a range of Irish bird species (e.g. Corn Bunting, Yellowhammer, Corncrake). The interactions of agricultural intensification on the ecology of the Hen Harrier in Ireland are less well established than the relationships between Hen Harrier and other land uses. For instance, fluctuations in Hen Harrier numbers within the SPA network as suggested from the national surveys undertaken in 2005 and 2010, appear largely linked to, but not limited to, the extent of second rotation and maturing conifer plantation forest (see Forestry Review).

The cumulative impacts of habitat loss, fragmentation, and degradation from agricultural intensification have significantly reduced the availability and quality of unenclosed heath/bog and open pastoral wet grassland habitats in areas important for breeding Hen Harrier in Ireland (O'Donoghue, 2010; O'Donoghue, 2011). The "bottleneck" caused by a dominance of maturing conifer plantations in Hen Harrier SPAs poses a significant pressure which could be compounded through changes in the extent and intensity of farming practices within the landscape (including grasslands, hedgerows, scrub and heath/bog). Such a net pressure will likely lead to further declines within the SPA network both in numbers and distribution.

Changing patterns of cereal farming in Ireland

It is known that a large proportion of the overwintering population of Hen Harrier in Ireland remain or transiently use lowland areas for foraging and roosting (O'Donoghue, 2010). The existing knowledge of roosts shows that a coastal corridor consisting of free-draining soils with the predominant land use of tillage (Gillmor, 1970; 1977; 1987; Frawley & Commins, 1996) along the South and East of Ireland supports some of the most important known sites for wintering Hen Harrier (O'Donoghue, 2010). Lowland tillage is an important source of small granivourous passerines and rodents for Hen Harrier in winter (O'Donoghue, 2010); however agricultural intensification has been shown to severely reduce the winter availability and extent of seed rich habitats on which granivourous passerines depend (Peach et al., 1999; Robinson & Sutherland, 1999; Siriwardena et al., 1999; 2000a; and 2000b). The 72% annual mortality rate of fledged first winter Hen Harrier in Ireland is a serious concern and considered likely a result of poor prey availability / habitat condition on wintering grounds (O'Donoghue, 2010). The amount of stubble and seed rich habitats in the landscape, determined by changing land use and crop cycle, may well be an important factor in determining winter survival and a contributing constraint to positive Hen Harrier population growth.

Satellite tracking studies in Ireland and Britain have shown that Hen Harrier will disperse up to 20km from roost sites during the day to forage, often returning to the same areas frequently over a period of days, weeks and months (B. O'Donoghue, pers comm; S. Murphy, pers comm). The wide dispersal of Hen Harrier in winter as shown from satellite tracking data may be the result of responses to changing crop cycles and prey availability, however could be a response to a complex combination of factors (e.g. inclement weather, social interactions, habitat change at local and landscape scale) and these interactions merit further study. Pressures associated with changing crop cycles are considered relevant because during the overwintering period:

- the available hours of daylight in which Hen Harrier can forage are shortened;
- Inclement weather, which can disrupt foraging activity is more prevalent; and
- Thermoregulatory energy demands are greater.

The development of high input, simplified arable systems has been associated with a decline in biodiversity in Ireland and Europe (Chamberlain et al., 2000; Stoate et al., 2001). The increased efficiency in arable farming within Ireland since the mid-1980s (O'Neill & Matthews, 2001) in combination with the sharp decline in the proportion of tillage since joining the EC in 1973 (Murphy & Lally, 1998) are implicated with declines on farmland bird species (Donald, 1997; Peach et al., 1999; Chamberlain et al., 2000; Robinson & Sutherland, 2002; McMahon et al., 2003). The total area of land used for crop production in Ireland has undergone a long term decrease since the 1850s (Eaton et al., 2008). Land holdings farmed for Wheat and Oats showed marked declines during the latter half of the 20th century, however Barley production increased over this period due to demands for animal feed (Redmond, 2000). In the late 20th century land viability in cereal production was more favourable in larger, more intensive land holdings, resulting in a decline in the collective area of small landholdings (Gaffney, 1997). The present day distribution of cereal production in

Ireland is concentrated in those areas most suitable for tillage farming with free draining soils, notably within the South and East lowlands (Gardiner & Radford, 1980; Frawley & Commins, 1996) Figure 5 shows the significant contraction in the distribution of Yellowhammer that occurred in Ireland from 1968 to 2011. This species is closely associated with cereal farming (Bradbury et al., 2000; Perkins et al., 2002) and whose breeding range in Ireland broadly reflects the changing distribution of cereal farming in Ireland. The contraction in extent of cereal farming in Ireland and its concomitant impacts on the abundance and distribution of granivorous bird species is likely to have negatively impacted the availability of winter foraging resources for the Hen Harrier in Ireland.

In recent times, the transition of spring sown to winter sown cereals in Ireland has been comparatively less pronounced than that seen in Britain possibly due to a reduced efficacy of this method in Ireland's wetter climate. The most recently available Central Statistics Office data on area, yield and crop production shows that overall approximately 59% of the total area farmed for wheat, oats and barley in Ireland in 2011 was spring sown. When this statistic is broken down by cereal type only 17% of the wheat crop was sown in spring along with 58% for barley and 80% for oats.

The Irish Hen Harrier Winter Survey (IHHWS) is the main source of survey and monitoring data for Hen Harrier during the non-breeding period in the Republic of Ireland, providing insights into the distribution and occupancy of roosts across the country and has been in operation since 2005. IHHWS surveyor observations have provided anecdotal evidence that link changes in roost occupancy with the specific timing of winter ploughing and spraying (B. O'Donoghue pers comm), however correlating patterns of Hen Harrier roost site use with the timing of winter ploughing and spraying is a challenge due to the variable characteristics and functions of roost sites and subsequent occupancy patterns. The interactions between Hen Harriers and the type and timing of land management at the field, farm and landscape scale during the non-breeding period in Ireland are therefore currently poorly understood.

In 2014 the IWHHS has identified 96 confirmed roost sites and a further 13 suspected roost sites. Of the 109 known/suspected roost sites, 43% (47) are considered to be under threat from agricultural related practices, notably reclamation (28); over-grazing (12); and, site drainage (7) (Barry O'Donoghue, pers comm), however the cumulative impacts of agricultural activities and land use change at or within proximity to the roost sites on the Hen Harrier are not well developed.

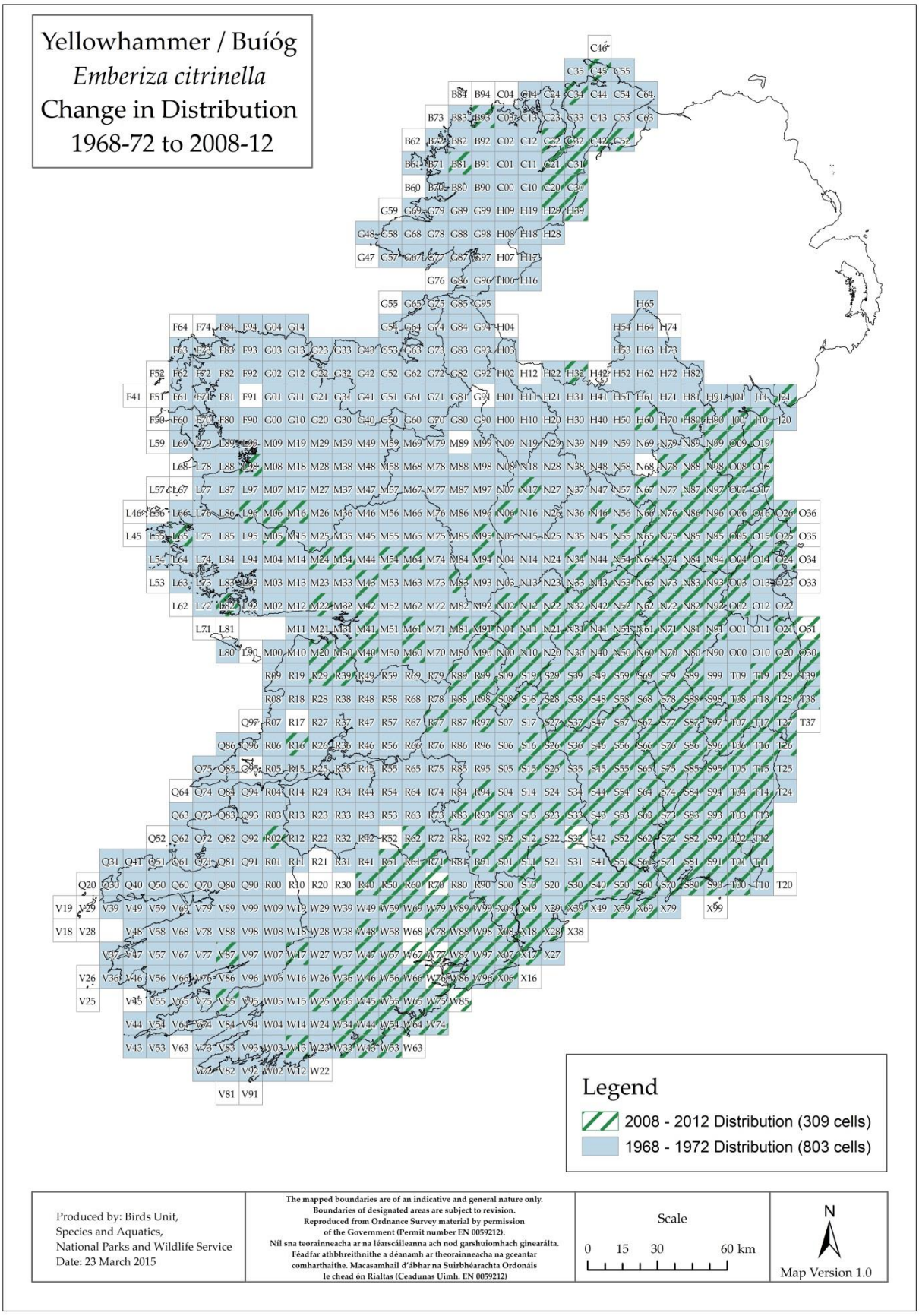

Figure 5. The reduction in the distribution of Yellowhammer breeding in Ireland (1968-2011)

Cross Compliance

Under the Basic Payment Scheme farmers are required to adhere to the legally binding standards outline in SMRs (of relevance here: SMR2 - Conservation of Wild Birds; and, SMR3 - Conservation of Natural Habitats and of Wild Flora and Fauna). Notwithstanding cross compliance measures, the cumulative impacts of farm management on the national Hen Harrier population may well be significant. This reduction in suitable breeding habitat is compounded by the fact that a large proportion of the landscape is unsuitable for foraging or nesting due to the extent of maturing forest in the breeding areas.

Agricultural activities to improve and maintain habitats of use to wintering Hen Harrier

Although overlapping the winter distribution of Hen Harrier in Ireland is significantly different from that during the breeding season (see Figures 3 and 1).Therefore agri-environmental conservation actions targeted at the important breeding areas will only provide support for a minority of the population during the winter period. A number of studies have shown that the presence and extent of arable land in the surrounding landscape can positively influence grassland bird communities (Robinson et al., 2001; Atkinson et al., 2002; Bright et al., 2014) especially when management is directed at retaining and increasing winter seed resources along field margins (Haysom et al., 1999; 2000, 2004; Vickery et al., 2002; Cunningham et al., 2004; Douglas et al., 2009) or field centres (Morris et al. 2004). The GLAS Wild Bird Cover action, for instance can potentially improve winter prey availability in farmland for the Hen Harrier. Siriwardena et al. (2006) demonstrated that several farmland bird species share resources within an area of *c*.500m, ranging over distance of less than 1km. This suggests that specific measures at a land parcel scale could be effective in maximising numbers of wintering birds and so such measures may be of benefit if targeted within small geographical areas (e.g. hinterland of roost sites). Therefore such a winter measure could play an important role in a conservation strategy for Hen Harrier at the local, regional and national scale. However further research is required to determine the necessary extent and intensity of such measures in order to maintain roost site occupancy rates as well as positively influencing overwinter survival rates.

Reclamation of Open Habitats (Unenclosed Land)

Agricultural reclamation usually results in the total elimination of existing open habitats or scrub vegetation for improved grazing or cultivation. The process of reclamation typically involves drainage, vegetation, re-seeding and fertilisation. When an area of land intended to be reclaimed for agricultural production exceeds set thresholds a requirement for screening of impacts by DAFM or a mandatory Environmental Impact Assessment (EIA) is triggered:

- commencing to use uncultivated land or semi natural areas for intensive agriculture;
    - >5ha screening required
    - >50ha mandatory EIA
- Land drainage works on lands used for agriculture;
    - >15ha screening required
    - >50ha mandatory EIA

The Regulations do not apply to reclamation, infill or drainage of wetlands, which are activities subject to planning permission under the Planning and Development (Amendment) (No. 2) Regulations 2011 and the European Communities (Amendment to Planning and Development) Regulations 2011.

Butet & Leroux, (2001) showed that conversion of extensive wet grasslands to intensively managed and drained agricultural land in western France reduced the nesting population of Montagu's Harrier (*Circus pygargus*) due to decreased availability of small mammals, the birds main prey species.

One of the protective measures associated with SPA designation is that consent should be given by DAHG for certain activities that can potentially impact on the conservation interests of the site. Such listed activities, known as Activities Requiring Consent (ARCs), can vary from one SPA to the next depending on specific listed interests of the site. The intensification of grassland (including reseeding, scrub clearance, drainage etc.) within the breeding Hen Harrier network is not directly subject to a specific notification and consent process.

Inserting such an ARC to the existing list of ARCs for the Hen Harrier SPA Network would provide a regulatory framework to constrain such activities. However it is considered to be a more appropriate conservation management approach to incentivise the maintenance of an extensive farming system via an appropriate agri-environment scheme along with an appropriate regulatory system under the Basic Payment Scheme (see below).

Upland Grazing

CAP funded development measures has a considerable influence on agricultural land use, particularly on upland habitat quality in response to changes in grazing regimes (Walsh et al., 2001). Quantifying the population effects of upland grazing in Ireland on the Hen Harrier at a regional or national scale are constrained due to the lack of accurate historical spatial data on livestock density. However, the Central Statistics Office does provide data on livestock numbers from 1926 which show national sheep and cattle numbers slowly and steadily increased until the 1950s. In 1955, Hen Harrier breeding distribution in Ireland was restricted to a few remnant colonies and slowly recovering after decades of persecution (Watson, 1977). Between 1955 and 1965 there was a *c*.50% increase in the number of sheep and cattle numbers. However further data detailing whether this increase was disproportionately targeted at uplands or otherwise were not available for this report. Coinciding with a presupposed increased grazing pressure, the government afforestation programme began in the 1950s with targeted planting on upland peatlands (heath/bog)(Smith et al., 2006). The combination of widespread upland habitat degeneration from increased livestock grazing (reduced habitat suitability for nesting) and the sudden replacement of heath/bog with fenced off with temporary early pre-thicket conifer forest with a dense understory (habitat suitable for nesting) could have been an important temporospatial land use change that influenced the observed significant shift in Hen Harrier nest site selection to pre-thicket forest during the 1950s onwards.

A reduction in livestock numbers during the 1970s was followed by a substantial increase in during the 1980s. This caused considerable vegetative loss and soil erosion in the hill and mountain environments particularly in the west of Ireland (Bleasdale and Sheehy-Skeffington, 1992). Increases in livestock peaked in early 1990s notably with numbers of sheep in the north-west of Ireland over 2.8 times greater than those during the early 1970s (Murphy & Lally, 1998). Livestock numbers remained largely at this level for the majority of the 1990s, reducing gradually up to 2010. The overall "unfavourable" habitat assessment status of Irish bogs and heaths (Eionet, 2014) suggest that the intensive grazing and its associated negative impacts on habitat quality is a continuing pressure in Hen Harrier areas.

Scrub clearance & Agricultural burning

Currently, land parcels dominated by scrub habitats (including riparian scrub) comprise <2% of the total land area within the SPA network (Moran & Wilson-Parr, 2015), however the Hen Harrier SPA Habitat Map does provide an estimate of scrub patches within individual field parcels (an additional *c.*400ha equivalent to 0.2% of the SPA network). An analysis of changes in the extent of scrub and hedgerow within the Hen Harrier SPA network is constrained due to lack of historical data.

The Department of Environment, Community and Local Government (DECLG) publish statistics from the National Directorate for Fire and Emergency Management. Published statistics cover the last 10 year period and include the regions, causes and number of fires attended across the 37 fire authorities. The causes of fires are categorised into ten separate groups. One category is distinguished as fires caused in relation to Forest/Bog/Grass etc. Between the year 2000 and 2012, the Fire Service responded to an average of 3,700 forestry, bog or grassland fires each year, with a peak response in 2010 of 6,871 incidents; the year of the last National Hen Harrier survey. In 2012, the fire service responded to a total of 1,641 forestry, bog or grassland fires, the lowest on record; equivalent to 6.8% of all fires attended nationally. Ruddock et al. (2012) reported that burning was the most frequently recorded disturbance or suspected reason for nest failure at Hen Harrier territories. Resolution of fire incident data is limited to county and city council level, precluding any useful analysis of agricultural burning events in relation to the spatial distribution of breeding Hen Harrier within SPAs or other important breeding areas. The population effects of agricultural burning at a regional or national scale are therefore also unclear.

Agricultural activities that improve and maintain habitats in the SPAs - Nesting

Conservation management within the Hen Harrier SPA network should focus on maximising the availability and suitability of nesting and foraging habitat for Hen Harrier (NPWS, 2007a). Nest sites situated in heath and bog habitats are relatively more stable through time than other nesting habitats (i.e. pre-thicket forest) and therefore more valuable for the long term maintenance of the Hen Harrier population. Hen Harriers select heather with a dense structure for nesting. A low intensity grazing regime in suitable habitats could maximise the availability of this diverse growth stage for Hen Harrier. Currently over 21% (35,343ha) of the

SPA network designated for breeding Hen Harrier in Ireland consists of open unenclosed habitats with the potential to support nesting and foraging Hen Harrier (heath, scrub etc.) (Moran & Wilson-Parr, 2015).

Heather Management

Agri-environment prescriptions aimed at maintaining low grazing intensity at a site appropriate level would lead to the promotion of deep heather (e.g. ≥40 cm) as a high quality nesting and foraging resource. Appropriate grazing levels will vary from site to site but are estimated to be between 0.15 Livestock Units (LU)/ hectare (ha) and 0.4 LU/ ha. Ideal stocking rates on wet heaths would be in the range of 0.2 LU / ha, while the stocking rate could rise to 0.6 sheep LU/ha on lowland dry heath with good heather growth (Milne et al. (1998); McGurn, 2011). For blanket bog where there is moderate damage stocking rates should be kept between 0.15 and 0.4 LU/ha. In severely damaged areas of heath bog, or areas dominated by *Molinia*, regimes that incorporate short to long term mixed grazing or off wintering would enhance dwarf shrub cover.

Scrub Management

Scrub is an important foraging and nesting habitat for Hen Harrier. Areas of dense scrub can have little or no ground vegetation under the scrub canopy and will be of limited nesting value. Agri-environment prescriptions that focus on increasing the structural diversity of scrub would increase its value as both a nesting and foraging resource. Large continuous blocks (>1 hectare) of established briar, scrub or gorse represent sub-optimal habitat which could be greatly improved if opened up to create a diverse structure.

Land Eligibility

As detailed in earlier chapters the destruction of valuable habitats for Hen Harrier such as heather and scrub through indiscriminate burning and scrub clearance can occur in order for farmers to qualify for payments through Pillar I and Pillar II of the CAP. This actively encourages the farmer either to clear the habitat that exists in the interest of making the land eligible for payment. This directly conflicts with the conservation requirements of the Hen Harrier and by extension it is at odds with the requirements of the Birds Directive. Dwarf shrubs such as heather are often a dominant component of the vegetation in Hen Harrier SPAs and other HNV sites, particularly those considered to be in favourable conservation status under the EU Habitats Directive.

EU legislation now provides for a pro-rata system to determine the payable area of parcels where areas with scrub exist within the parcels. Furthermore, there are concessions for land in Natura 2000 sites which has accumulated scrub since 2008. Where areas have become ineligible and this is due to compliance with SPA or SAC management requirements or ecological objectives, these areas will continue to be eligible for payment, subject to certain conditions.

Both of these concessions together should disincentivise the removal of scrub on agricultural parcels. However there are approaches through other regulatory provisions that could consider all appropriately managed/farmed upland areas as eligible e.g. under Art. 4 (1)(h) of Regulation 1307/2013 where "land which can be grazed and which forms part of the established local practices where grasses and other herbaceous forage are traditionally not predominant in grazing areas". The guidance document on the land parcel identification system (LPIS) under Article 5, 9 and 10 of Commission Delegated Regulation 640/2014 (DSCG/2014/33) makes this clear. Regulation 1305/2013 Article 32(4) also clearly states that areas shall be eligible for payments under Article 31 if they are affected by specific constraints and if it is necessary for land management to be continued in order to conserve or improve the environment,

Agricultural practices that improve and maintain habitats in the SPAs - Foraging

Agri-environment schemes that facilitate access to healthy invertebrate food populations are likely to aid farmland bird conservation and in turn provide an abundance of prey species for the Hen Harrier.

Maintenance of extensive grazing and rush management (Enclosed Land)

81% of national agricultural area is devoted to pasture, hay and grass silage (3.63 million hectares) (DAFM, 2014b). Within the SPA network high to medium intensity managed agricultural grassland comprises *c*.9% (15,152ha), of which high intensity improved grassland accounts for 6% of the current SPA land cover (Moran & Wilson-Parr, 2015). Improved grassland is avoided by Hen Harrier (Fielding et al., 2011; Irwin et al., 2012; Wilson et al., 2012) and therefore with negligible conservation value.

Hen Harrier foraging habitat use is strongly associated with rough grassland with a litter layer (Amar et al., 2005a). This habitat is maintained by low intensity grazing (Pärt & Söderström, 1999; Amar et al., 2011). Currently, 11% of the national agricultural area is devoted to rough grazing (0.47 million hectares) (DAFM, 2014b). Rough grassland also comprises 11% (18,414ha) of the Hen Harrier Network (Moran & Wilson-Parr, 2015). NPWS (2007a) recorded approximate cover of rough grassland in the SPA network generated from 2000 aerial photos and based on 6" Ordnance Survey sheets. Comparing the estimated habitat cover data from 2000 and 2013 there has been a 53.5% (21,225.7ha) reduction in rough grassland habitat. The Forest Service inventory shows that the amount of new conifer plantation established within the SPA network between 2000 and 2013 is *c*.19,111ha, which accounts for the majority of land cover change. Although the comparative analyses need to be treated with caution due to the different approaches used to estimate the extent of rough grassland in 2000 and 2013 it can be noted that only a minority of the rough grassland resource is estimated to have been lost to agricultural intensification.

Reduced grazing intensity increases the structural diversity of vegetation and the subsequent abundance, availability and accessibility of food resources to foraging Meadow Pipits, the Hen Harrier's predominant prey species (O'Donoghue, 2010). Mixed grazing can generate greater

heterogeneity in vegetation structure, which modifies prey availability, resulting in a greater abundance of birds (Evans et al., 2006). An optimum grazing regime would balance the need for farm production and improve the quality of foraging habitat for Hen Harrier. Therefore an appropriate grassland management regime would:

- Aim to have a high proportion of rushes, but not to the point that they are lodging. The ideal range is considered to be between 30 – 70% rush cover;
- To retain and restore rough, damp pasture with a grazing regime providing taller, tussocky vegetation. The preferred grazing regime for this habitat is considered to be between 0.15 and 0.6 LU/ha on specific plots; and
- If this level of grazing does not stop the rushes from exceeding 70% cover, then mowing in certain years may be necessary.

Increasing hedgerow cover in agricultural land parcels

Establishing new hedgerows around existing agricultural field boundaries would not only increase habitat but also improve connectivity between foraging areas. Hen Harrier show strong preference for hedgerows of a width of 3 – 4m (Irwin et al., 2012). Generally, the majority of hedgerows along field boundaries are >2m wide. The components of hedgerow structure (e.g. hedge height) seem to be the most important factor in determining farmland bird communities within Irish agricultural ecosystems (Moles & Breen 1995). The aims of suitable hedgerow management would be to optimise the diversity and abundance of associated birds while achieving a hedge structure that allows Hen Harrier access to this prey resource. Therefore appropriate prescriptions would promote the maintenance, enhancement and further planting of hedgerows in the SPAs. Under GLAS the Laying of Hedgerows action and the Planting New Hedgerows action would complement the Hen Harrier action.

Severe cutback of hedges has major effects on the distribution of the bird population in an area (Lack, 1987) and that such a method of managing hedges cannot be considered as ideal from the birds' point of view in the short term. Ideally autumn hedgerow cutting should be delayed to ensure a supply of hedgerow fruits for finches and wintering thrushes; important prey species for Hen Harrier during the late autumn and winter periods. Therefore hedgerow cutting should be pushed back as late in the season as possible and done so infrequently. It is recommended that hedgerows are cut only once every five years and only if hedgerows have become overgrown.

A dense vegetation cover at and around hedgerow bases increases bird diversity and abundance by providing a combination of nest sites and increased abundance, availability and accessibility of invertebrate food sources. Any cutting therefore should aim to achieve an “A” shape, i.e. wider at the base than at the top. A buffer zone of 1.5m on each side of the hedge must be left uncut. Fertilisers should not be applied within this buffer zone. In addition herbicides and pesticides should not be used within 5m of an existing hedgerow.

Locally-Led Agri-Environment Scheme

O'Donoghue (2010) notes that a holistic approach to upland conservation must be realised where the fundamentals of upland habitat retention and improvement contribute directly to the Hen Harrier population in Ireland. The continuous evaluation and adaptation of agri-environment schemes is needed to enable the biodiversity on farmland to recover from the EU's former policies (Kliejn et al., 2001; 2004; Berendse et al., 2004) and integrate links between agricultural policy, land-use and biodiversity (Mattison & Norris, 2005). Applying a regional approach has been widely advocated to make agri-environment schemes more ecologically and socially sustainable (van Dijk et al., 2015).

In Ireland, such a holistic approach has been very effectively demonstrated by the Burren Farming for Conservation Program (BFCP), an outputs-driven agri-environment scheme contributing to the positive management of the Burren landscape; cultural heritage; and to improvements in water quality and water use efficiency (McGurn & Moran, 2013).

The Program was funded through Article 68.1 (a) (i) of Council Regulation (EC) 73/2009 which makes provision for the use of unused Single Payment Programme funds for higher level specific types of farming which are important for the protection or enhancement of the environment.

A Locally-Led Agri-Environment Scheme under the new RDP will provide €70million funding to complement broad-based GLAS measures and to support local solutions to specific environmental problems. Two flagship projects will be supported with the expansion the existing Burren Farming for Conservation Project; and the introduction of similar projects in a number of priority Freshwater Pearl Mussel catchments (DAFM, 2014). More recently specific targeted funding for enhanced measures in Hen Harrier areas have been decided upon (DAFM pers com).

Besides the above-mentioned projects, DAFM also intend to support an additional number of projects selected through a competitive call for proposals that are likely to require collective or community action at local level. As the Hen Harrier outputs based project may well be restricted to certain limited areas there is further scope to devise an uplands theme measure whose outputs based would benefit the Hen Harrier and its habitats through commonage management plans as part of wider countryside measures compatible with the Hen Harrier Threat Response Plan.

Commonage Management Plans in SPAs

Commonage land covers 79.4% of the total terrestrial area designated as Natura 2000 in the Republic of Ireland and 6.3% (10,531ha) occur within the Hen Harrier SPA network (Figure 7.). Commonage Management Plan (CMP) will be devised under the GLAS Commonage Action and will be devised to ensure that commonage lands are appropriately grazed and managed to optimise habitat quality as well as ensuring that they remain in GAEC and are compliant with eligibility criteria. Set conditions to avoid farming practices that cause environmental

damage are applicable on in commonage within Natura 2000 sites under these GLAS measures (Appendix 15. GLAS Specification). There is potential for Commonages to contribute to the maintenance and restoration of quality breeding habitat through themed targeted Upland Birds Management Plans. Such measures would also benefit a number of other bird species of conservation concern (e.g. Red Grouse, Curlew).

Wider Countryside Breeding Season Measures

The SPA network supported over 60% of the national population of breeding Hen Harrier in 2005 (Barton et al., 2006) however this proportion decreased to 44% in 2010 (Ruddock et al., 2012). It is likely that this trend will continue in the immediate future should breeding populations in some SPAs continue to decline. Therefore a 'Wider Countryside Birds' element is now increasingly more relevant to the conservation of this species at the national scale and places proportionally greater conservation importance on non-designated areas. The value of these wider countryside areas of known importance to Hen Harrier conservation is twofold:

- a species with a wider breeding range has a national population that is likely to be more robust to pressures acting at the site level; and,
- it is possible that due to the maturation of the forest estate in combination with other pressures occurring in SPAs that for some sites at least, the breeding population may drop below a critical level – a sufficiently large and persistent population outside of the network could improve the re-colonisation potential for those SPAs that are at risk of local extinctions.

Supporting agricultural activities that improve and maintain habitats of benefit to the Hen Harrier in marginal and upland areas is crucial if Hen Harrier populations are to be resilient to the threat of projected level of future forest maturation in breeding areas (see Forestry Review) and other pressures. A number of studies have shown that an important determinant on the tolerance of raptors to forest cover in the landscape is the quality and connectivity of natural and semi-natural open habitat (Marquiss et al., 1978; Newton et al., 1982; Rankin & Taylor, 1985; Ratcliffe, 1990; Millon et al., 2002; Whitfield et al., 2011). Based on 2010 survey data seven non-designated Hen Harrier breeding areas (covering 71,966ha) were identified as supporting relatively important populations (Figure 6). Whilst acknowledging that priority are given to farmers within the SPAs, the inclusion of such non-designated areas eligible for inclusion into GLAS significantly benefits the conservation prospects for Hen Harrier in these areas provided appropriate conservation actions are achieved (see Chapter 4).

Commonage Management Plans in non-designated Hen Harrier breeding areas

Ireland has approximately 4,500 commonages comprising over 330,000 hectares divided into more than 6,700 plots. (JCAFM, 2013). Of the 15,000 farmers who applied for direct aid under agri-environmental schemes in the previous RDP, approximately 1,650 (11%) applied in respect of commonages over a ten year period (JCAFM, 2013). In a review of commonages, JCAFM (2013) identified that the improvement of commonages in order to remedy environmental damage sustained due to earlier policies; and, the effects of dormancy on the

management of commonages and on their agricultural and environmental conditions as key priorities. The review also recommended that the management of commonages be promoted through output-driven schemes.

In the RDP financing period 2014-2020, support for the development of Commonage Management Plans is one of the key actions for implementation in the new GLAS. The tier 1 status of the commonage action in the Scheme will ensure priority entry for farmers, which should facilitate a high level of uptake. Flexibility has been introduced to permit any farmer with commonage lands entering the scheme as an individual, provided he/she commits to working towards a single framework plan for each relevant commonage. Beneficiaries will be required to achieve certain targets stocking levels over the period of the plan (GLAS Specification dated 14 April 2015). The Joint Committee on Agriculture, Food and Marine pointed out that where current grazing levels are adequate, controls are required to ensure that the collective maximum is not exceeded when farmers outside of GLAS are included (JCAFM, 2013). A number of commonages offer considerable potential to benefit the Hen Harrier due to their proximity to nearby important breeding regions if collective minimum stocking levels are achieved. Figure 8 highlights a selection of commonages within the foraging ranges of regional Hen Harrier breeding populations and the historical numbers of occupied territories potentially benefiting from appropriate standards and best practice facilitated through commonage agri-environment supports.

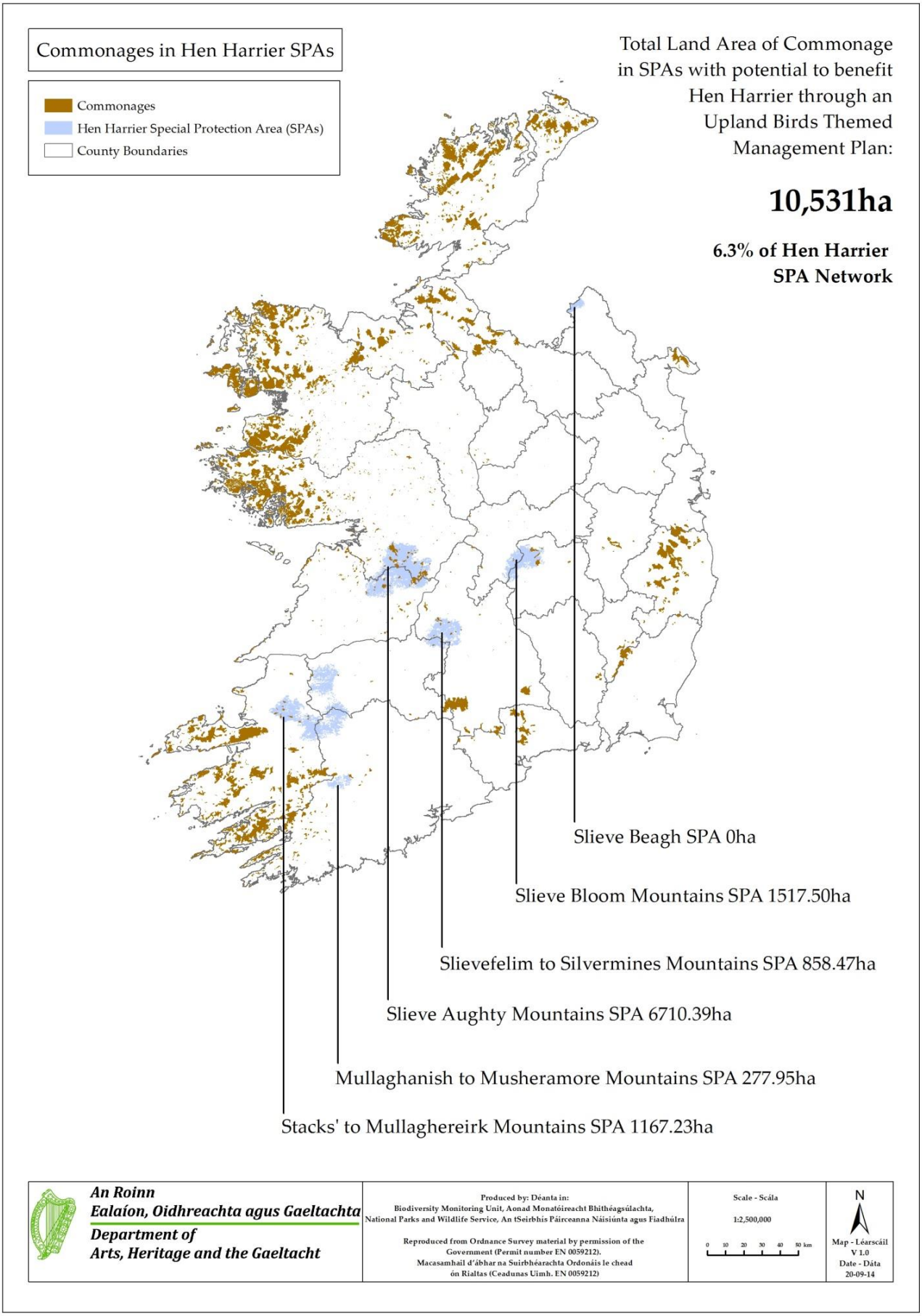

Figure 6. Commonages in Hen Harrier SPA Network

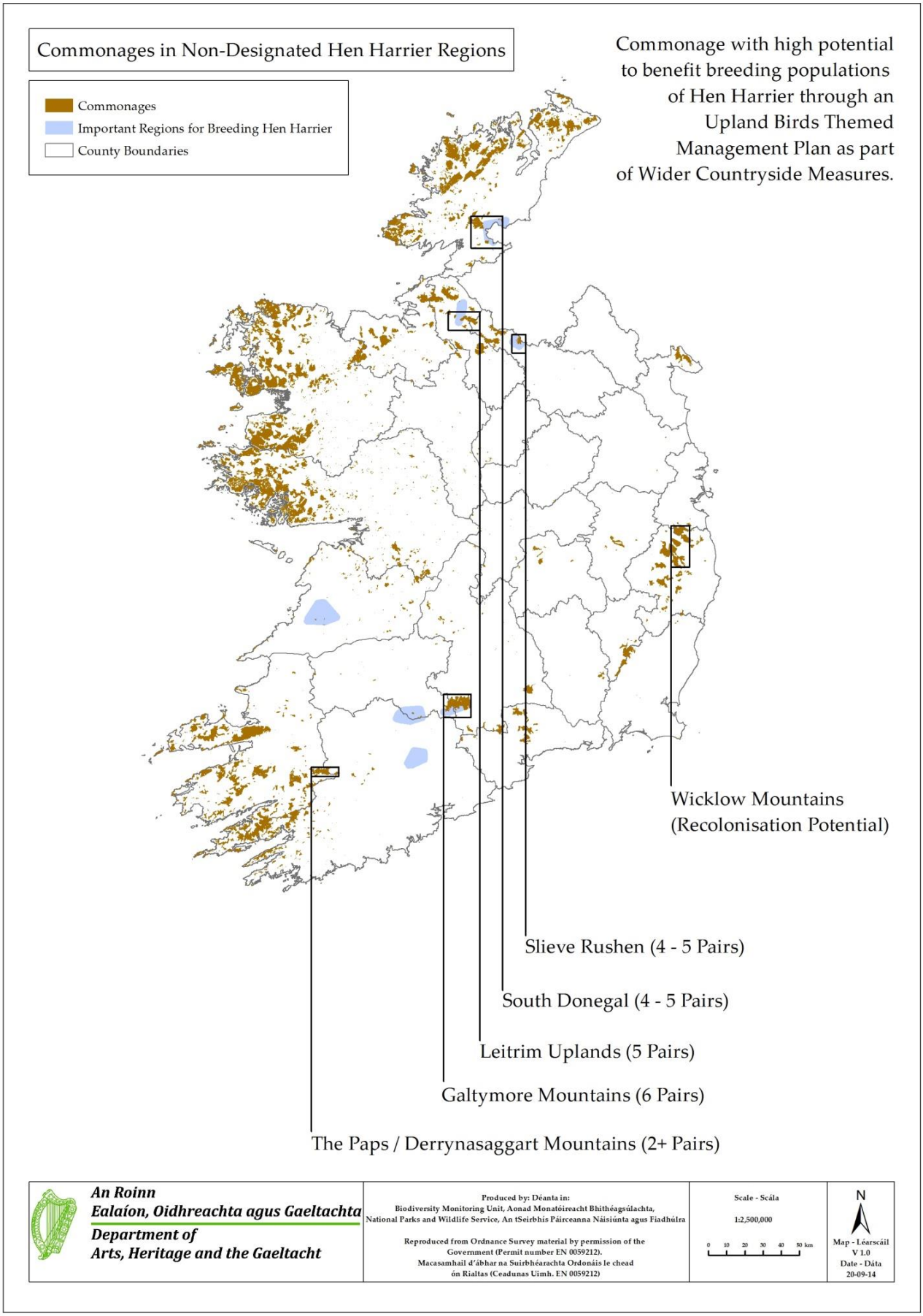

Figure 7. Selected Commonages with potential to benefit the Hen Harrier

CHAPTER 4: CONSERVATION MANAGEMENT OPTIONS

Introduction

This final chapter sets out a series of management options in relation to the conservation of the Irish Hen Harrier population relevant to the Agricultural Sector that could be developed and integrated into the overall Hen Harrier Threat Response Plan.

The 2015 report "Hen Harrier Conservation and the Forestry Sector in Ireland" states:
"*During the breeding season Hen Harrier requires suitable (both in size and quality) areas of open habitat to forage over. In most instances breeding birds use a combination of more stable open habitat (e.g. heath/bog, rough grassland and scrub) and pre-thicket forested areas to forage over. Due to the maturation and estimated harvest cycles currently envisaged for the SPA Network it is predicted that the pre-thicket forest resource will continue to decline significantly over the next 10 years… This bottleneck caused by a dominance of mature closed canopy plantation poses a significant pressure…*"

The negative impact of this bottleneck where with every passing year the extent of foraging and nesting resource available to the Hen Harriers is reduced can be offset to some degree if the farming community is adequately supported and encouraged to farm in a way that is compatible with Hen Harrier conservation. Furthermore famers can play a strong central role in maintaining and improving the necessary conservation conditions for the Irish Hen Harrier population in the wider countryside throughout the year.

Pillar 1 eligibility and the Birds Directive

Land parcels which include scrub but are dominated by heather and rush are some of the most important habitats with in the SPA Network for Hen Harrier. However under the Single Payment Scheme, area reductions have been applied on account of the presence of scrub. The risk of such financial penalties has resulted in some farmers removing these valuable habitats in order to protect their income.

Defining Utilisable Agricultural Area and land eligibility criteria that would support the retention and management of semi-natural areas pursuant to the objectives of Article 3 and 4 of the Birds Directive would have a direct positive impact on the conservation of Hen Harrier at these sites. Increasing the amount of eligible land within the target areas for both Pillar 1 and Pillar 2 requirements would increase the amount of land that would be potentially maintained or improved through GLAS actions. The recent publication of DAFM's Guide to Land Eligibility Direct Payment Scheme clarifies the situation for those lands within the Hen Harrier SPA network.

The 2010 National Hen Harrier Survey identified several relatively important areas that are not designated as SPAs for this species. The land parcels that contain suitable Hen Harrier breeding habitat within these 'Wider Countryside Areas' (i.e. outside of Natura 2000) are subject to the same Redlining and Reduction Coefficient Procedure as other areas of the

country where the Hen Harrier does not regularly breed. Where the total ineligible area within a parcel accounts for up to 10% of the area of the parcel, less the area deducted as 100% ineligible, no reduction will apply to the adjusted reference area of the parcel. However where scattered scrub or other ineligible features are greater than 10% of the parcel area, a reduction coefficient must be applied, even where these features support Hen Harriers.

- On foot of the 2015 National Hen Harrier Survey results consider extending relevant eligibility criteria to certain undesignated areas

Conserving Hen Harrier breeding habitat within the SPA Network through an appropriate agri-environment scheme

GLAS aims to deliver overarching benefits in terms of the rural environment whilst addressing the issue, among others, of the preservation of priority habitats and species. Under GLAS the Hen Harrier action and other relevant complementary actions form the most important (in terms of potential overall area) agri-environment scheme that could deliver positive impacts on the conservation of Hen Harrier at the population level.

It is estimated that over 50,000ha of the Hen Harrier SPA network is managed for livestock grazing (LIPIS, 2014). Over 15,000ha of this land is considered to be intensively managed grassland and therefore, currently, is of little value for Hen Harrier (Moran and Wilson-Parr, 2015). Therefore the existing suitable Hen Harrier habitat within the SPA Network could be maintained, improved and expanded if:

- An effective and appropriately incentivised agri-environmental scheme is available to farmers within the breeding Hen Harrier SPA Network.

GLAS is in its early stages and so, currently, there is no information available with regard to the level of uptake of the Hen Harrier action or its complementary measures by farmers in the target areas. A suboptimal uptake by farmers in these areas would increase the risk that farmed land outside of GLAS but within the SPA Network would be intensified which would be counterproductive to the conservation management of the Hen Harrier. Closely integrated with the successful uptake of a GLAS scheme is the effectiveness of the prescriptions to improve the availability of nesting and foraging resources for Hen Harrier. Agri-environmental prescriptions should be formed with the aim of achieving a balance of productive farming and positive conservation outcomes.

As a monitoring and evaluation project will be built into the RDP process it would be of conservation benefit if one was to

- Monitor the level of uptake of the Hen Harrier action by farmers in the Hen Harrier SPAs and if necessary consider ways to increase uptake
- Evaluate the efficacy of the Hen Harrier action across the SPA Network with regard to its objective to promote the maintenance and creation of suitable

breeding and foraging habitats for the Hen Harrier; and if necessary to recommend changes to the prescriptions

The proposed DAFM Locally-Led Agri-Environment Scheme is to complement the more broadly based GLAS and GLAS+ measures and is to be aimed at supporting local solutions to specific environmental problems. DAFM intends to support an additional number of projects selected though a competitive call for proposals that are likely to require collective or community action at local level. DAFM intends to support Locally-Led Agri-Environment Schemes for Hen Harrier. This positive action could

- Target LLAEs at specific SPAs that have been identified as having particular ecological and/or environmental challenges and would deliver effective on the ground improvements over and above those measures that would be prescribed in GLAS.

Such LLAE schemes have the scope to deliver significant conservation returns for Hen Harrier especially when such output based schemes are designed to complement a more basic yet more extensive fit for purpose agri-environment scheme.

EIA (Agriculture) Regulations 2011 and the protection of habitat within the SPA Network

Under these Regulations and where it is intended to undertake one of the three relevant on-farm activities (i.e. restructuring of rural land holdings; commencing to use uncultivated land or semi-natural areas for intensive agriculture; and land drainage works on lands used for agriculture) and where the proposed works exceeds a specific threshold, then an application to DAFM for screening must be submitted.

As of the end of 2014 very few applications from farmers from the Hen Harrier SPA network have been sent to DAFM for screening. However there is documented evidence of instances where work impacting on habitats has continued within SPAs. As described in the previous chapter, all three types of relevant activities would result in a reduction in the extent and/or quality of the breeding habitat for Hen Harrier. Due to the relatively recent pressure on habitats in relation to the interpretation of Pillar I eligibility criteria, assessment of cumulative impact of individual cases along with sub-threshold activities is constrained by available relevant data. Lack of robust data at the site level in relation to the rate of decline of suitable Hen Harrier breeding habitat (that extensive farming provides) due to intensification of farming is an issue. This data gap could undermine the ability of an assessor to undertake a rigorous cumulative impact assessment of the proposed Hen Harrier habitat destruction. Building on the recent Hen Harrier Habitat Mapping Project the rate of habitat loss caused by the removal of scrub and intensification of farming practices could be estimated by

- undertaking a repeat Hen Harrier Habitat mapping exercise or taking a statistically robust subsampling approach to the SPA Network based on more contemporaneous aerial images.

Wider Countryside Breeding Season Measures

According to the 2005 National Hen Harrier Survey data, the SPA network supported over 60% of the national breeding population (Barton et al., 2006). Our current knowledge (based on the 2010 survey) shows that the majority of breeding birds now occur outside of the network with the consequence that the 'Wider Countryside' element is increasingly more relevant to the conservation of this species at the national scale. The current GLAS Hen Harrier action goes a significant way to address this by opening the scheme to approximately 1,600 farmers farming in non-designated areas that are considered to be important breeding areas. However room remains to expand the conservation actions for the species in the wider countryside. Relevant options to improve agricultural related activities (and primarily targeted at the important areas identified through national surveys) could include:

- Monitor and evaluate the uptake and efficacy of the GLAS action in the non-designated important breeding areas and if necessary amend entry criteria and/or prescription details;
- Ensure that the conservation requirements of Hen Harrier are taken into consideration in the formation of relevant commonage management plans; and
- Review the results of the 2015 national survey in order to re-evaluate the relative importance of those important breeding areas that were identified using the 2010 national survey – the results of this review would be available to inform future targeted conservation management measures.

In relation to the loss of suitable Hen Harrier habitat as a result of deductions in Pillar I payments and also in relation to the EIA (Agriculture) Regulation 2011, where there is insufficient data available to examine if the cumulative impact of such sub-threshold activities is having a significant negative impact on the Hen Harrier population, it would be prudent to

- Estimate the contemporary rate of loss of Hen Harrier breeding habitat caused by intensification of farming and scrub removal in important yet non-designated areas. This could be achieved by repeating or taking a statistically robust subsampling approach to the Hen Harrier habitat mapping project in these areas using 2013 imagery data and more contemporary imagery data.

Wider Countryside Non-breeding Season Measures

O'Donoghue (2010) estimated that the Irish juvenile Hen Harrier survival rates were lower than those estimated for the Scottish and Welsh populations. Irwin et al (2012) recommends that detailed studies of juvenile Hen Harrier survival to breeding age in Ireland are required.

A focused programme of work including research on the ecology of Hen Harrier outside of the breeding season using satellite tracking technology and continued monitoring of the population would significantly increase our scientific knowledge of this species. Such a programme of work would provide:

- Updated and more robust data on the population dynamics of Hen Harrier in Ireland including juvenile overwinter survival rates and population trends;
- A greater understanding on how this species uses the agricultural landscape and how the constituent agricultural activities (e.g. intensification, changing patterns of cereal farming, scrub clearance) are impacting on the conservation status of Hen Harrier in Ireland;
- A required evidence base to inform any potential future provision of a measured and detailed series of agri-environment prescriptions that would lead to positive impacts at the population level; and
- Further data that would inform the degree of risk of secondary poisoning due to rodenticide use that this species is currently subjected to.

In the meantime the positive management measures for the important breeding areas (both designated and undesignated) would also provide some limited contribution to supporting the overwintering harrier population. Also current GLAS measures and in particular the wild bird cover action aimed at supporting granivorous bird populations across Ireland could contribute positively to Hen Harrier conservation to some degree.

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