



Deer Management in Scotland: Report to the Scottish Government from Scottish Natural Heritage 2016





Scottish Natural Heritage
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Foreword

Deer, and especially red deer, are emblematic of the wild beauty and nature of Scotland's upland and woodland landscapes.

Three years ago, the RACCE (Rural Affairs, Climate Change and Environment) Committee of the Scottish Parliament reviewed the management of deer in Scotland. In replying to the findings of the Committee, the Minister for the Environment indicated that a review of deer management would be carried out by Scottish Natural Heritage in 2016. In carrying out this review, we seek to support effective and sustainable deer management which realises a range of benefits. This includes the ambitions set out in the Scottish Biodiversity Strategy which is a high priority for Government and underpins Ministers' ambitions for a vibrant rural economy.

Debates over deer management are not new and SNH's policy statement in 1994 on Red Deer and the Natural Heritage identified the negative environmental impacts which high numbers of red deer can cause. Since then, there have been a number of developments in relation to deer management, policy and practice which articulate the principle that those who own or manage land have a responsibility to deliver the public interest.

This review draws on a wealth of research and information collated from deer managers, agencies, NGOs and researchers. Of particular value is the input from deer managers – and I want to put on record my gratitude to the Association of Deer Management Groups (ADMG) who have been strong advocates in supporting, planning and collaborating among their members and who have played a significant role in the progress made by Deer Management Groups in developing deer management plans.

There is, however, more to be done to maximise the public benefits that deer and good deer management can deliver for the natural environment and the wider economy. Current approaches to deer management under the existing statutory framework are showing signs of improvement, but we cannot confidently conclude that a step change has been taken.

I very much hope that this review helps in pointing both to successes and to the further work needed to manage deer sustainably. Support for the sustainable management of deer is a priority for SNH and we will continue to work collaboratively to support the further development and implementation of deer management planning.

I am grateful to many colleagues in SNH for compiling this report and thank staff in Forestry Commission Scotland and Forest Enterprise Scotland for the contribution they have made to the work. We appreciate advice from members of SNH's Board and Scientific Advisory Committee, as well as from members of a specially convened Deer Science Group (Professors Robin Pakeman, Josephine Pemberton and Chris Quine). We have also received considerable analytical support from Professors Steve Albon, Justin Irvine and Jim McLeod of the James Hutton Institute, as well as Dr Mark Brewer, Professor David Elston and Dr Jackie Potts at Biomathematics and Statistics Scotland, along with staff from Strath Caulaidh Ltd. We are also grateful to Professor Colin Adams who provided an independent scientific review of the report.

W. J. (Ian) Ross
Chairman, Scottish Natural Heritage

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Summary

Background

This report has been requested by the Scottish Government and is intended to inform debate on the sustainable management of deer. The focus of the report is to assess the effectiveness of current deer management arrangements in protecting the public interest, with specific attention on the impact on the natural heritage. The report covers both the uplands and lowlands of Scotland.

The report provides an assessment of key national datasets relating to the interactions between deer management and the natural heritage. Key datasets examined include Forestry Commission Scotland's Native Woodland Survey of Scotland; an assessment of the impact of deer on protected areas using Scottish Natural Heritage's Site Condition Monitoring programme; an assessment of progress of the 44 upland Deer Management Groups; and evidence from analysis of Section 7 Control Agreements. Wider contextual information on socio-economic costs and benefits of deer management was also reviewed.

This review provides an assessment of the current state of deer management in Scotland. As such, it represents a snapshot in time based on the evidence available. However, managing the impacts of deer on the natural heritage is a long-running conservation issue. While this review necessarily focuses on the natural heritage, deer have a wider impact and deliver multiple benefits beyond those related to biodiversity.

Main findings

- Wild deer are important to Scotland's rural economy, provide us with healthy food and recreational opportunities and are integral to Scotland's ecosystems.
- Deer management provides a number of socio-economic benefits including supporting employment, contributing to rural tourism, providing sporting income and the sale of venison. Other benefits are intangible and a total monetary value cannot be estimated.
- There are significant differences in the management of deer in the uplands and lowlands of Scotland. Variations are a result of differences in the ranges of the different species; different behaviours of red and roe deer; differences in the pattern of land ownership; the levels of woodland cover; differences in land quality, history and culture; and issues in the peri-urban/urban environment.

- There are substantial areas of Scotland in both the uplands and lowlands where no formal collaborative approach to deer management exists.
- It is too early to say if the new models of collaboration adopted in some parts of the lowlands will be effective in delivering the public interest.
- The ability to undertake a full assessment of deer and deer impacts in the lowlands is limited due to insufficient data.
- Between 1961 and 2016, red deer densities in Scotland have increased by 60% overall although there are marked variations in deer densities across the country.
- The reassessment of 44 upland Deer Management Groups shows that between 2014 and 2016 significant progress has been made in developing effective deer management plans.
- Progress in Deer Management Group plans has been less evident for public interest categories most relevant to the natural heritage.
- The analysis of Section 7 Control Agreements shows that there has been some reduction in deer numbers across all agreements. However, deer density targets and habitat condition targets have not been met in around half of the agreements reviewed.
- Grazing by deer and other herbivores is a major cause of unfavourable condition of natural features in protected areas.
- The Native Woodland Survey of Scotland found that more than a third of all native woodlands were in unsatisfactory condition due to herbivore impacts. Evidence supports the view that deer are a major factor in limiting woodland condition recovery.
- Available information suggests that if deer densities were lower across much of Scotland the benefits arising from deer could be largely maintained, and many of the costs (such as deer-vehicle collisions and impacts on forestry productivity) reduced leading to enhanced overall delivery of public benefits.
- On the basis of evidence from the analysis of DMG plans, Section 7 Control Agreements and assessments of the impacts of deer on other interests in the uplands and lowlands, we are not confident that present approaches to deer management will be effective in sustaining and improving the natural heritage in a reasonable timescale – particularly in time to contribute significantly to the specific challenges outlined in the Scottish Biodiversity Route Map to 2020.

1. Introduction

Background to the Commission

In November 2013, the Rural Affairs, Climate Change and Environment Committee (RACCE) heard evidence about the effectiveness of the current system of managing Scotland's deer population. In response to the Committee's findings¹, the then Minister for Environment and Climate Change agreed that the end of 2016 would be a suitable time to consider progress in developing and implementing deer management plans and whether or not the present voluntary system has produced a step change in the delivery of effective deer management².

The Minister asked Scottish Natural Heritage (SNH) to provide an assessment of the current model of deer management in Scotland; its effectiveness in sustaining and improving the natural heritage; and the current pace of change in securing greater public benefits from deer management. In May 2016, the Cabinet Secretary for Environment, Climate Change and Land Reform gave SNH a specific commission as set out below.

1. This is a commission for Scottish Natural Heritage (SNH) to review and provide Scottish Ministers with a report on deer management in Scotland. This stems from the agreement by Scottish Ministers and the Scottish Parliament's Rural Affairs, Climate Change and Environment Committee that a review of deer management in Scotland be undertaken in 2016.
2. SNH will deliver a report to Scottish Ministers by the end of October 2016 on a review of current arrangements for the sustainable management of deer in Scotland and whether or not the current voluntary system has produced a step change in the delivery of effective deer management.
3. The report will assess the effectiveness of deer management in protecting the public interest, with a specific focus on the impact on the natural heritage. The report will be undertaken in the context of key policy documents for the management of deer including the 'Code of Practice on Deer Management', and 'Scotland's Wild Deer: A National Approach'.
4. The report will provide an assessment of progress by the 44 upland Deer Management Groups (DMG) towards delivery of effective, environmentally-responsible and publicly-available deer management plans and the extent to which public interests as set out in 'Scotland's Wild Deer: A National Approach' (WDNA) strategy are addressed in the plans, and are leading to changes in approaches to deer management. The assessment of individual DMG plans will be based on analysis of DMG plans submitted to SNH in March 2016. The assessment will be shared with the Chair and Secretary of the relevant DMG.
5. The report will also provide an update on the work of the Lowland Deer Network and progress with management of deer and associated issues in the lowlands.
6. Impacts on the natural heritage will be considered using available data, including a detailed assessment on delivering favourable condition and deer impacts on protected sites, using data from SNH's Site Condition Monitoring programme. Evidence from

other sources, such as a review of the existing Section 7 Control Agreements and the Forestry Commission Scotland (FCS) Native Woodland Survey of Scotland, will also be used.

7. By way of context, the report will provide a short overview of the current model of deer management in Scotland, and a summary of the available evidence on the social and economic costs (to both the public and private sectors) and benefits of deer management. A summary of current knowledge about deer populations and trends for all four species will be presented.

Approach to Undertaking the Review

In order to fulfil the commission from the Cabinet Secretary, this report uses existing published information as appropriate, including results from national datasets such as the Native Woodland Survey of Scotland and the results of recent reviews, for example the review of Deer Management Group Plans in 2016. The report is based on existing data and evidence as it relates to the current system of deer management in Scotland. It does not consider alternative scenarios for deer management in Scotland, nor draw any comparisons with deer management models in other countries.

In addressing this commission, SNH has reviewed a wide range of information collected for a range of purposes. A range of stakeholders has contributed data to the review including individual deer managers; the Association of Deer Management Groups; agencies including Forestry Commission Scotland and Forest Enterprise Scotland researchers; and non-governmental organisations. A full range of SNH staff have also contributed to this report. The report has gone through a robust assurance process with the appointment of an SNH Deer Science Panel. This included a range of external academics who reviewed the analysis of key pieces of evidence. In addition, an external peer review has been done by Professor Colin Adams, Glasgow University. We have not, however, undertaken a full literature review. In some cases, the evidence points to clear conclusions, while in other situations informed judgements have been made based on the best available evidence. The origin and strength of the evidence is outlined in the relevant sections. Following the direction set in the commission for this work, the review necessarily has a strong focus on the natural heritage. It does not include a full analysis of the wider public interest issues such as the impact of deer-vehicle road collisions or of Lyme disease.

Some evidence relates specifically to the work of Deer Management Groups. However, the review appraises progress across the range of the current delivery models, including non-traditional deer management groups and areas without any formal management structure. The Review recognises that delivery is not uniform across these models.

The approach taken to this task has been to:

- Assess *the current practice* of sustainable deer management in Scotland across all delivery mechanisms. This is done by outlining the existing deer management framework and the impact that this has had over recent decades on estimated deer populations, their range and impacts. The impacts on the natural heritage are scrutinised in particular detail, as required by the commission, but we also review wider social and economic impacts.
- We have examined *recent progress* in developing and enhancing deer management structures (in the uplands and lowlands), and changes in the scale and pace of deer management planning since the Rural Affairs, Climate Change and Environment

Committee considered deer management in 2013. The DMG Assessment process (see Chapter 6) has been particularly valuable in measuring change within existing deer management groups.

- There has been limited time for these changes to be implemented and to lead to measurable changes to the natural environment. To assess *the rate of progress* arising from these recent changes, we have looked at evidence from mechanisms (such as Section 7 Control Agreements) already in place which replicate many of the aspects of collaboration and deer management planning promoted in the DMG Assessment process. This allows us to draw conclusions on the likely scale and speed of change arising from recent management changes, as well as the level of assurance that this will lead to an improvement in sustainable deer management in Scotland in the future.

In undertaking this review, it is clear that there are gaps in our collective knowledge about aspects of deer management and the extent to which it provides a range of public and private benefits. The Scottish Government and SNH are currently undertaking a research project 'Meeting the Challenge of Wild Deer Research to Support Delivery of Sustainable Deer Management in Scotland', which aims to identify specific evidence gaps that need to be addressed in order to deliver 'Scotland's Wild Deer: A National Approach' and manage deer sustainably in Scotland. A series of workshops with stakeholders identified a need for: greater knowledge and guidance on conflict management tools and cross boundary processes, greater evidence on public perceptions of deer management, and the need for a stronger evidence base on deer movement/migration and the impacts of other herbivores. This study will be completed by the end of 2016.

SNH is currently working with The James Hutton Institute to provide a more recent estimate of the national population of red deer on hill-ground in Scotland. This work will include estimates of the regional variation in the trends in population size, an analysis of the likely drivers of differences in regional trends, and an assessment of evidence that regional and temporal differences in deer density may contribute to variation in the condition of the natural heritage. This work will be completed in early 2017; interim results are presented in this report.

2. The Current Approach to Deer Management in Scotland

Key Findings

1. In legal terms, wild deer belong to no-one and can only be shot by those who own or manage the land or with their permission. The right to shoot deer cannot be separated from ownership of the land. Deer management is carried out on a voluntary basis.
2. There are significant differences in how deer are managed in the uplands and lowlands of Scotland. These variations are a result of differences in the ranges of the different species, different behaviours of red and roe deer, differences in the pattern of land ownership, the levels of woodland cover, differences in land quality, history and culture, and issues in the peri-urban/urban environment.
3. There are 44 Deer Management Groups (DMGs) coordinating deer management in the open hill red deer ranges. These DMGs cover approximately 39% of the land area of Scotland.
4. Deer management in the lowlands is not coordinated across groups in the same way as in the upland DMGs. They are instead managed in a number of different ways, ranging from informal arrangements with owner/occupiers, to stalking leased from larger commercial forestry companies through to the 11 Lowland Deer Groups. In some areas, there are no formal collaborative structures for deer management.
5. Expectations on deer managers have changed substantially in recent years with a growing desire that deer management should support a range of public benefits. As a result of this expectation, changes in approaches to deer management have accelerated with the expansion of Lowland Deer Groups and accelerated production of deer management plans among upland DMGs.

Introduction

This chapter summarises the legislation and national strategies relevant to deer management. It also describes the structures and organisations involved in deer management in both the uplands and lowlands of Scotland. The chapter finishes with an overview of the diversity of approaches to deer management across Scotland and a summary of recent changes. Deer are a common resource that whilst territorial can range across different landholdings, often at different times of year, which makes their management complex.

The legal framework for wild deer management is derived from Scots law, under which deer belong to no-one until they are killed or captured. The right to take or kill deer cannot be separated from ownership of land. Wild deer are managed throughout Scotland by a wide range of land management interests including individuals, businesses, recreational and community bodies and organisations across private, voluntary and public sectors.

There is no general legal obligation on landowners or occupiers to manage deer. Much of the legislation enacted since 1959 has concentrated on ways of addressing serious damage to agriculture and forestry. There is, however, a growing desire for deer management to realise wider public benefits and to ensure that any adverse impacts on the natural heritage, along with wider economic costs, are minimised.

Deer management mainly takes two forms: hunting or stalking by shooting, and fencing to exclude deer from specific areas, although these are not mutually exclusive. The wide variety of landowners within Scotland have diverse objectives for their land and this influences their approach to deer management. Objectives include management for stalking, where populations of deer are managed to provide sport, to management for woodland or grouse where the presence of significant numbers of deer is generally undesirable.

There are no predators of deer in Scotland and, if left unmanaged, there is a tendency for deer numbers to increase. Increasing deer numbers can lead to damage to forestry and agricultural interests, to the environment, and may have impacts on public safety through road traffic accidents.

Statute

The principal statute protecting and regulating wild deer in Scotland is the Deer (Scotland) Act 1996. This Act consolidated and replaced the Deer (Scotland) Act 1959. The 1996 Act has been further amended by the Wildlife and Natural Environment (Scotland) Act 2011 (WANE) and the Land Reform (Scotland) Act 2016.

Through the Deer (Scotland) Act 1996 as amended, SNH is charged with furthering “the conservation of deer native to Scotland, the control and sustainable management of deer in Scotland, and to keep all matters relating to deer including welfare, under review”^a. SNH has a duty to take account of:

- the size and density of the deer population and its impact on the natural heritage,
- the needs of agriculture and forestry,
- the interests of owners and occupiers of land,
- the interests of public safety

^a Sect 1 Deer (Scotland) Act 1996 as amended.

- the need to manage deer populations in urban and peri-urban areas.

The act confers powers on SNH to intervene to address damage or likely damage to different public interests; specifically, the risk of damage to:

- woodland
- agricultural production including livestock or serious overgrazing of pasture
- welfare of deer
- the natural heritage
- public interests of a social, economic or environmental nature
- public safety.

These intervention powers can only be used to prevent damage. The powers cannot be used to seek enhancement of the public interest. A caveat to this was brought in through the WANE Act 2011 which provides powers to rectify damage.

The 1996 Act includes a mechanism for SNH to negotiate voluntary control (Section 7) agreements with landowners where deer have impacts on public interests, to set up control (Section 8) schemes if a voluntary control agreement is not working, to apply emergency measures (Section 10) to prevent damage by deer, to authorise the shooting of deer during close seasons and at night, to request annual cull returns from owners and occupiers, to collate returns from venison dealers and maintain a 'Fit and Competent' register.

The Land Reform (Scotland) Act 2016 brought in some further powers for SNH. These include the power to require land managers to prepare a deer management plan where the public interests of an environmental, economic or social nature are likely to be damaged. Failure to produce a competent plan within a given timescale is grounds to move a Section 7 Control Agreement. The provisions also extended the previous power established in the 1996 Act to form deer 'panels' by increasing local community engagement and representation. Panels have been used successfully to address deer-vehicle collision hotspots and review the authorisation process. Also included is the power for SNH to require land managers to notify it of the planned number of deer to be taken in the following year.

The changes made in legislation since 2011 have arisen because Government wished a clearer expression of the public interest to be delivered through deer management. The development of an overarching Government vision for deer management and the development of a code of good practice were seen as building blocks to enable the voluntary management mechanisms to accomplish an enhanced range of public and private outcomes.

Vision

[‘Scotland’s Wild Deer: A National Approach’](#) (WDNA), first published in 2008, sets out the Scottish Government’s 20 year vision for the sustainable management of deer. This vision is that by 2030:

“There will be widespread understanding and achievement of sustainable deer management:

- Deer will be valued as part of Scotland’s natural heritage, in balance with their habitats and will contribute to a high-quality, robust and adaptable environment;
- Deer will be a resource for diverse sustainable economic development with adverse impacts on other land being minimised;
- Deer management will promote social wellbeing through enjoyment of the outdoors

and healthy lifestyles.

Wild deer will be managed in an inclusive way with knowledge used to underpin all decisions.”

The [reviewed WDNA](#), published in 2014, builds on the 2008 version. It includes a set of priorities and challenges for 2015-2020.

The main priorities are based around:

- collaboration and effective deer management planning and implementation
- healthy ecosystems
- lowland and urban deer
- economic and community development
- training and deer welfare.

The priorities are set out in an [annual Action Plan](#) which shows the breadth and depth of actions happening across the land and deer management sectors.

Code/Guidance

The WANE Act 2011 required SNH to prepare a code of practice for the purpose of providing practical guidance in respect of deer management. [The Code of Practice on Deer Management](#) (Deer Code) sets out the musts, shoulds and coulds in deer management. It was approved by Parliament and came into force at the beginning of 2012.

The Deer Code applies to all who own or manage land where wild deer occur. It applies to all four species of wild deer and all habitats. This is a statutory Code that has been subject to Parliamentary approval; however, it is not an offence to breach the Code. SNH and other public bodies have a duty to follow the Code. Non-public bodies do not have a duty to comply and if damage due to deer is identified, whether or not the Deer Code has been followed will be taken into account. SNH originally had a duty to ‘monitor compliance’ with the Deer Code. This has now changed, through the recent Land Reform Act, to a duty to ‘review the extent to which the Deer Code is being followed’ every 3 years. This work will commence on completion of this review.

In addition to the Code of Practice on Deer Management, a further source of advice and guidance for deer managers is the well-respected 74 [Best Practice Guides](#) developed by SNH in collaboration with the industry.

Mechanisms for Delivery

In Scotland, deer management is carried out on a voluntary basis. There are significant differences in the management of deer in the uplands and lowlands of Scotland. These variations result from differences in the distribution of the different species, behaviours of red and roe deer, the pattern of land ownership, the levels of woodland cover, differences in land quality, history and culture, and issues in the peri-urban/urban environment.

There are a wide range of owners of land within Scotland, which include significant numbers of community land and non-government organisations, alongside private and public landowners. Public landowners include the National Forest Estate, SNH, Local Authorities,

Ministry of Defence and Scottish Water. This review considers deer management across all land ownership types, including land owned by SNH, but makes no assessment of the impact of different ownership models on natural heritage outcomes. Owners have diverse objectives for their land and this influences their approach to deer management. Objectives can include management for stalking, where populations of deer are managed to improve sport, to management for woodland, nature conservation or grouse shooting where the presence of significant numbers of deer are generally undesirable. Multiple management objectives within single ownerships are also common.

Throughout most of the upland red deer range, local management of deer is coordinated through Deer Management Groups (DMGs). In the lowlands, coordination is less well developed and, if carried out, is through various formal and informal mechanisms, including Lowland Deer Groups (LDGs).

Figure 2.1 shows the distribution of the two different types of deer groups in Scotland.

Significant areas of Scotland, such as Argyll and areas in the lowlands, currently have no established management structures. Consideration should be given to the value of a more collaborative and co-ordinated approach to deer management in these areas, whether in the uplands or lowlands.

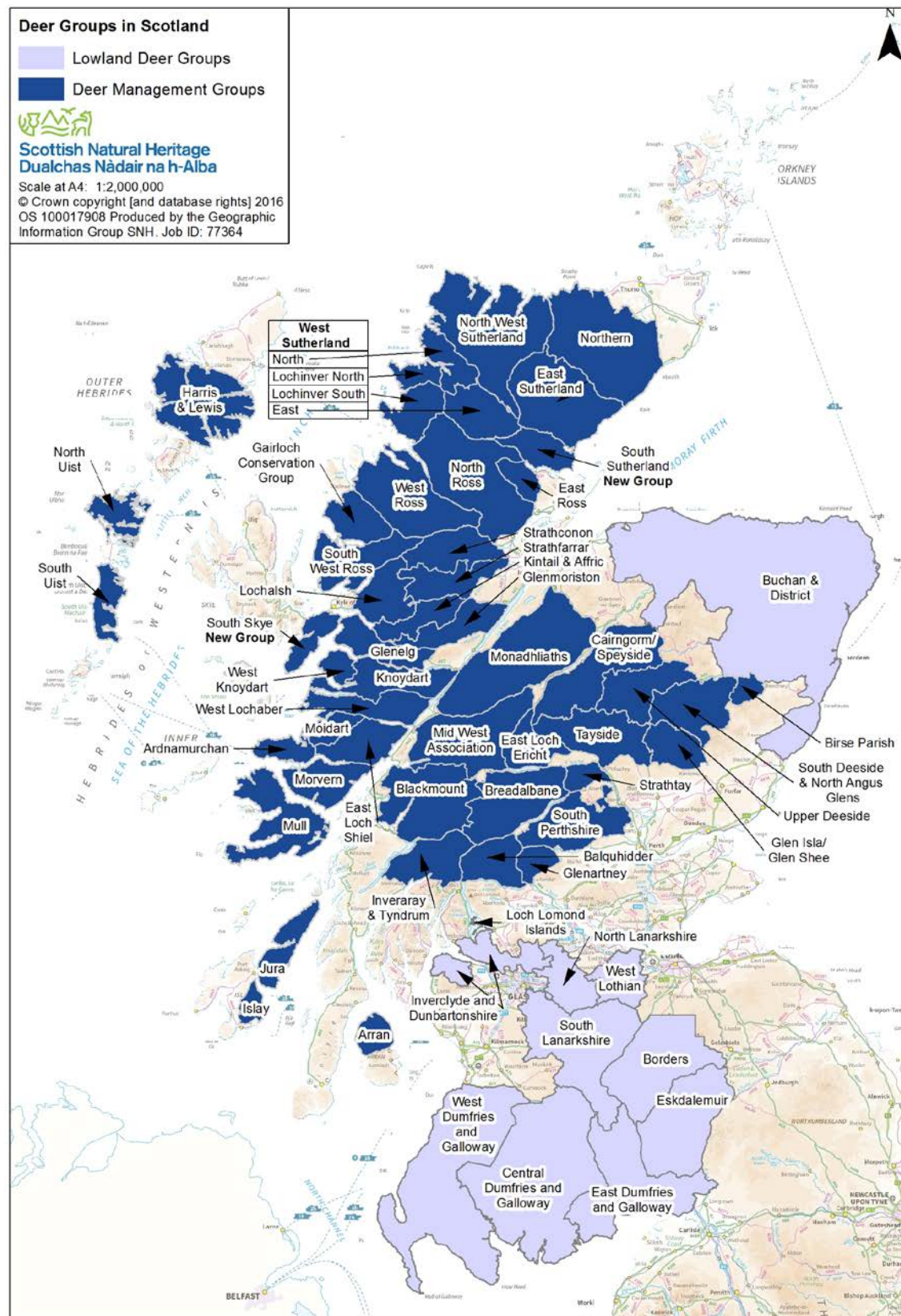


Figure 2.1. Distribution of Groups Involved in Managing Deer.

Deer Management Groups

Deer Management Groups (DMGs) have been established in upland red deer ranges over the last 40 years to coordinate deer management between neighbouring landowners, initially to meet sporting objectives. In the last 10 years, they have expanded their considerations to meet a wider range of public and private interest objectives.

At present, there are 44 established DMGs covering approximately 39% of the land area of Scotland. The large majority of the red deer open-hill range in the Highlands and Islands is covered by DMGs. Deer Management Groups are voluntary, meeting at least twice per year. Membership comprises land managers, including public sector land managers, farmers, private estates, NGOs, and private forestry/land management companies which own or manage land in the Group area. Representatives from Scottish Natural Heritage, the local community and locally-relevant NGOs may be invited to attend meetings of the Group. Final decisions on the management of deer within the Group area rests with the landowning members¹.

Incentives for managing deer are provided through the Scottish Rural Development Programme (SRDP) which includes options relevant to deer management. The extent of payments made are summarised in Chapter 5.

Association of Deer Management Groups

The [Association of Deer Management Groups](#) (ADMG) was set up in 1992 to act as an umbrella organisation of DMGs in Scotland. It is a voluntary body led by an Executive Committee, with a number of experts also co-opted on to the Committee.

The ADMG developed the '[Benchmark](#)' for Deer Management Groups (2014). The 'Benchmark' (Annex 1) sets out guidance on how DMGs should be set up and function. A template for the constitution of DMGs¹ has also been produced. The ADMG has been proactive in supporting DMGs across all aspects of deer management planning and delivery. The ADMG has also provided informal assistance for DMGs to support delivery of enhanced collaborative management.

The ADMG has supported the co-ordination and expansion of deer management structures outwith existing DMG areas particularly in lowland Scotland, where it has supported the creation of the Lowland Deer Network Scotland.

Deer Management in Lowland Scotland

The Scottish Lowlands are generally defined as those parts of Scotland at lower altitudes, mainly South Scotland, Central Scotland and East and North East Scotland. The lowlands have particularly abundant roe deer which are widespread throughout Scotland and the primary species in the lowlands, particularly in the central belt. In contrast to red deer, roe deer are territorial, generally found in open mixed, coniferous or purely deciduous woodland.

The need to manage deer numbers and their impacts has become increasingly important in peri-urban and urban locations as the range of roe deer expands. A different approach is required to deer management in the lowlands from the deer management structures which have evolved in the uplands.

The challenges in managing deer in the lowlands relate to:

- the fragmented pattern of land ownership
- impacts on nature conservation interests
- damage to agriculture, woodland and forestry
- deer-vehicle collisions
- wildlife crime and other anti-social behaviour associated with deer
- public perceptions of lethal control of deer.

There are a number of different ways in which deer are managed in the lowlands, ranging from ad hoc informal arrangements with owner/occupiers, to stalking leased from larger commercial forestry companies through to Lowland Deer Groups. It is important to emphasise that across the lowlands, deer management is largely carried out by individual vocational stalkers and motivation for collaboration is different from the uplands. The benefits and challenges of collaboration vary across the lowlands depending on the scale of land holdings and the species of deer. Where local groups have evolved they have tended to focus on training, improving skills, and sharing experience.

Evidence from habitat monitoring, census work and deer-vehicle collision (DVC) data indicates emerging “hotspots”, where there is an increasing need to plan and manage the impacts of deer in the lowlands. Census work in the lowlands is driven by individual problems requiring local intervention, e.g. wildlife crime reports; damage to golf courses, private property or woodland sites. Our ability to undertake a full assessment of deer and deer impacts in the lowlands is limited due to insufficient data. Lowland Deer Groups are a relatively recent development so it is too early to say how effective these new structures will be.

SNH, in partnership with the Lowland Deer Network Scotland (LDNS), Forestry Commission Scotland (FCS), Forest Enterprise Scotland (FES) and Transport Scotland are developing a project to better understand the current models of deer management in the lowlands and the extent to which public interests are being delivered. A pilot area of some 950km² to the north of Glasgow has been selected as it encapsulates all the characteristics of the lowlands and a range of public interests, including woodland expansion and impacts on designated sites as well as damage to agriculture and deer-vehicle collisions. The first phase of this project will run until April 2017 and will make an assessment of the current system and its effectiveness. The second phase, to spring 2019, will trial different approaches to deer management to support better delivery of public interests.

Lowland Deer Network Scotland

The [Lowland Deer Network Scotland](#) (LDNS) was proposed by SNH in partnership with the Association of Deer Management Groups in 2011 and developed concurrently with the progress of the WANE Act 2011 and the 2012 Code of Practice on Deer Management. It was formally constituted in 2012. The LDNS is core-funded by SNH, FCS and Transport Scotland. An executive committee oversees the affairs of the LDNS.

The LDNS seeks to offer a collaborative, coordinated approach to the management of wild deer in Scotland’s lowlands and the urban fringe. Its particular challenges relate to securing collaboration for territorial non-herding species, working across a diverse membership, dealing with generally local issues against a backdrop of the number and scale of landholdings.

LDNS membership is principally made up of low-ground deer management practitioners (e.g. sportsmen, stalkers, rangers), landowners and farmers, and organisations with an interest in deer management and deer welfare including local authorities.

Its aims are to:

- promote a better understanding of how deer interact with the environment and seek to manage the impacts associated with them
- establish a range of fora providing opportunities for increased collaboration and effective information exchange
- encourage adoption of best-practice standards in deer management.

Membership of the LDNS is open to all individuals, public bodies, representative bodies and commercial interests involved in the management of deer in the Scottish lowlands. The LDNS has developed a range of initiatives e.g. development of a website, agreeing a template for the constitution of lowland deer groups² and facilitating lowland deer management 'training-type days'.

Lowland Deer Groups

There are currently 11 Lowland Deer Groups (LDGs) covering approximately 24% of the area of Scotland. (See Figure 2.1). All are constituted to varying degrees and all are group members of the LDNS.

There are 3 broad types of LDG depending on the main interests of the members of the group:

- Commercial forestry – membership dominated by both public and private forestry companies e.g. Eskdalemuir and Borders LDGs
- Stalker lead – membership dominated by vocational stalkers operating over defined areas with nominal Local Authority boundaries. e.g. North Lanarkshire, South Lanarkshire, West Lothian, Inverclyde & Dunbartonshire, East Dumfriesshire and Banff & Buchan LDGs
- Mixed – covers a mixture of landholdings with objectives of timber and/or agricultural production and deer damage mitigation, e.g. South Ayrshire and Central Galloway LDGs.

A mosaic of smaller landholdings, which dominates the pattern of land ownership in lowland Scotland, means that LDG structures and ways of operating are different from DMGs in the uplands. As not all landholdings are represented within the LDG, group-wide deer management plans and cull targets are not appropriate. For example, the South Lanarkshire LDG has many hundreds of properties within its boundaries. As a territorial non-herding species, there are not significant movements of roe deer across landholdings, thus the requirement for collaboration is less critical.

The common objectives across all LDGs are to ensure members are competent to undertake deer management according to Best Practice Guides taking deer welfare into account, to promote communication on deer management and work with local communities to raise awareness.

The growth in development of deer management in the lowlands has been substantial in the last five years as a result of industry initiative and support from public bodies.

Public Sector Involvement in Deer Management

The public sector is involved in deer management in a number of ways. It provides advice, support, incentives and regulation for sustainable deer management. As land managers and landowners, public bodies have a responsibility to manage wild deer.

In addition, public bodies, including SNH, must consider the Code of Practice on Deer Management when making regulatory decisions which could have an impact on deer.

SNH role and powers of intervention

A considerable element of SNH's role is to provide advice and guidance on policy and support to those involved in managing deer.

Staff attend DMG meetings in all 44 established groups and provide support to developing new groups. SNH also works with the LDGs and is a key partner in the LDNS. Staff have regular bilateral meetings with organisations which represent the deer sector, working particularly closely with the ADMG, LDNS, Environment LINK Deer Task Force and providing leadership for the Deer Management Round Table. Work with other organisations includes the Scottish Venison Partnership and Lantra on aspects of competence and training. SNH has led on developing Best Practice Guidance in collaboration with the deer sector, which is highly regarded by the sector.

Advice and funding has been provided to the LDNS and to individual DMGs in order to support development of their deer management plans. Substantial funding has also been provided to support the development of a database which seeks to help deer managers in their use of data to make management decisions, particularly the integration of habitat impact information. Habitat monitoring is undertaken to assess habitat condition in specific areas and since 2010 the SNH deer count programme has supported DMGs through undertaking annual counts of more than 500,000ha of land at a cost of around £200,000 per annum. SNH has supported the development of deer management plans through the provision of data and advice on appropriate actions to meet public interest objectives.

SNH works with land managers in achieving favourable condition of designated features and facilitates the delivery of voluntary Section 7 Control Agreements to ensure deer populations are not having a damaging effect on designated sites where deer have an impact. In addition, SNH has a regulatory role and can directly intervene in deer management issues and has the statutory power to take regulatory action, if required.

In addition, SNH staff support delivery of the Scottish Rural Development Programme and undertake deer management on National Nature Reserves owned by SNH and on adjacent land by agreement.

Forestry Commission Scotland and Forest Enterprise Scotland

The mission of Forestry Commission Scotland (FCS) is to protect and expand Scotland's forests and woodlands and increase their value to society and the environment. FCS has a

pivotal role in developing policy around deer management and is represented on the WDNA Steering Group. FCS also supports the Lowland Deer Network Scotland. The Forestry Grant Scheme, managed by FCS, provides the main mechanism by which deer management is linked into the creation and management of new or existing woodlands.

Forest Enterprise Scotland (FES), as an agency of FCS, manages the National Forest Estate (NFE) which covers about 9% of Scotland's land area across both the uplands and lowlands. Management of deer is an essential activity for gaining benefits from the National Forest Estate. FES employs 70 deer management staff (64 Full-Time Equivalents), and provides direct work for 30-35 deer culling contractors on short-to-medium-term contracts³.

FES is a member of the ADMG and supports DMGs and local deer management activities including: development of deer management plans, discussing proposed cull targets and progress, proposed deer fencing programmes, results from habitat surveys and assessments and tree damage assessments and planting programmes.

Local Authorities and National Parks

SNH cooperates with Local Authorities (LAs) in relation to specific casework on mitigating deer impacts and encouraging uptake of best practice, compliance with the Deer Code and delivery of effective sustainable deer management. The engagement of LAs and the extent to which they are proactively addressing their deer management responsibilities within the Code of Deer Management Practice is very variable.

The Cairngorms National Park Plan recognises the importance of deer and appropriate deer management to the park area, but it also recognises the damaging impacts which deer can have. The Authority has developed a Deer Management Framework which seeks to acknowledge the many different values that people attribute to deer. It further aims to bring together those with an interest in deer management, promote respect for a range of different management objectives, and encourage a spirit of co-operation and compromise. The Authority has developed the Cairngorms Deer Advisory Group to promote better communication and understanding between all organisations with an interest in deer and their management. Specifically, the Authority has an active role in the DMG's within the park boundary, has helped in the deer management planning process, and has contributed funding to develop at least one plan.

Loch Lomond and the Trossachs National Park Authority staff have been involved with the local DMG's over the last two years. The Authority recognises the potential for collaborating with DMGs to improve communications with land managers and to provide a means of encouraging links between habitat networks. Authority staff have been practically involved in discussions and actions to manage predominately fallow deer on the Loch Lomond Islands.

Recent Changes in Delivery of Deer Management

Successive governments have reinforced their desire to support a voluntary system of deer management in Scotland. However, the expectations about what this should achieve have changed in recent years. There are several drivers behind this change, including the recognition that deer management can have a number of social and economic benefits, but also that inappropriate deer management can lead to significant costs to the public purse and hamper the delivery of important Government policy objectives. In recent debates, the impact deer are having on the natural heritage has been prominent and the extent to which

they are hindering progress in achieving targets and outcomes in the '*2020 Challenge for Scotland's Biodiversity*' and '*Scotland's Biodiversity – a Route Map to 2020*'.

The Deer Code and the revised WDNA both set out more clearly the public interests in deer management and how land managers are expected to take account of these. DMGs, as a well-established model for deer management across the uplands, came under particular scrutiny in the RACCE evidence sessions in 2013, with a particular focus on the extent to which deer management plans were directing decisions and leading to positive change on the ground. In response to this challenge, the ADMG led the development of an industry benchmark, which combined with a set of public interest indicators developed by SNH, form the basis of a DMG assessment process.

The ADMG has promoted this approach to all DMGs and been instrumental in substantial and rapid change in performance of DMGs and a notable increase in deer management planning across the sector since 2013. This has been facilitated by SNH through a dedicated support fund and advice on the development of effective deer management plans.

Alongside this change in approach within upland DMGs, there has been a recent expansion of management structures across the lowlands supported by the LDNS. Insufficient time has elapsed to determine whether these recent changes to the voluntary system will address the remaining gaps in management structures or lead to measurable changes in effective deer management practices.

3. Deer Populations and Trends

Key Findings

1. Between 1961 and 2000, red deer densities on the open hill have increased markedly, with a 60% increase since 1961 reaching a peak in 2000-01. Since 2000-01, the previous 40-year trend of increasing deer density appears to have stopped.
2. There are marked variations in red deer density trends at DMG scale. Over extensive areas of the red deer range, densities have continued to rise or remain high. The underlying causes of these are being examined and will be reported early in 2017.
3. Up-to-date national population estimates for red and roe deer are required. There is no systematic monitoring of roe deer across all of their range. SNH is working with the James Hutton Institute to provide an up to date estimate for red deer numbers across their main open-hill-ground range. Previous estimates for red deer were between 360,000 and 400,000.
4. The population of deer in woodland habitats is estimated to be between 210,000 and 250,000. The red deer component is estimated to be between 85,000 and 105,000, with the roe, Sika and fallow deer ranging between 125,000 and 145,000.
5. National trends for woodland deer populations are uncertain due to challenges in data collection. Estimates for private woodlands suggest the deer population is stable or possibly declining slightly. On National Forest Estate land, estimates point to a 24% decline for all deer species combined between June 2001 and June 2016.
6. Over the last 15 years, the total number of red deer reported to have been culled peaked in 2004-05, decreased substantially to its lowest level in 2011-12, but by 2014-15 had returned to 2004-05 cull levels (over 68,000).
7. The number of roe deer reported to have been culled has increased substantially in the last 15 years (from 26,214 in 2001-02 to 38,628 in 2014-15), largely driven by the increased culling of deer in woodland.

Introduction

This chapter provides a national picture of deer numbers and trends in Scotland. There is no definitive figure for the size of the overall population of deer. We have used the most recent data and analysis available to provide a national picture. Furthermore, we have commissioned The James Hutton Institute to undertake further analyses of data at the DMG scale in order to show regional variations for red deer.

There are four species of wild deer in Scotland. Roe deer and red deer are native to Scotland, colonising naturally after the end of the last glaciation around 10,000 years ago. Sika and fallow deer have become established as a result of deliberate releases and escapes from deer parks. Annex 2 provides UK-wide distribution maps of red deer, roe deer, Sika and fallow deer as recorded in 2007 and 2011, compiled by the British Deer Society in 2013.

Roe deer are widespread throughout Scotland (absent from some islands), and are the commonest of the deer species in the lowlands, particularly in the central belt. They are generally found in open mixed, coniferous or purely deciduous woodland, particularly at edges between woodland and open habitats.

Red deer are distributed across much of northern Scotland, Argyll, the Trossachs and Galloway occupying a variety of habitats – on open moorland as well as in coniferous and deciduous forests and woodlands. Red deer have adapted to the open habitats which dominate much of the Scottish uplands. However, they are woodland animals by preference and make use of any available woodland for shelter and foraging.

Fallow deer occur in isolated populations around areas in which they were originally kept in captivity. **Sika** deer, first introduced in the 19th century, can hybridise with red deer and have steadily expanded their range so that it now occupies some 40% of the red deer range; it can be difficult to visually distinguish Sika hybrids from 'pure' red deer.

Since the extirpation of the wolf, deer have no natural predators in Scotland and there is therefore a tendency for deer populations to increase. As the populations of fallow and Sika deer are relatively small, the focus of this chapter is on the native red and roe deer.

National Population Estimates

Deer are highly mobile, living on the open hill and in woodland as well as agricultural land and urban areas. Obtaining an accurate estimate of populations across the whole of Scotland is complex, difficult and expensive.

The Red Deer Commission (RDC) and its successors the Deer Commission for Scotland (DCS) and SNH have been counting red deer in open-hill ground in Scotland since the 1960s. Initially, counting was done on foot whereby teams of counters covered the ground in a line using binoculars or telescopes to spot deer. More recently, helicopters and digital cameras have been used which reduce disturbance to deer and potentially improves the accuracy of the counts.

It is more difficult to estimate abundance of deer in forest environments and this has led to the use of indirect survey methods such as faecal pellet group counts, otherwise known as 'dung counting'. Deer counts on the National Forest Estate use this method. Red deer dung

can be distinguished in the field from other species due to its size, but separating roe, Sika and fallow deer can be more difficult and error-prone.

Estimating the total roe deer population size (the commonest species in the lowlands) is difficult because most animals seek refuge in cover and there is no systematic monitoring across habitats. There are 'guesstimates' that the UK population is around 500,000, with about 70% being in Scotland¹.

The range of roe deer is evidently expanding, particularly in parts of England and Wales. On the Scottish mainland, they occur everywhere except a few isolated parts of the north west coast¹. There is some evidence from the British Trust for Ornithology (BTO) for an increase in abundance and range expansion in Scotland between 1996 and 2015. In 1995 roe deer were detected in 30% of sample squares; in 2015 they were detected in 39% of squares². The data are based on a relatively small sample and collected as part of the BTO breeding bird survey³, so caution is needed in drawing firm conclusions.

Deer in open-hill habitat

Open-hill red deer have been counted and recorded since around 1960. The purpose of these was principally to inform management of deer populations at a local scale. Counts were repeated fairly frequently or at regular intervals and were often in response to a recognised need for deer control to reduce impacts on habitats. The detrimental impacts of local deer populations have been the main driver behind the timing and spatial structure of deer counts since 2002. Therefore, surveys have not been designed with a view to estimating national red deer populations. Nevertheless, attempts have been made to estimate the overall number of red deer in Scotland by various methods using the same source data. The figure of 360,000 – 400,000 presented in the report to RACCE in 2013⁴ was based on work by Clutton-Brock *et al.*⁵ who estimated the population of red deer in open-hill ground for the year 2000.

An up-to-date estimate for red deer in open-hill ground is being devised by SNH in partnership with the James Hutton Institute (JHI), using counts of deer at the estate level.

Deer in woodland habitat

All wild deer species are found within woodlands with roe being the most abundant. Roe deer are distributed widely across Scotland throughout a variety of habitats including urban areas and agricultural land. There are currently no surveys or sampling schemes which cover the extent of roe deer distribution and therefore it is extremely difficult to estimate roe population size. The most recent estimate of 200,000 – 350,000 animals was documented in the report to RACCE in 2013⁴. Previous estimates have included one from Shedden⁶ who reported a population of 305,000 – 400,000 in 1993.

Deer densities within the National Forest Estate (NFE) are regularly calculated at a local scale. The NFE covers over 650,000 ha of forest, woodland and open ground. This amounts to almost 9% of Scotland's land mass⁷. Sampling of the NFE is not necessarily repeated regularly or consistently across the whole area, but is instead organised in response to management objectives and deer impacts – for example, forest re-stock sites. Nevertheless, there were enough repeat surveys from recent years from a proportion of NFE sites for a woodland deer population to be modelled using local density estimates and cull data. Results from the population model relating to the sample of NFE sites were extrapolated to the whole NFE to give rough estimates for total populations in the whole NFE⁷. The

estimate for red deer in the NFE was 40,000 – 45,000 and for the remaining species (roe, Sika and fallow) the estimate was also 40,000 – 45,000 deer⁷.

Private woodlands in Scotland cover around 945,000ha, but there are few data on deer abundance or densities in these woodlands. Cull records from the private sector are submitted annually to SNH and data on the structure of private woodlands are available from the National Forest Inventory (NFI). The composition of private woodlands is broadly comparable to wooded areas of the NFE with a key difference being a higher percentage of broadleaf and lower percentage of mature conifers in private woodlands⁷. This suggests that private woodlands should be as suitable, if not slightly better, than the NFE for deer⁸. Using recruitment rates derived from cull data and a basic rule of thumb used by NFE managers for estimating deer numbers*, a 'ballpark' figure of 130,000 – 160,000 deer was estimated for private woodlands⁸.

By combining the evidence for NFE and private woodland a rough estimate of woodland deer populations in Scotland amounts to 210,000 – 250,000. Table 3.1 illustrates the breakdown by species and woodland type.

Table 3.1. Estimates of deer populations in woodlands in Scotland derived from population modelling.

Estimate Type	Roe / Sika / Fallow	Red	ALL	Comments
NFE woodlands	40,000 to 45,000	40,000 to 45,000	80,000 to 90,000	Based on land mass estimates and extrapolations from modelled data
Private woodlands	85,000 to 100,000	45,000 to 60,000	130,000 to 160,000	Based on scaling-up of national cull levels, using recruitment rate data contained within the cull records and other available indicators of population performance and trajectory
ALL Woodlands	125,000 to 145,000	85,000 to 105,000	210,000 to 250,000	Combined estimates based on all modelling exercises

Trends: Deer in Open-hill Habitat

The JHI is undertaking a detailed analysis of counts of red deer in open-hill ground at the estate level. Here, we present the latest findings from the interim report⁹. The report is expected to be completed in early 2017.

The results indicate that the population of red deer in open-hill ground in Scotland has been increasing. Data from 1960 - 2016 show that deer density increased steadily since 1961 (around 8 deer/km²), and peaked in 2000-01 at around 13 deer/km² – an increase of 60%. In the last 15 years, the population growth appears to have halted and the estimated deer density in 2016 is around 12.5 deer/km². Figure 3.1 illustrates the changes in deer density (stags, hinds and calves) since 1961. The trend supports the contention made by Clutton-Brock *et al*⁶ that the population growth rate was slowing by 2000.

* If the cull being taken keeps the population stable then it is likely that the total population present is approximately 5 – 6 times larger than the cull itself. If the population is declining then a factor of 3 – 4 might be more appropriate.⁷

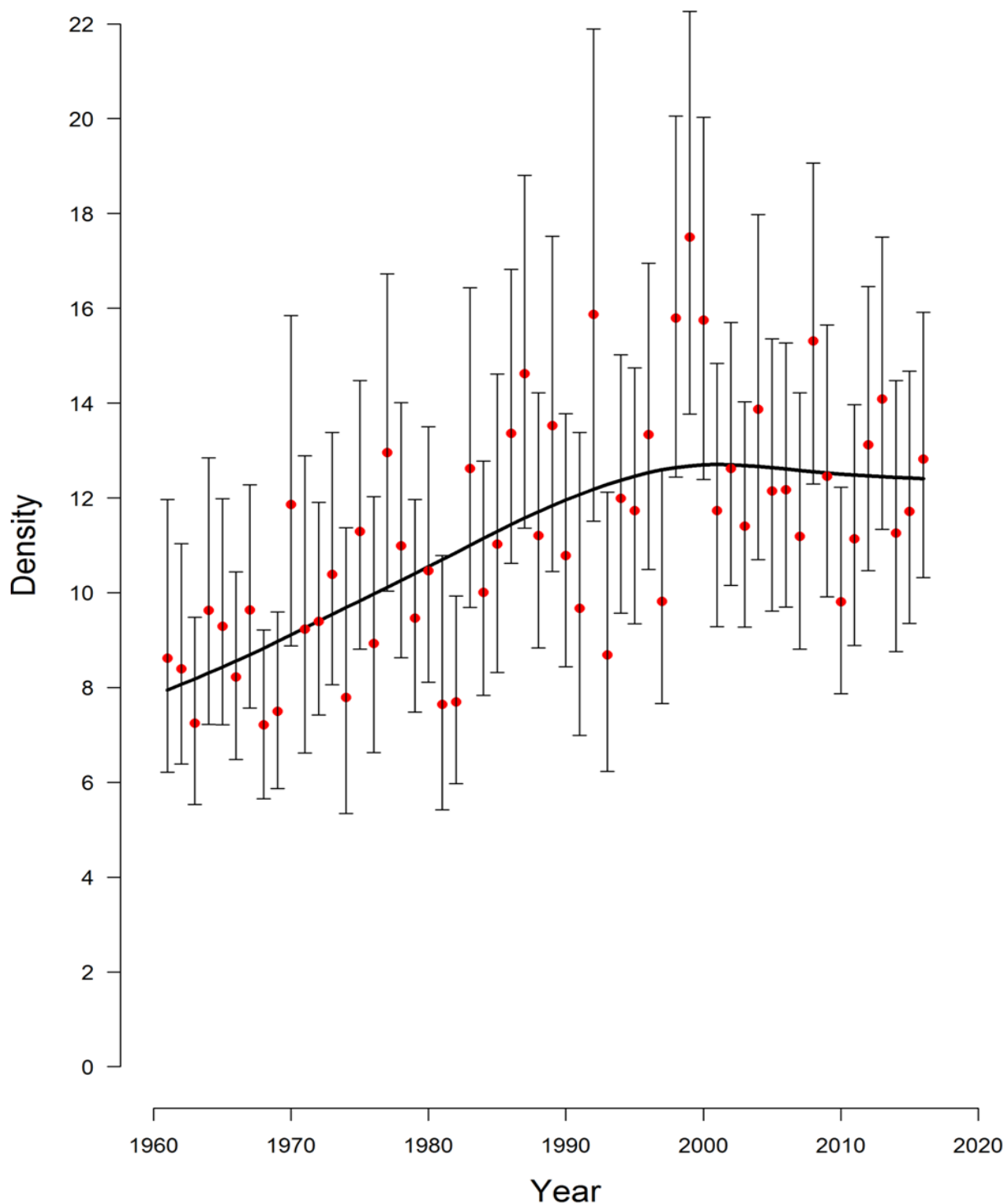


Figure 3.1. Annual estimates (red dots) between 1961 and 2016 of the mean red deer density (deer/km²) on open-hill ground across Scotland. The curved black line shows the overall trend. The annual estimate confidence intervals are shown by the vertical grey bars.

Since the outbreak of foot and mouth disease in 2001, and reform of the EC Common Agricultural Policy (CAP) in 2005, the reductions in hill sheep numbers which share the red deer range, at least in summer, has been dramatic¹¹. In the last decade, the sheep population in Scotland has decreased by 15% (see Annex 3). The reduction in sheep will reduce grazing pressure which will in turn allow more grazing to be available to support deer. As well as influencing deer densities, it may also have influenced deer behaviour; there are marked differences in trends and densities across the country. Work with the JHI is investigating the underlying causes of national and regional changes. The interim results describing the status and patterns of change are summarised below⁹.

In general, red deer densities are lowest in the north west and Outer Isles, as well as in areas on the north border of the Central Belt (Figure 3.2a,b). Deer densities are higher in the central mountain massif both west of the Great Glen (particularly South Ross, but also Glenelg, Knoydart, West Lochaber and Moidart) and east of the Great Glen, including Breadalbane, East Loch Ericht and Tayside (Figure 3.2a,b).

Trends in deer density vary markedly between DMGs. Figure 3.2c illustrates trends in red deer density in DMGs since 1961. Population modelling by the JHI, which takes account of the different areas covered by DMGs, suggests densities have continued to rise or remain high over extensive areas of the red deer range (Figures 3.2a, 3.2b and 3.2c). (West Loch Lomond has not been included as there were only two counts and thus will not show a trend.)

Fairly large DMGs with high densities and where the densities have increased from 2000 to the present include South Ross (13% increase, present density estimated to be 17.1 deer/km²), Tayside (12% increase, present density estimated to be 24.3 deer/km²) and Moidart (20% increase, present density estimated to be 15.7 deer/km²) (Figures 3.3a and 3.3b).

Densities have also increased substantially in some of the smaller DMGs with lower densities, including Mull, Inveraray/Tyndrum and East Ross; present densities are estimated to be between 12.7 to 16 deer/km². Populations have also increased in Northern DMG and the Uists (Figures 3.3a and 3.3b).

Several DMGs have shown little change in deer density between 2000 and 2016. Examples of those with moderate-to-high densities include West Sutherland, North Ross, Arran, Morvern, Blackmount, East Loch Ericht and Jura (Figure 3.2c).

For a number of DMGs, deer densities have reduced since 2000, but the densities are still high. Deer density for Breadalbane has reduced by 30%, though the present density is estimated to be around 12.7 deer/km². In East Grampian the density has reduced by 20%, with the present density estimated to be 11.6 deer/km². Densities for Glenelg, Knoydart and West Knoydart have also reduced, though to a lesser extent since 2000. Present densities are still high (between 13.6 to 15.1 deer/km²).

DMGs with low-to-moderate densities which are declining include Cairngorm/Speyside (72% decline), East Loch Lomond (33% decline) and Balquhiddar (27% decline). Deer densities are estimated to be between 1.9 and 5.4 deer/km². North Sutherland and Harris/Lewis have low densities which have remained relatively stable between 2000 and 2016 (Figure 3.2c).

Declines in deer densities in some areas began in the 1990s (Cairngorm-Speyside and Strathhtay) or even earlier (Rum, Glenelg and West Knoydart). Figure 3.2c shows the decline in deer density on Rum National Nature Reserve since the 1960s. Long-term research¹⁰ on the Isle of Rum has provided useful insights into the relationships between deer density and

productivity. The study showed that reducing deer density, especially hind density, increases calving rates, the proportion of stag calves born, calf and yearling survival (especially in stags) and antler size. Stag emigration is also reduced.

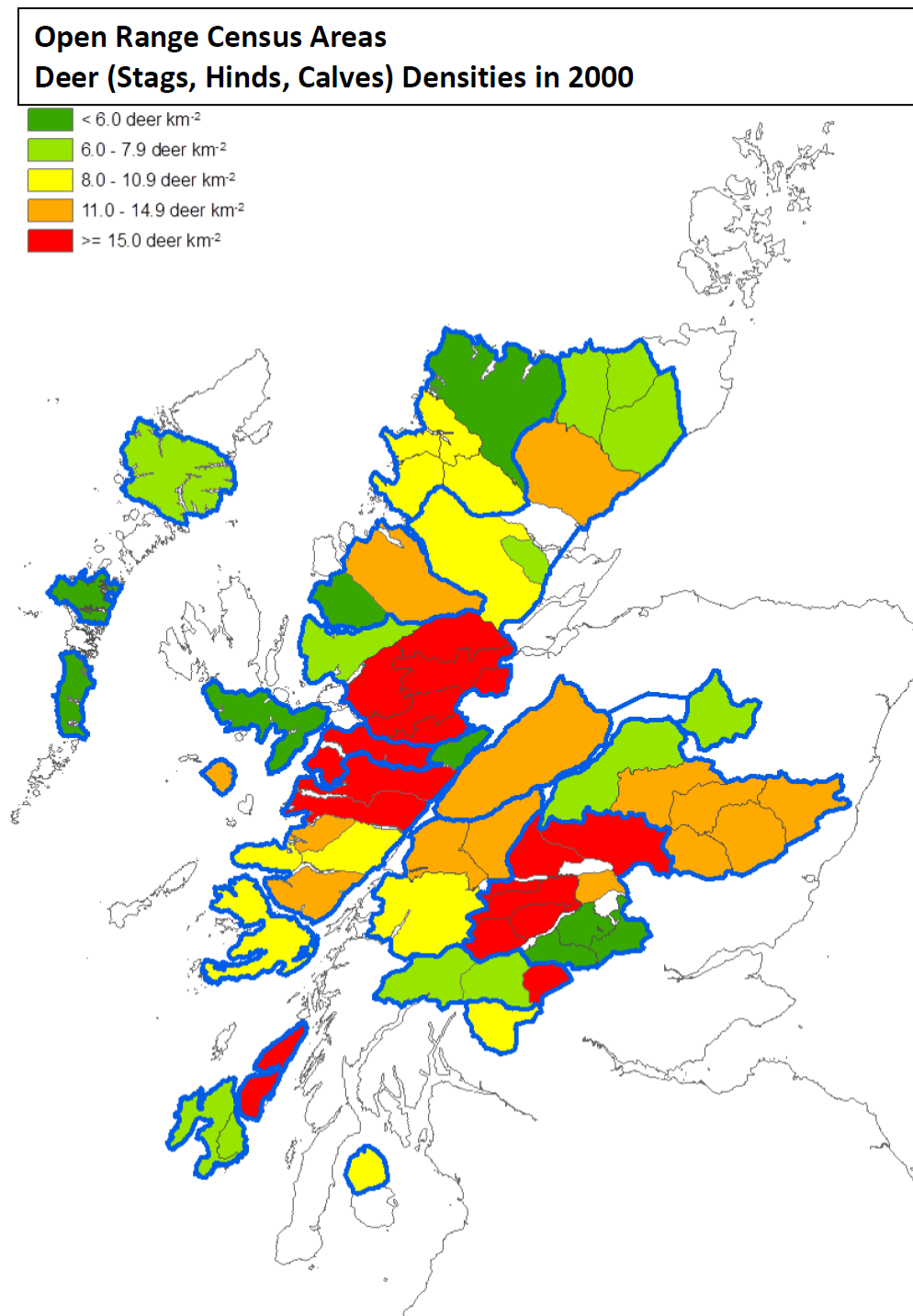


Figure 3.2a. Comparative estimates of red deer density (stags, hinds and calves) in open range census areas across Scotland in 2000.

Open Range Census Areas Deer (Stags, Hinds, Calves) Densities in 2016

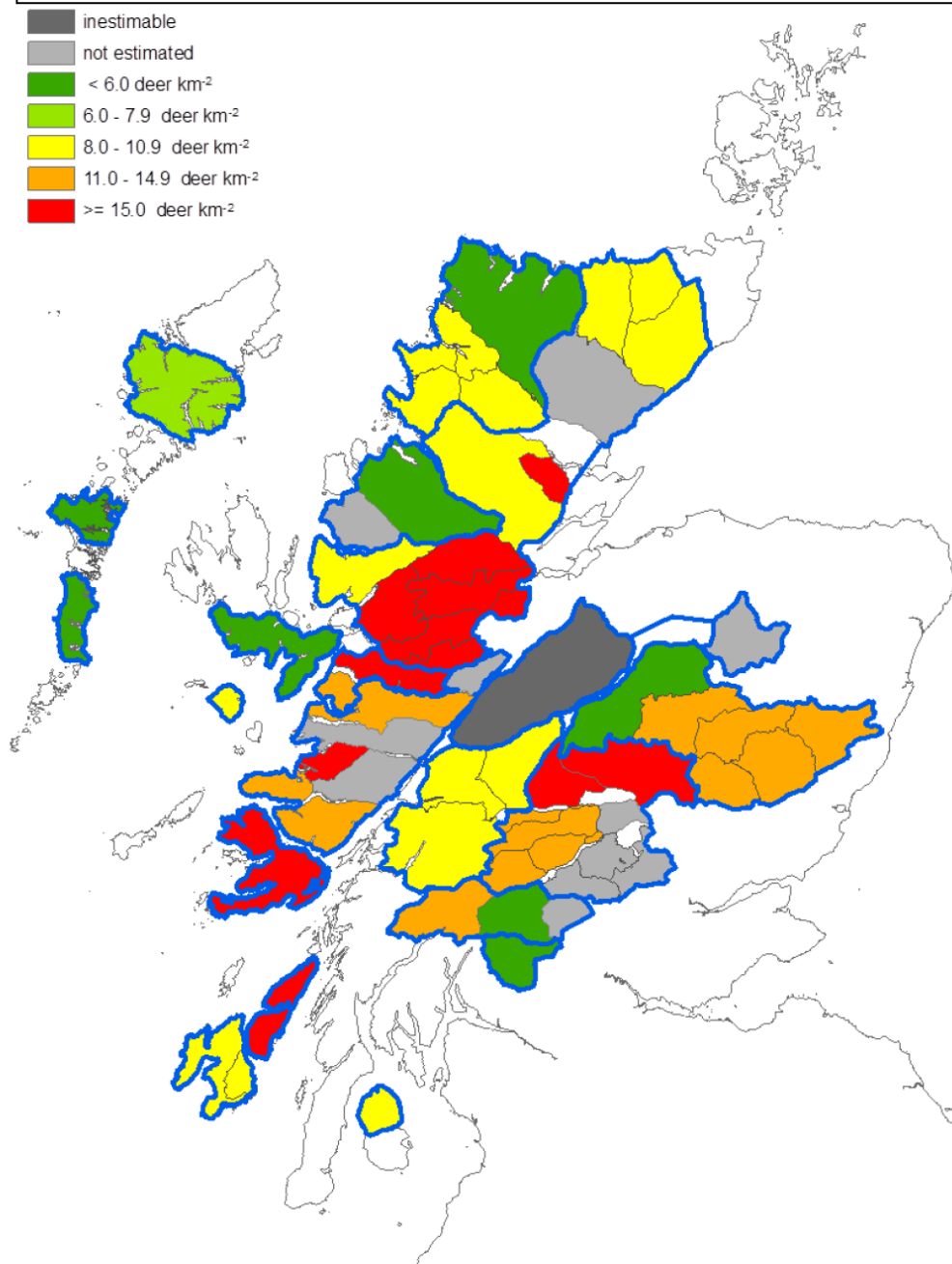


Figure 3.2b. Comparative estimates of red deer density (stags, hinds and calves) in open range census areas across Scotland in 2016. DMGs not counted since 2011 are 'not estimated' (light grey). No estimate is given for the Monadhliaths (dark grey) as data are currently being analysed.

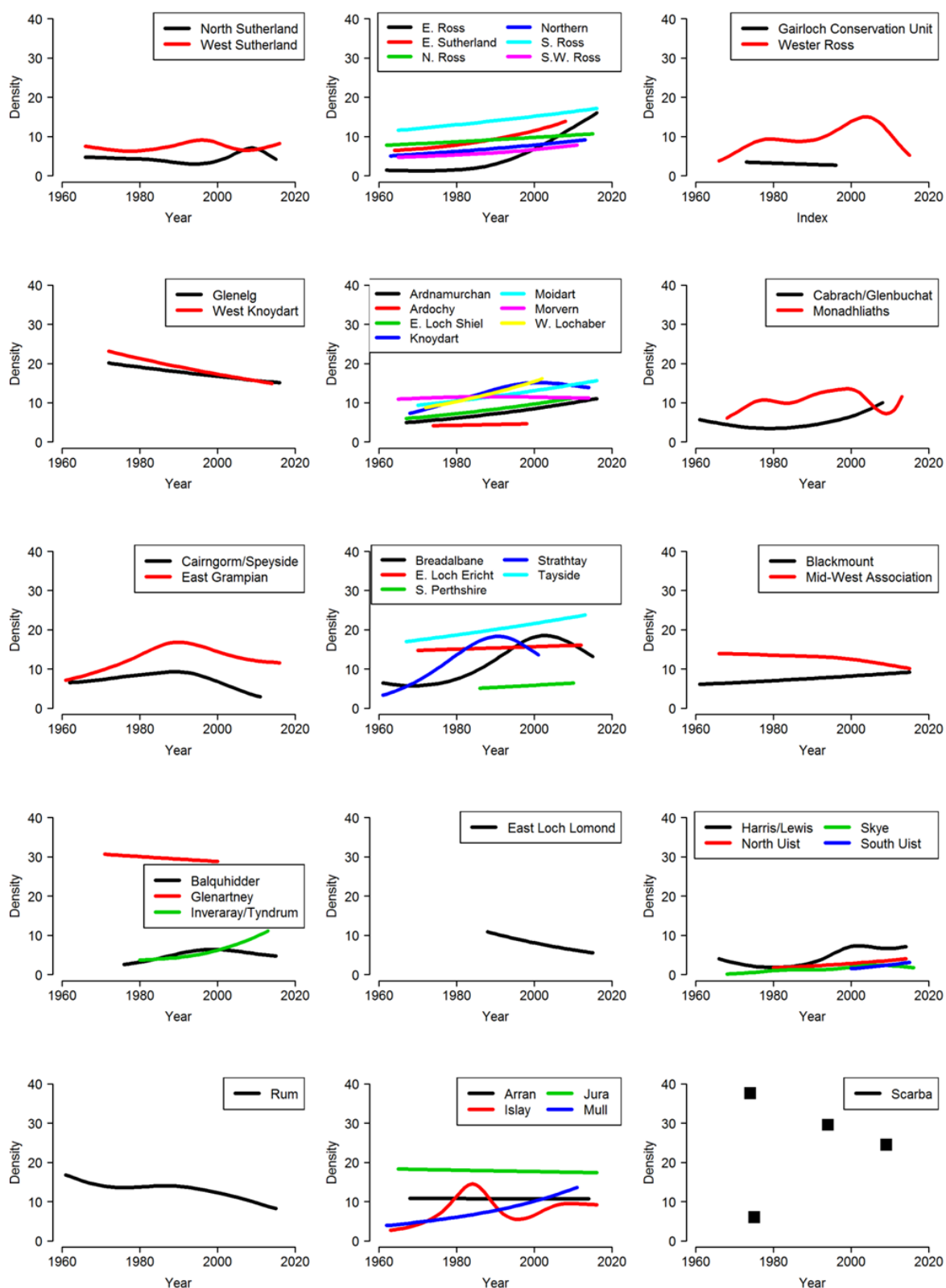


Figure 3.2c. The trends in red deer density (stags, hinds and calves) since 1961 in DMGs, aggregated into zones, where two or more adjacent DMGs have similar trends.

Open Range Census Areas

% Change in Deer (Stags, Hinds, Calves) Densities (2000 - 2016)

- not estimated
- > 20% decline
- 5% - 20% decline
- no change
- 5% - 20% increase
- > 20% increase

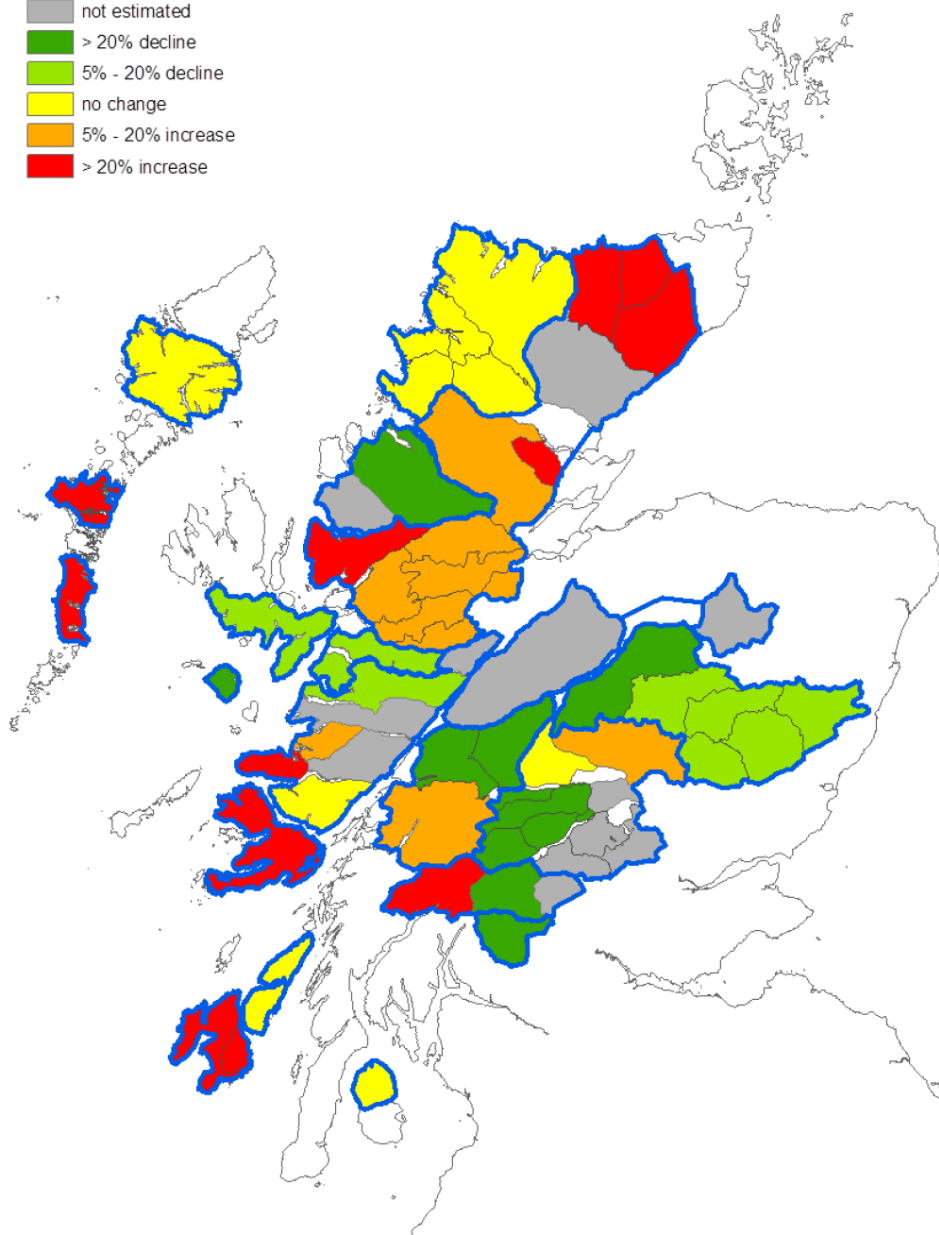


Figure 3.3a. Estimates of the percentage change in red deer density (stags, hinds and calves) in open range census areas across Scotland between 2000 and 2016. DMGs not counted since 2011 are 'not estimated' (light grey).

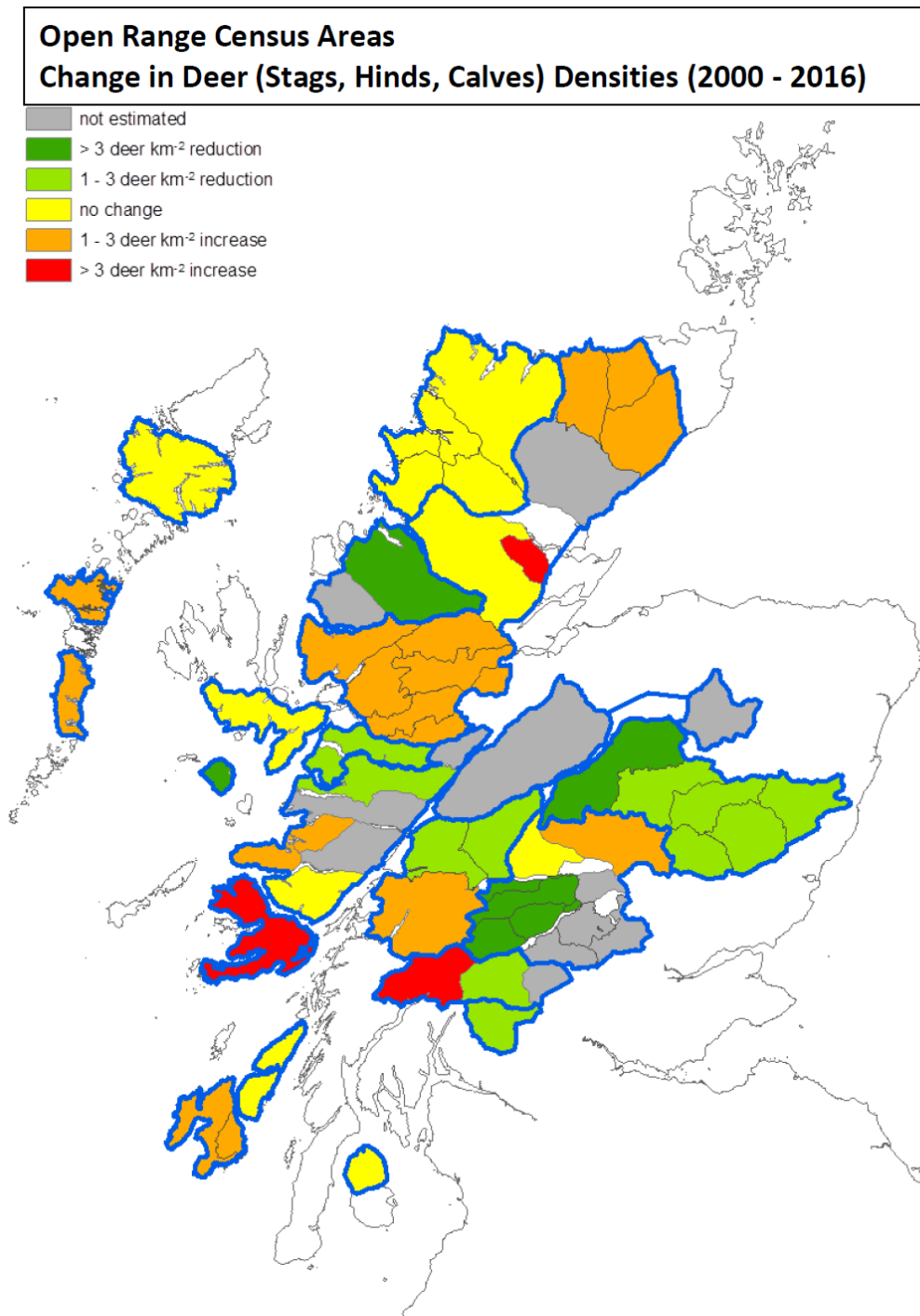


Figure 3.3b. Estimates of the change in red deer density (stags, hinds and calves) in open range census areas across Scotland between 2000 and 2016. DMGs not counted since 2011 are 'not estimated' (light grey).

Trends: Deer in Woodland Habitat

Recent work has been undertaken to compile deer density data for the National Forest Estate. The national dataset on dung counts provides an estimate of deer density in woodlands. Along with cull data, population models were developed for 32 sites covering around 248,000ha (equivalent to 38% of the NFE landholding).

Results from the population model of woodland deer in the NFE suggest that the abundance of all deer species has decreased since 2001-02⁸. This has been particularly apparent since 2014-15. On NFE land, there has been an estimated 24% decline for all species between June 2001 (estimated density of approximately 16.5 deer/km²) and June 2016 (estimated density of approximately 12.5 deer/km²). Roe/Sika/fallow deer are estimated to have declined by a third, and red deer by 12% (Figure 3.4). (The costs associated with deer management on the NFE are provided in Chapter 5).

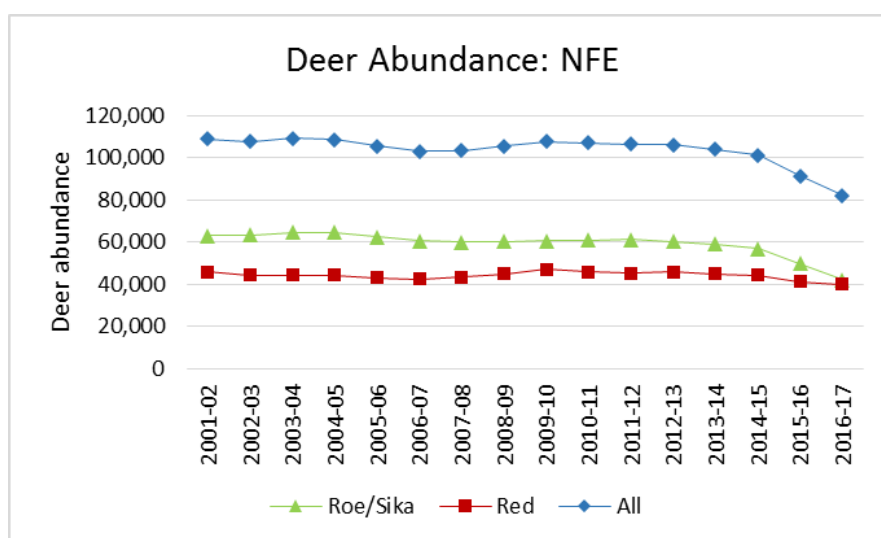


Figure 3.4. National trends for extrapolated deer abundance estimates across the whole NFE.

Trends in private woodland come with greater uncertainty. Based on evidence of culls, recruitment and habitat suitability, it would appear that the deer population in private woodlands is stable or possibly declining slightly. Together with the estimated trends for the NFE, this suggests that overall the woodland population of deer in Scotland is declining slowly⁷. There is variation at the local level which is influenced by a number of factors including species density, recruitment rates, culling tactics and forest structure⁸.

Cull Data

Cull data are reported to SNH by both public and private sectors every year. Data are recorded by species, annual cull season (year), sex and age class (male, female or calf), estate, the organisation conducting the cull, DMG (where applicable), habitat of cull location, and whether the animal was culled in or out of 'season'. Data are available for four deer species – red, roe, Sika and fallow – across mainland Scotland as well as the Inner and Outer Hebrides. Cull data for fallow and Sika deer are not discussed hereafter as these represent a small proportion of the total cull.

Since 2000-01, reported red deer culls across Scotland peaked in 2004/05 then declined until 2011-12 before increasing again in recent years to a level similar to the peak year (Table 3.2, Figure 3.5). Reported red deer culls in open range habitats (including agricultural land) have varied over time, demonstrating an overall decline until 2011/12 which was followed by a slight increase to 2014-15. Red deer culls reported from woodland have increased, particularly since 2009-10 (Figure 3.6).

The number of reported roe deer culls has increased since 2000-01 (Table 3.2, Figure 3.5). The majority of roe deer (over 80%) are culled in woodland. The number of roe deer culled in open range habitats (including agricultural land) has remained fairly stable since 2000-01 (Figure 3.6).

At least a quarter of all red and roe deer culls reported in Scotland each year are conducted by FCS.

Table 3.2. Number of red and roe deer culled.

	Season 2000/01	Season 2014/15	Annual min. (season)	Annual max. (season)
No. of red deer culled	66,931	68,064	53,006 (2011/12)	68,685 (2004/05)
No. of roe deer culled	26,214	38,643	26,214 (2000/01)	38,643 (2014/15)

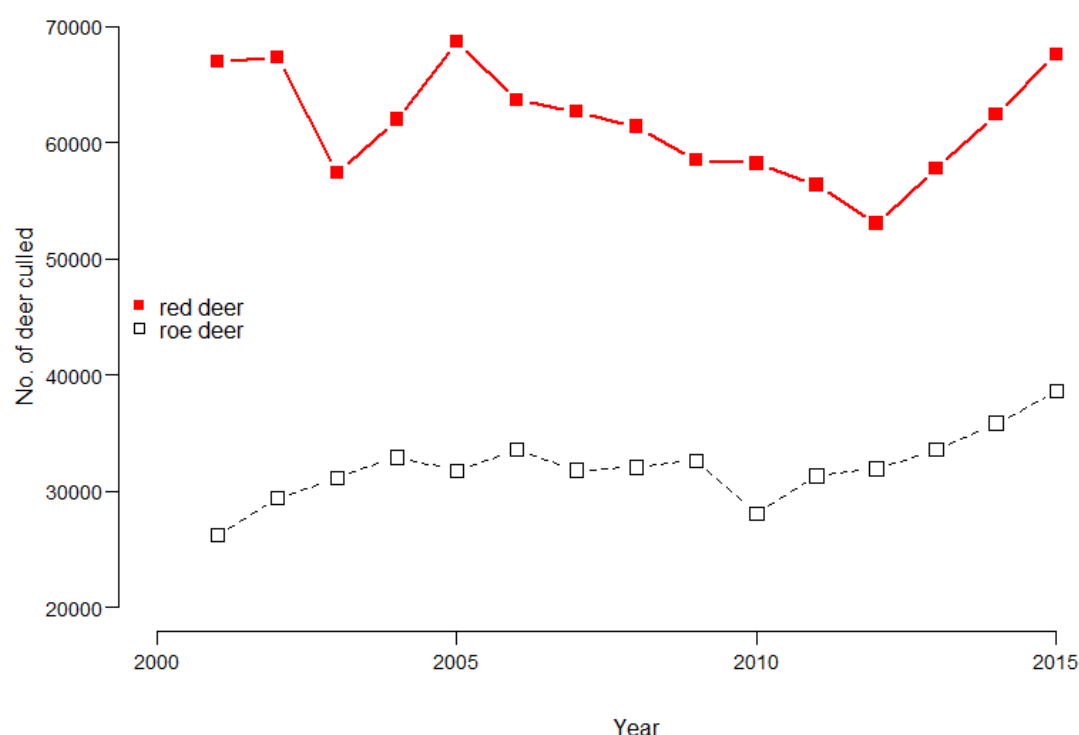


Figure 3.5. Total number of reported red and roe deer culled in Scotland from 2000-01 to 2014-15. Note: the y-axis does not start at zero.

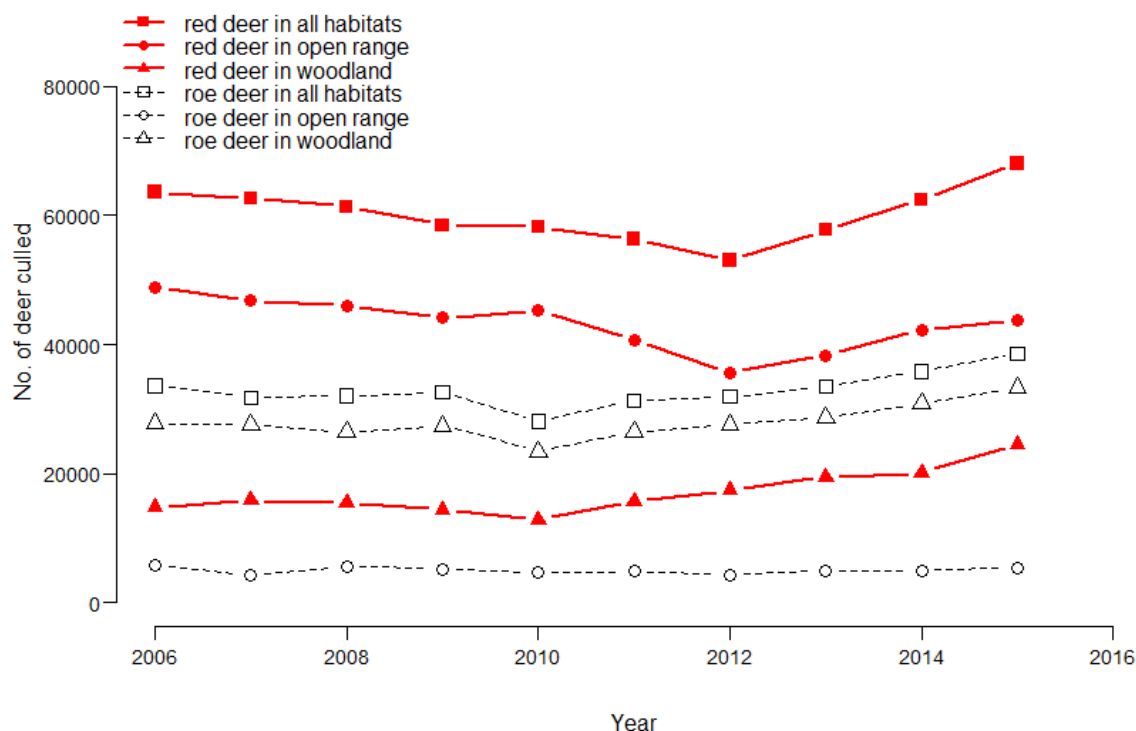


Figure 3.6. Reported number of red and roe deer culled in total and per habitat type (open range and woodland) from 2005-06 to 2014-15.

Deer population growth can be controlled through appropriate culling. As an illustrative example, the culling activities of a sample of 14 DMGs were compared with their respective predicted population increases during a one year period to determine whether the culls were sufficient to reduce the deer population in that single year. Data from one year in isolation does not allow for the temporal aspects of cull planning and/or adaptive management or the objectives of DMGs. However, the example usefully illustrates the cull levels required to manage deer populations.

If a population is to be maintained or reduced in size, the annual culls need to be equal to or greater than the annual rate of population increase (also known as recruitment). Recruitment for red deer populations was estimated using a basic population model (accessible to deer managers¹²) using spring counts of stags, hinds and calves. The calving rate was varied to account for variation within deer populations and uncertainty in the actual calving rate. If the annual cull was greater than the estimated recruitment at the maximum calving rate (40%), then the cull was deemed sufficient to reduce the population.

The sample of 14 DMGs included all those that had been surveyed at least once since 2010 and had individual count totals for stags, hinds and calves. DMGs with unclassified deer records were not included, therefore the sample is effectively all data that were available in the appropriate format within a specified time frame (2010 – 2015), rather than a random sample of all DMGs with count data. The population modelling for each DMG is based on one year of data only (season of last deer count) and is therefore only an estimate of cull sufficiency for that single year. It is a snapshot in time and should not be used to predict future trends.

Overall, there was a mixed picture (Table 3.3). From the sample of 14 DMGs, approximately two-thirds of culls (nine DMGs) were insufficient to reduce red deer populations in open-hill

ground for the years that were analysed. Five out of 14 DMGs had culls sufficient to reduce red deer populations in the study years.

Table 3.3. Results of estimated population increases for red deer populations in 14 Deer Management Groups at variable calving rates.

DMG	Season of last deer count	Actual cull total in that season	Estimated recruitment based on variable calving rates			Cull sufficient to reduce the population
			30%	35%	40%	
North west (NW) Sutherland	2011/12	1226	1150	1367	1585	Inconclusive*
Northern	2012/13	1355	1819	2160	2501	No
North Ross	2014/15	2654	2151	2557	2963	Inconclusive*
South west (SW) Ross	2010/11	453	615	731	847	No
Mid west association	2010/11	2338	1468	1747	2026	Yes
East Loch Ericht	2011/12	887	897	1066	1234	No
Blackmount	2014/15	1465	1206	1432	1657	Inconclusive*
Breadalbane	2014/15	3026	1396	1659	1922	Yes
Balquhiddar	2009/10	876	349	415	480	Yes
South (S) Perthshire	2010/11	1788	831	985	1140	Yes
Knoydart	2014/15	1082	1079	1283	1487	No ⁺
Arran	2014/15	313	222	264	306	Yes
Mull	2011/12	1147	929	1103	1278	Inconclusive*
Harris & Lewis	2013/14	426	524	623	721	No

* The actual cull falls within the range of estimated recruitment values. At lower calving rates the cull is likely to be sufficient, but not at higher calving rates.

⁺ The actual cull and minimum estimated recruitment values are very close. This population could be maintained, but not reduced, at this level of culling at the lowest calving rate.

Whilst the data above are from one year in isolation using the most recent counts, the varying results from individual DMGs can be compared with the examples of trends in estimated deer densities in DMGs illustrated in Figure 3.2c.

Culls levels and deer populations in woodland habitats

Survey work and data analyses conducted on the National Forest Estate (NFE) by Strath Caulaidh Ltd⁸ suggested that, on average, the current level of culling is resulting in declining deer densities within the NFE. However, there is also evidence to suggest that recruitment rates are increasing in areas where deer densities are decreasing⁸, so culls will need to be adjusted to account for this.

4. Environmental Impacts of Deer

The context for this chapter is the Scottish Biodiversity Strategy '[The 2020 Challenge for Scotland's Biodiversity](#)'. This strategy recognises the need to protect biodiversity and restore and enhance ecosystems which contribute to sustainable economic growth, and support wellbeing and wealth creation. The strategy is Scotland's response to international targets which call for a step change in efforts to halt the loss of biodiversity and restore the essential services that a healthy natural environment provides.

'[Scotland's Biodiversity: a Route Map to 2020](#)' published by the Scottish Government in 2015 sets out priority projects and targets to help deliver the 2020 challenge and to improve the state of nature in Scotland. The priority projects include the restoration of peatlands and native woodland as well as actions to ensure protected areas are in good condition. The first progress report for the Route Map shows that good progress has been made across many of the targets. However, two targets on native woodland planting and restoration are identified as in need of further work.

4.1 Protected Areas

Key Findings

1. Of 5,271 natural features assessed across Scotland's protected areas, 81% are in favourable or unfavourable recovering condition. For those features potentially affected by herbivores (a subset of 1,606 features), the figure drops to 75%.
2. Herbivores (deer, sheep, rabbits and hares) continue to be a major driver of unfavourable condition of natural features, particularly for upland, woodland and lowland heath habitats.
3. Woodland, upland and bird features have the highest proportion of features remaining in unfavourable condition.
4. The proportion of features in favourable and unfavourable recovering condition is 10 – 12 % lower in areas covered by deer groups compared with the rest of Scotland.
5. Section 7 Control Agreements were established in DMGs where there were particular concerns about deer impacts on natural features. The proportion of features in favourable and unfavourable recovering condition in Section 7 Agreement areas is, therefore, 7% lower compared with non-Section 7 areas.
6. The Section 7 approach appears likely to improve the condition of features by specifically reducing herbivore pressures through the introduction of agreed management arrangements.

Introduction

The purpose of this section is to present the results of SNH's Site Condition Monitoring (SCM) for protected areas in Scotland, highlighting differences in the results for features which may be affected by herbivores for different habitat types and different geographical areas. The SCM results do not differentiate between impacts from different herbivores, e.g. sheep, deer, hares etc. Further work is underway with The James Hutton Institute to assess the evidence on the extent that regional and temporal differences in deer density may contribute to variation in the condition of protected habitats.

Since 1999, SNH has assessed the condition of the most important habitats and species on protected areas across Scotland. Site Condition Monitoring is SNH's rolling six-year programme of monitoring the condition of these natural features in these protected areas. It informs our understanding of the influences of land management and other factors on these features, and enables us to determine whether each natural feature is in favourable condition (i.e. all, or the majority of, targets have been met) or not. The condition assessment is carried out by collecting field data on key 'attributes and targets' for each feature (e.g. specified habitats and species). These provide indicators of the condition of features, and by looking at them over time, we can determine if a feature is changing. The underlying causes for features being in unfavourable condition are not always apparent (e.g. whether the balance of herbivore pressure relates to wild herbivores or domestic stock).

Protected areas encompass Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites. There are 5,355 natural features (all terrestrial, freshwater and marine features) hosted on 1,866 protected areas in Scotland, covering a range of habitat types, species populations and earth science formations. Out of the total of 5,355 features, the condition of 5,271 features has been assessed to date. The results¹ are published annually in [Official Statistics](#) reports.

The SCM results have been grouped into the following categories:

Favourable	All, or the majority of, targets have been met
Unfavourable Recovering	One or more targets in the field have not been met, but measures are in place such that signs of recovery are observable on the ground, and in the fullness of time will result in favourable condition being achieved
Unfavourable Recovering Due to Management	Following an unfavourable SCM assessment, management measures have been put in place to address the known causes of unfavourable condition
Unfavourable	One or more targets have not been met and the long term viability of the natural feature is likely to be compromised if remedial action is not taken

Owing to the sampling approach used to monitor features in the six-year monitoring cycles, there may be several years between assessments of the same feature. During this time, management practices may change in order to address an unfavourable assessment. Where this has occurred, but the feature has not been re-assessed, an 'interim condition assessment' known as Unfavourable Recovering Due to Management (URDTM) is assigned to the feature.

For the purposes of this report, only the results for natural features where the presence of herbivores may have an effect on a natural feature (e.g. grazing, trampling) have been analysed. The analysis has excluded data from Orkney and Shetland, as these islands are outwith the natural range of wild deer populations. This subset of features analysed is hereafter referred to as 'potentially affected by herbivores'.

The number of features potentially affected by herbivores is 1606, comprised of the following broad feature types:

Upland	739
Woodland	481
Lowland Grassland	136
Lowland Heath	33
Vascular Plants	115
Moorland and Woodland Birds	102

Grazing has a crucial influence on many of the habitats and species in Scotland. For many open habitats, such as grasslands and heath, some level of grazing is required to prevent the encroachment of scrub, bracken or rank grasses, which can reduce the species diversity. In a woodland context, some level of grazing is desirable, for example, to create seedbeds through hoof marks. Grazing levels must, however, be in balance with the habitat - too much grazing can reduce species diversity as the more palatable species are grazed out. Looking across the features likely to be affected by herbivores, it is apparent that overgrazing is a much more significant issue than undergrazing. Of the 1606 features examined, 56% of features have a negative overgrazing pressure identified, compared with only 9% having negative undergrazing pressures. The following analysis therefore focuses on overgrazing impacts.

The Condition of Natural Features in Scotland

Table 4.1 summarises the SCM results for all natural features in Scotland¹ and provides a comparison with those from the smaller sub-set of data comprising only those features potentially affected by herbivores.

Table 4.1. Results for Scotland for all features and features potentially affected by herbivores.

	All features (5,271 features)	Features potentially affected by herbivores (1,606 features)
Favourable	67%	48%
Unfavourable Recovering	6%	11%
URDTM	8%	16%
Favourable and recovering total	81%	75%
Unfavourable (with herbivores a negative pressure)	6%	19%
Unfavourable (but no herbivore pressures to address)	13%	6%

The results show that for all features, 81% are in favourable and favourable recovering condition. For only those features potentially affected by herbivores, 75% are this condition.

For those features potentially affected by herbivores, a higher percentage is in unfavourable condition. From the 2016 Condition of Protected Areas Official Statistic¹, of all the negative pressures with impacts on features, 18.4% relate to overgrazing, second only to the pressure of invasive non-native species at 20%.

Figure 4.1 summarises the breakdown of results for the six different feature types identified as being potentially affected by herbivores.

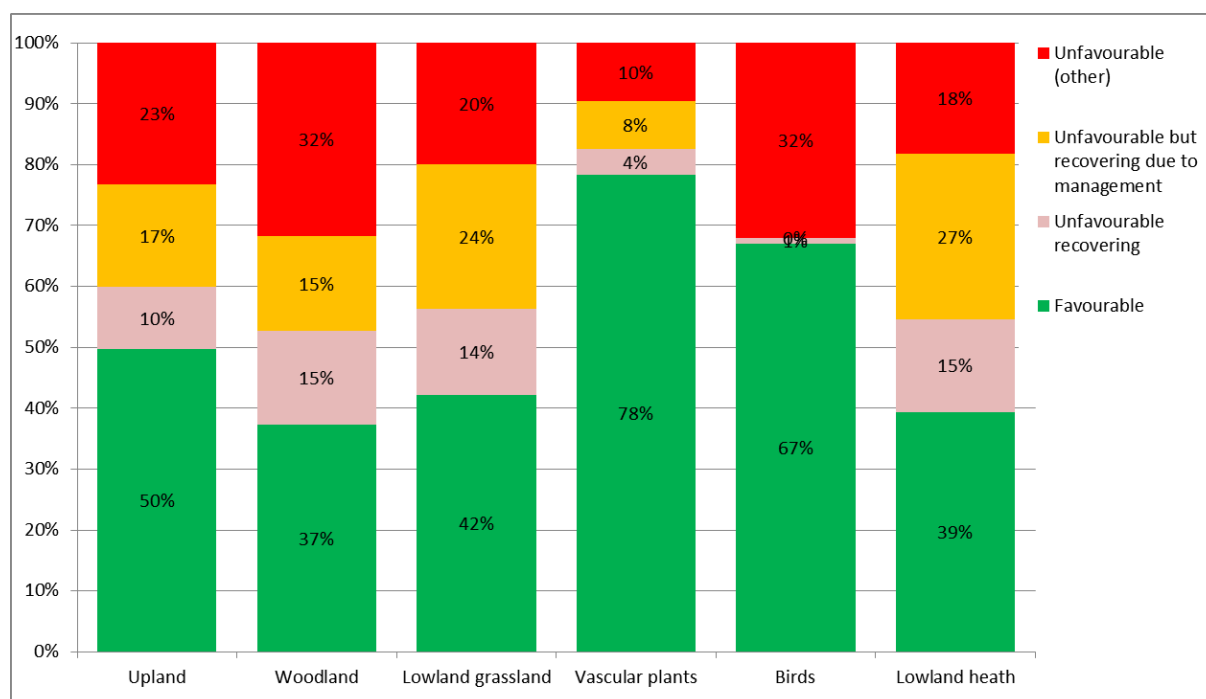


Figure 4.1. SCM results across the six feature types potentially affected by herbivores

This shows that there is considerable variation in the proportion of features in favourable and recovering condition across the feature types, with the level of unfavourable condition of woodland features the highest among habitats and birds highest among species.

The results suggest there has been more success in putting in place remedial management for lowland features (grassland and heaths) than for uplands or woodlands. This may be a function of the scale of the area where remedial action is needed (the lowland features tend to be smaller with fewer owner/occupiers), the type of pressures addressed and the sorts of grazing issues tackled (i.e. domestic stock more readily managed than wild herbivores).

Analysis of the pressures and herbivore target indicators from the SCM data shows the degree to which herbivore pressures need to be addressed in order to improve unfavourable features. The analysis for features which are assessed as unfavourable is summarised in Figure 4.2. This shows that, with the exception of bird features, the majority of unfavourable features require reductions in grazing pressures. Addressing grazing pressure is complicated, in particular for the uplands where a high percentage of unfavourable features require herbivore management. This is because over some extensive areas, deer, sheep and mountain hares are in combination having adverse impacts.

The slightly lower proportion of herbivore pressures associated with unfavourable woodland and lowland grassland features is likely to reflect the degree to which invasive species (native and non-native) influence condition on these habitats.

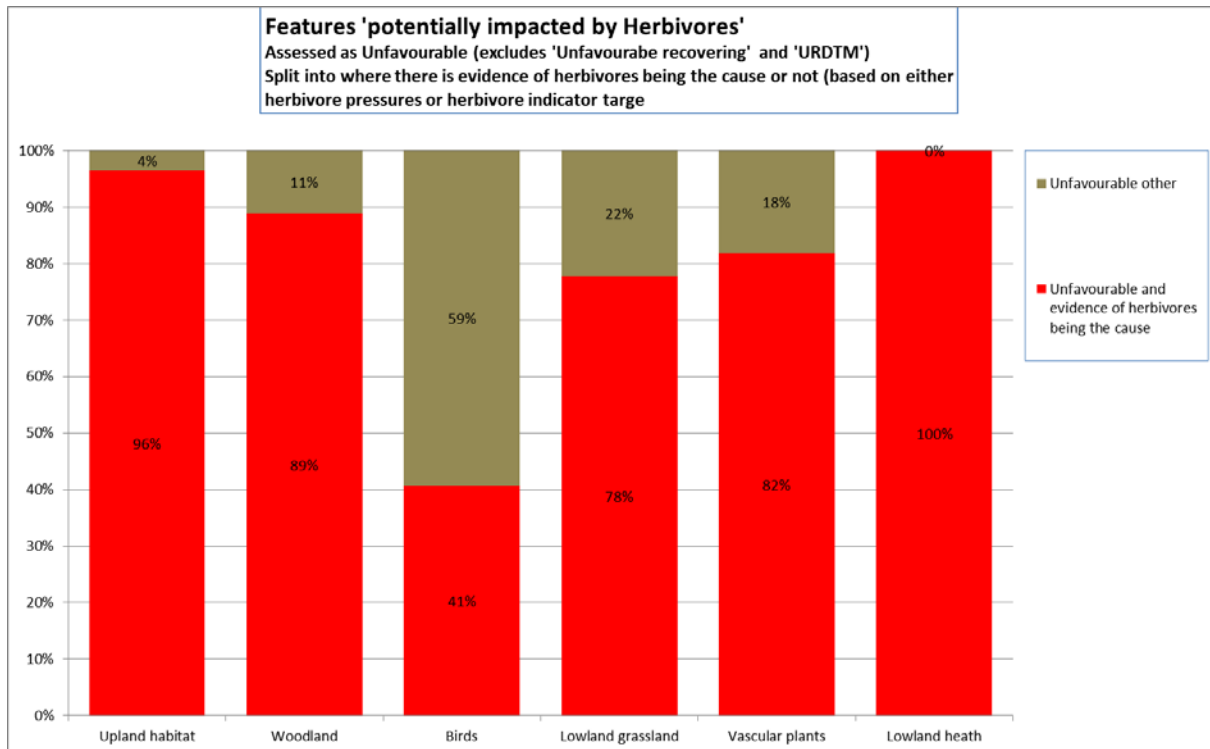


Figure 4.2. Proportion of features assessed as unfavourable due to herbivores or other pressures.

Results for Different Geographical Areas

The results for features potentially affected by herbivores are given for three geographical areas according to the type of deer management in place:

- areas covered by DMGs
- areas covered by LDGs
- the rest of Scotland i.e. areas where there is no formal deer group influencing management

Figure 2.1 (in Chapter 2) shows the distribution of groups involved in managing deer. Table 4.2 shows the proportion of the different feature types within these three geographical areas.

Table 4.2. Proportion of features (potentially affected by herbivores) within different geographical areas.

Feature Types	Percentage of features (potentially affected by herbivores) within different areas		
	% Features in Deer Management Groups	% Features in Lowland Deer Groups	% Features in the Rest of Scotland
Birds	7.9	5.3	2.5
Lowland Grassland	3.6	17.4	16.3
Lowland Heath	0.7	3.4	5.2
Upland	54.5	35.8	27.9
Vascular plants	7.2	5.3	8.6
Woodland	26.1	32.8	39.6
	100	100	100

This table shows that the profile of features within the LDG areas more closely resembles the profile for the rest of Scotland than DMG areas. There is a much higher proportion of upland features in DMGs compared with LDGs and the rest of Scotland. Conversely, DMGs have a very small proportion of lowland heath and lowland grassland features compared with the other areas.

However, Figure 4.3 shows that LDG areas more closely resemble DMG areas, particularly for the percentage of features in unfavourable condition. The proportion of features in favourable and unfavourable recovering condition is 10 – 12 % lower in areas covered by LDGs and DMGs compared with the rest of Scotland.

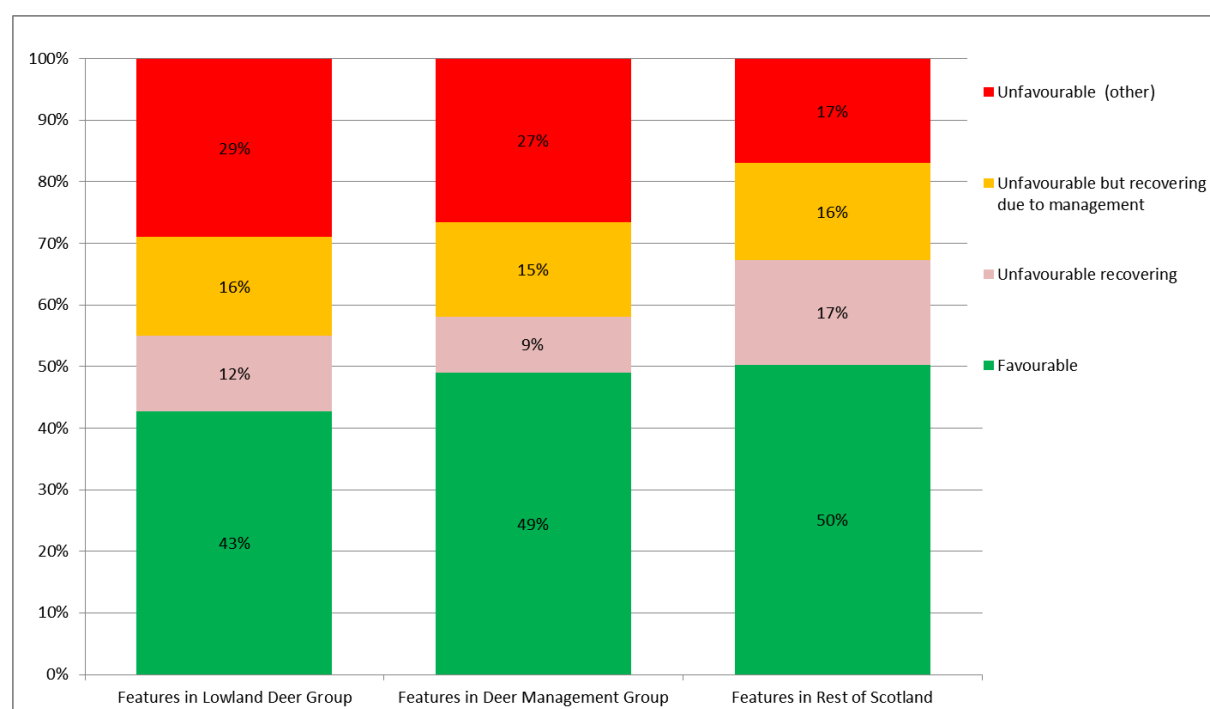


Figure 4.3. SCM results for features potentially affected by herbivores across three geographical areas.

Closer alignment of the condition results for LDGs and DMG appears to be a function of the underlying negative pressures that are causing unfavourable condition. However, overgrazing pressures alone do not account for the closer alignment in condition of features within these areas. Hence, of:

- 267 unfavourable features encompassed by DMGs, 91.8% have herbivore pressures identified as a negative influence
- 76 unfavourable features in LDG areas, 78.9% have herbivore pressures
- 55 unfavourable features in the rest of Scotland, 78.1% have herbivore pressures identified as a negative influence.

These figures suggest that other pressures, such as non-native invasive species, are more important in LDGs than in DMGs.

Results for Features Covered by Section 7 Agreements

Chapter 6 (section 6.2) describes the use of Section 7 Agreements in Scotland and the progress for individual agreements. As set out in that chapter, Section 7s are put in place for a number of reasons including where SNH are of the view that deer have caused or are causing damage to the natural heritage. As a result of this, one would anticipate that feature condition levels would be lower in this subset of sites compared with features outwith Section 7 areas. This section provides a broad comparison of the SCM results for areas covered by Section 7 Agreements and DMG areas where there are no agreements in place. Within DMGs, Section 7 Agreements cover 198 features assessed through SCM. A further 817 features lie within DMG areas, but are not covered by Section 7 provisions.

Figure 4.4 shows the proportion of features in favourable/unfavourable condition across these two categories. In Section 7 areas, the proportion of features in favourable and unfavourable recovering condition (excluding features which are URDTM) is 7% lower than non-Section 7 areas. This may seem counter intuitive, but is likely, at least in part, to reflect that Section 7 Agreements are entered into in areas where there is a higher level of concern over features in unfavourable condition.

When considering remedial action taken to address unfavourable condition, areas covered by Section 7 Agreements have 6% more URDTM features than DMG areas where there are no agreements in place. Although the number of features in favourable and favourable recovering condition is 7% lower in areas covered by Section 7 Agreements, these results point to the Section 7 approach showing signs of success in promoting management to support the recovery of unfavourable features. More detail is given in Chapter 6 where herbivore impact assessments are analysed for individual Section 7 Agreements.

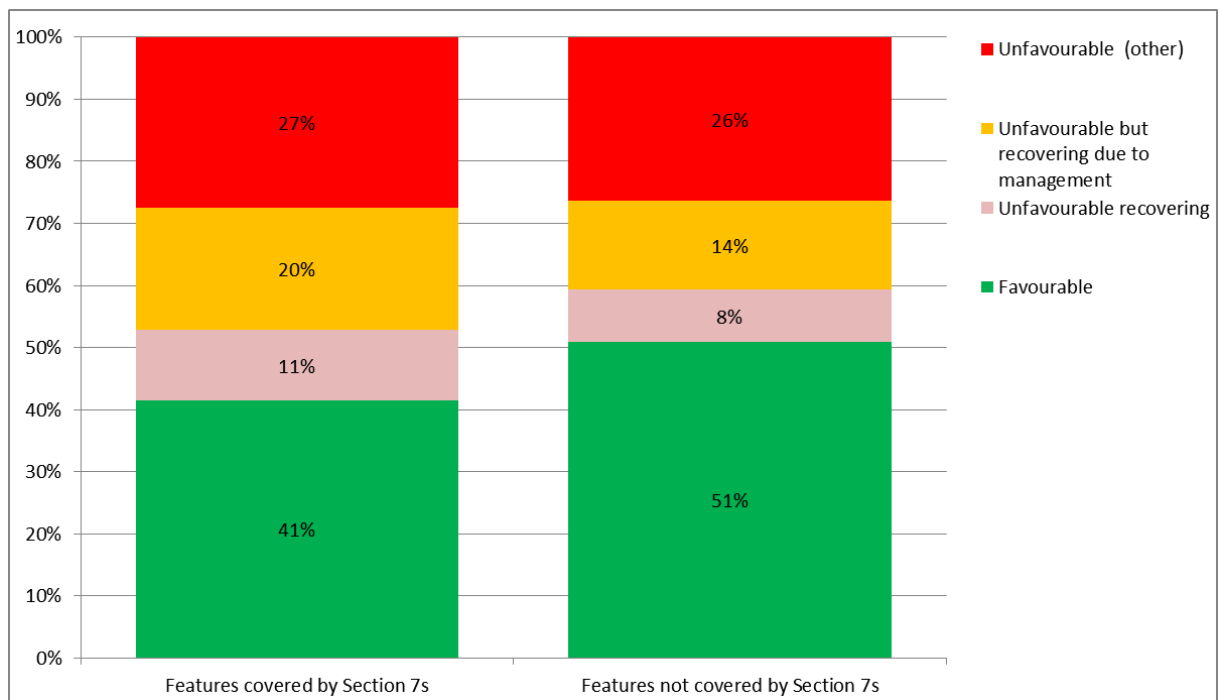


Figure 4.4. The proportion of features in DMGs in favourable, recovering and unfavourable condition within and outwith Section 7 Agreement areas.

4.2 Environmental Impacts of Deer on Woodlands

Key Findings

1. The Native Woodland Survey of Scotland found that more than a third of all native woodlands were in unsatisfactory condition due to herbivore impacts. About half were within upland DMGs and about half in the 'lowlands'. Deer were recorded as a significant presence in 73% of native woodland areas.
2. Woodlands subject to high herbivore pressure suffer a decline in biodiversity and productivity as a result of loss of regenerating seedlings/saplings due to browsing and changes in the habitat structure.
3. The impacts of deer cannot always be disentangled from the impacts of other herbivores, but the evidence supports the view that deer are a major factor in limiting the recovery of woodland condition.
4. Two targets for native woodland planting and restoration are identified as in need of further work in Scotland's Biodiversity - a Route Map to 2020 first progress report 2015/16.
5. The Scottish Government has a number of high-level objectives relating to woodland expansion and biodiversity which depend on effective management of deer. The present reliance on fencing to achieve these objectives comes at a cost to the public purse, with wider implications for biodiversity and deer welfare.

Introduction

The purpose of this section is to describe the impacts of deer on woodland environments. It excludes the impacts on timber production covered in Chapter 5 Socio-Economic Costs and Benefits of Deer. This assessment uses Scotland-wide information to present an overall picture, and recognises that the impacts of deer management at any given site may differ from this national assessment.

Deer are a natural feature of woodlands and grazing is part of the natural dynamics of woodlands and woodland biodiversity, but woodland environments can experience adverse impacts where deer numbers are too high. The woodland environments of highest value and sensitivity are in semi-natural native woodlands, but the broadleaved, native, riparian and old-tree components of plantation forests are also valued environments.

The absence of natural predators can lead to deer populations which are higher than the natural levels to which the woodland is adapted. In those circumstances, woodland environments can decline in condition and even be lost entirely. This is generally managed in three ways:

- a) culling deer to reduce and maintain population levels which allow regeneration.
- b) limited culling which allows higher deer populations, the consequences of which restrict or limit the woodland's ability to regenerate and leads to a long-term decline in biodiversity.
- c) erecting fences to exclude deer from woodlands.

The first of these – culling to maintain deer populations at a level that allows regeneration – is uncommon in Scotland, especially in semi-natural woodlands, although there are some well-recorded examples such as Glen Feshie and Creag Meagaidh, and areas of the NFE such as the Black Wood of Rannoch. These have been supported through SRDP funding, although with low levels of applications. There is some evidence set out in Chapter 3 (see Figures 3.5 & 3.6) of increasing cull levels of woodland deer, particularly on the NFE. However, the second and third approaches to deer management in woodland are much more common.

Ecological Impacts of High Deer Populations

High grazing levels in woodland prevent the establishment of new trees through loss of regenerating seedlings/saplings due to browsing. Woodland biodiversity can be affected by preferential browsing, resulting in changes in habitat structure and the loss or suppression of understorey plants, climbers and ground flora, and the species which these components support². In addition, there can be impacts on longevity and productive value of mature trees when bark is stripped.

Deer generally make up a substantial component of herbivore pressure within woodlands³. In addition, there is evidence to show that hill sheep numbers have declined⁴ in recent years (see Annex 3).

The available information suggests that these ecological impacts affect a significant proportion of native woodland. The most important source for this information is the Native Woodland Survey of Scotland (NWSS). The NWSS was carried out between 2006 and 2013 by Forestry Commission Scotland to identify and map the location, extent, type and condition of all of Scotland's native woodlands. The total area of native woodlands was 319,000ha in

March 2013. This is 4% of the total area of Scotland and 22.6% of woodland cover. The NWSS [results](#) were released in full in February 2014.

The results show that from the 1970s to 2013, the area of ancient woodland (defined as land that is currently wooded and has been continually wooded, at least since 1750) declined in Scotland by an estimated 14.2%⁵, with the decline largely in the unenclosed uplands. This loss of woodland is largely caused by the mortality of old trees and herbivore pressure suppressing seedlings and saplings.

For the remaining native woodlands, the NWSS reported that:

- more than a third of all native woodlands were in unsatisfactory condition due to herbivore impacts⁵. Of these, about half were within upland DMGs and about half in the rest of Scotland.
- deer were recorded as a significant presence in 73% of native woodland areas⁵
- few native woodlands had sufficient established regeneration to sustain them in the long term⁴

SNH's Site Condition Monitoring programme (SCM) reflects the above results and supports the conclusions that high grazing levels are a major driver of unfavourable condition in designated woodlands (Chapter 4, Figures 4.1 and 4.2).

While the NWSS identified herbivore impacts as the most frequent issue to be addressed, other factors which contribute to the poor condition of native woodlands include invasive non-native species. However, an assessment of their impact is outwith the scope of this review.

Government has a number of high-level objectives relating to woodland expansion and biodiversity which are dependent on effective management of deer. '[Scotland's Biodiversity - a Route Map to 2020](#)', published by the Scottish Government in 2015, includes a target for the '*restoration of 10,000ha of native woodland into satisfactory condition in partnership with private woodland owners through deer management plans*'.

We anticipate that there will be some changes in woodland management in future, including the ageing of the existing stock of woodlands, ambitions to establish more woodlands in peri-urban areas (especially the Central Scotland Green Network area) and possibly a greater diversity of the tree species used in woodlands (as part of policies related to climate change adaptation and general resilience). However, assuming a continuation of current grazing levels, woodlands will remain vulnerable.

Managing the Impacts of Deer on Woodlands

Deer fencing

Where woodland managers have regarded the impacts of deer populations on woodlands as unacceptable, they have usually adopted the management option of erecting deer fences, usually supported by public grant schemes. There is some information available to show the extent of these fences and their cost to the public purse which is covered in Chapter 5.

The use of fences has allowed improvements in native woodland condition and the establishment of considerable areas of new native woodland in such areas. Erecting fencing has the effect of excluding deer from shelter, which can have an impact on deer welfare.

This can have consequential impacts on deer size and breeding productivity as well as longer-term survival.

Fenced woods

All woodlands are sensitive to high deer impacts on a continuing basis, not simply at the planting phase or at a point in time to allow regeneration. Thus, the sustainable forest management need is for deer impacts to remain sufficiently low to allow the normal development of trees, shrubs, understorey plants, climbers and ground flora – and their dependent species

The lifespan of a standard deer fence is 20-30 years depending on maintenance, location and quality of construction. Survey evidence of fences older than this indicates that they are usually porous to deer and non-functional⁶. Experience from SNH and FCS staff suggests that fences may become porous much earlier than this expected lifespan where maintenance is poor or conditions particularly difficult.

We estimate that at least 3,000km of deer fence protecting designated or other sensitive woodland was erected before 2000 and is approaching the point at which deterioration could become a substantial problem. If nothing is done, fences will become progressively more porous and where herbivore pressures are high, woodlands will be vulnerable to the ecological impacts described above. The designated woodland features would be at higher risk of reverting to unfavourable condition.

If fences are replaced at the end of their operational life using public funding, this could require a further £100m (2016 equivalent) to replicate the funding which has already been invested. If only 3,000km of deer fencing around the most sensitive woodlands is replaced, this would require £25.5m of public funding at 2016 rates over the next 10 years. The alternative would be to reduce herbivore pressure through increased culling to maintain low deer populations, but this could also require financial support.

Unfenced woods

Unfenced woodlands in areas/regions where deer numbers are high will face the ecological impacts already described. This includes over 33% of all native woodlands which are in unsatisfactory condition due to herbivore impact⁵, a proportion of which are designated as SSSIs or Natura sites. The condition of these woodlands will continue to decline. In productive woodlands, unprotected by fencing, it is likely that natural regeneration will be limited and further planting will be required.

These declines may not occur for some time while current canopy trees persist. However, the ability of older trees or low-density stands to produce sufficient viable seed diminishes, and biodiversity dependent on vulnerable ground flora, shrubs and climbers will decline or experience local extinctions.

Woodland expansion

The ambition to expand woodland in Scotland is well-established through the Scottish Forestry Strategy and is likely to continue to seek expansion of woodland by planting around 10,000ha/year. If this continues under the existing approach to deer management, the need

to erect deer fences is likely to impose an additional cost of £5.4m each year. One potential shift in woodland establishment may be towards more peri-urban planting which tends to use tree shelters rather than deer fencing.

A future priority is likely to relate to the role of riparian woodland to protect streams, rivers and freshwater biodiversity from the impacts of climate change and harness opportunities for natural flood management. Climate change will warm freshwater temperatures to levels damaging to ecologically and economically important biodiversity (such as Atlantic salmon), as well as having adverse effects in river channels and increased flood risk through changes in rainfall. Riparian trees and woods provide shade which reduces mean and maximum stream temperatures, as well as maintaining channel structure and providing food sources. Available research suggests that the requirement for dappled shade needs riparian trees along 20-50%^{7,8} of stream banks. Under existing deer management arrangements expansion of riparian woodland generally needs to be fenced, and the linear nature of riparian woodland makes this fencing a major cost.

5. Socio-Economic Costs and Benefits of Deer

Key Findings

1. Deer management provides a number of socio economic benefits including supporting employment, contributing to rural tourism, providing sporting income and the sale of venison.
2. An estimated 722 full-time equivalent (FTE) direct paid jobs are associated with deer management, and an additional 124 unpaid jobs.
3. The estimated annual monetary benefit to the private sector associated with deer management is £15.8m per year. The estimated annual monetary benefit to the public sector is £1.8m per year.
4. Estimated annual costs of managing deer (operational and capital expenditure) to the private sector are £36.8m per year (including salary costs of £17m per year). Estimated annual monetary costs to the public sector in managing deer are £12.9m per year (i.e. expenditure on operations, capital items, grants and administration).
5. Annual costs related to deer-vehicle collisions are estimated to be £13.8m. The proportion of the estimated annual costs of Lyme disease (a minimum of £0.5m) attributable to deer cannot currently be isolated from other factors, but it may be high.
6. Total annual costs of deer damage cannot currently be estimated due to uncertainties over costs relating to damage to forestry, agriculture and the natural heritage.
7. Evidence gathered to date suggests that management of deer in Scotland results in a net monetary loss for both the private and public sectors. However, many of the impacts and benefits are not easy to assess or do not lend themselves to monetary valuation.
8. Calculating the national net socio-economic cost or benefit is likely to be impracticable. There are significant uncertainties about costs and benefits, and expressing 'net impacts' in a single number poses the risk that trade-offs will be 'lost' in the overall calculation.

Introduction

This chapter sets out the main socio-economic costs and benefits associated with wild deer and their management at a national level. Data and information included in relevant published reports is used, in particular drawing on the SNH Commissioned Report No. 526, 'Scoping the economic benefits and costs of wild deer and their management in Scotland', Putman, R. (2012) ('the Putman report')¹ and 'The Contribution of Deer to the Scottish Economy', PACEC (2016) ('the PACEC report')². While the review draws on previously published data, it does not include any new analysis of that data. The potential for high densities of deer to have wider impacts, for example, on peat erosion and increased flooding risk have not been considered as part of the review.

Costs

A cost, for the purposes of this chapter, is the value of damage caused by deer, and of expenditure on deer management (operational and capital).

Benefits

A benefit, for the purposes of this chapter, is the value of deer and deer management, including associated employment opportunities.

Public and private interests

For the purposes of this chapter, understanding of the public and private interest is taken from 'Scotland's Wild Deer: A National Approach' (WDNA)³ and the Code of Practice on Deer Management (the Code)⁴. The WDNA states that wild deer should be managed to meet a wide range of objectives. These are made up of an individual land manager's private interests and public interests as captured in policy and legislation. 'Public interest' includes management objectives to, 'contribute to the economic development of communities' and 'secure the favourable condition of Scotland's sites designated for nature'. Private interests are those that affect private landowners, businesses and individuals.

Links between costs and benefits

Costs and benefits associated with managing deer are complex and inter-related. The difference between a cost and a benefit often depends on perspective. For example, the (private) costs incurred by a landowner to pay a stalker generate a (public) employment benefit, and may also generate private benefits via income from sporting clients. This chapter attempts to disentangle the main costs and benefits from a public and private perspective and summarise national figures and statistics where they are known. Monetary estimates are from a variety of sources, and are all expressed in 2016 prices. Double-counting has been avoided where possible and any remaining instances of likely double-counting have been noted.

Costs Associated with Wild Deer and their Management

Deer-related costs can be split into two categories:

- **Costs of damage caused by deer** – includes impacts on trees, agriculture, natural and semi-natural habitats, deer-vehicle collisions and contribution to the spread of Lyme disease; and
- **Costs of deer management** – includes private and public costs of managing deer, as well as monitoring and regulation.

The different types of cost are summarised in Table 5.1. The first five are deer-related damage, and the second five are costs associated with deer management.

Table 5.1. Summary of costs associated with deer and deer management (2016 prices)

Description	Public or private cost?	Estimated annual cost (£)	Source(s)	Comments
Costs associated with damage caused by deer				
Tree damage	Private/public	uncertain but significant		Deer browsing on sitka could result in a loss of 3.4% of revenue (on browsed crops only)
Agricultural damage	Private/public	uncertain not significant		Some losses to a variety of crops, generally considered to be localised
Damage to habitats	Private/public	uncertain - difficult to monetise		Costs to prevent damage (e.g. fencing) identified separately below
Deer-vehicle collisions	Mainly public	£13.8 million	Langbein (2007) ⁵	
Lyme disease	Mainly public	£0.5 million	Joss et al (2003) ⁶	Possible under-reporting of Lyme disease; attribution to deer difficult
Costs associated with managing deer				
Effects on public access	Public	uncertain		Includes constraints on public access related to stalking activities and fencing
Operational and capital expenditure on deer management	Mainly private	£42.6 million	PACEC (2016) ² ; FES evidence to Deer Authorisations Review Panel (2016) ⁷	This includes operational expenditure of £36.4m, major elements of which are staff costs (£17.1m) and property rent and maintenance (£4.8m) This figure includes approximately £5.8m public expenditure. The remainder is private
Fencing	Public	£4.8 million	Scottish Government (2013) ⁸	£3.4m via SRDP Rural Priorities Scheme for deer fencing, and £1.4m expenditure by FES
Other deer management via	Public	£0.8 million	Scottish Government	SRDP Wildlife Management on Upland Peatland Sites / Woodland

SRDP			(undated) ⁹	Improvement Grant – Reducing Deer Impact Likely to be double-counting with the £42.6m 'operational and capital expenditure' above
Monitoring, regulation and administration	Public	£1.5 million	Putman (2012) ¹	Based on Deer Commission Scotland costs from 2009/10, which have now been absorbed into the SNH budget.

Costs of Damage Caused by Deer

Deer can cause adverse impacts to agriculture, commercial forestry, non-commercial forestry, amenity trees, farm woodlands and the conservation of species and habitats. Several attempts have been made to estimate the economic cost of actual damage at a national scale, but the Putman report concluded that 'attributing accurate costs at a national scale is particularly difficult to do for agriculture and forestry impacts as costs tend to be very site-specific'¹. The data that we do have are included below.

Tree damage

Deer cause damage both to native woodlands and commercial forestry in both the public and private sectors. Deer grazing, browsing, fraying and trampling damages trees and restricts the regeneration of woodland and forests. Deer damage commercial forestry by:

- browsing on re-stock sites;
- damaging established trees by bark stripping, fraying or browsing;
- having an adverse impact on levels of regeneration and seed stocks.

There is a lack of data regarding the estimated total cost for actual damage to forestry caused by deer in Scotland, especially in the private sector¹. There are some data on the levels of damage to commercial forestry.

In 2015, FES recorded 19% of the leading shoots of Year 1 re-stocks being lost to deer damage (around 3 million trees). In addition, 60% of forestry planting coupes (areas designated for both harvesting and replanting) had more than 10% of their shoots lost to deer⁷.

A report by Gill *et al* (2000)¹⁰ concluded that browsing on Scottish Sitka spruce could impose an average delay in height growth of approximately one year which could result in a 3.4% loss in revenue. The figures do not account for the additional accumulated losses due to stem damage through browsing and fraying (0.03% - 1.03% revenue loss) or from leader loss which leads to poor stem form (0.8% - 8.4% revenue loss). Furthermore, a delay in tree height growth by browsing extends the period over which young trees are established. During this extended period of height growth, these trees continue to be vulnerable to browsing damage and to additional competition by other plant/tree species re-establishing on site.

It is difficult to calculate precisely a financial value against these levels of tree damage for various reasons. Producing a crop from a Sitka plantation takes time during which there are

likely to be significant fluctuations in the value of timber and associated products. The impact of the damage will be different on the range of site types on which commercial crops are grown, and there is a constant improvement in the genetic quality of the planting stock used for restocking purposes. No long-term studies have followed the effect on timber value for the 45-year period between the damage occurring and trees being felled and sold.

Expenditure on deer management will include an element which is incurred to avoid tree damage. This is discussed below.

Agricultural damage

In a review of the evidence throughout the UK, the Putman report¹ explains that deer might damage arable, root and grass crops, as well as more intensively managed crops (such as orchards and market gardens). Any impacts that do occur tend to be highly localised (e.g. a specific field in a specific area because it is close to a woodland strip), and Putman concludes that the effects of deer on agriculture are not of economic significance at a regional or national scale.

Expenditure on deer management (see below) will include an element which is incurred to avoid agricultural damage. Night shooting authorisations are issued when there is damage, or likely damage, to agricultural land. Between 2008/09 and 2015/16, on average 2,170 deer were culled per year as a result of such authorisations.

Damage to habitats

Deer have an ecological impact on a range of habitats, but whether this translates to a socio-economic cost depends on the management objective¹¹. As discussed above, deer damage to commercial forestry and agricultural land has socio-economic consequences. However, where the main management objective is to provide deer sporting opportunities, habitat impacts will have limited socio-economic relevance. The environmental impacts of deer are described in more detail in Chapter 4.

Deer-vehicle collisions

Deer-vehicle collisions (DVCs) is a broad term used to describe any incidents where it may be concluded that a collision of a road vehicle with a deer occurred, as evident either from live injured or dead deer casualties found at the roadside, or reported road traffic collisions in which deer were implicated.

DVCs are positively correlated with deer densities, although a number of other factors are also relevant (e.g. road layout, speed restrictions, fencing, visibility etc.). SNH (and previously the Deer Commission for Scotland) commissioned a number of studies examining data on the numbers and distribution of DVCs. From 2003 to 2008 the manner in which information on DVCs was gathered was inconsistent so this data has not been included here. Table 5.2 shows the results¹² for Scotland for the period 2009–2015. The records suggest an increasing trend.

Data is from a variety of sources including Trunk Road Operating Companies records and Scottish Society for the Protection of Animals (Scottish SPCA) call-outs to attend deer road casualties. Data from Police Scotland road safety road traffic collision reports and Forestry

Commission call-outs to deer road casualties has also been incorporated. Overall, major roads (A-class plus motorways) contributed over 75% of all DVC reports.

There is no legal requirement for DVCs to be recorded or reported to any authority, so records are likely to be an underestimate of actual DVCs. Even with the improvement in data reliability from 2008, the data presented represent a sample. Whilst allowing a general year on year comparison, the incidents reported annually represent a small proportion (most likely less than 20%) of all deer road kills or related incidents nationwide⁵.

Table 5.2. Annual records of Deer-Vehicle Collisions in Scotland between 2009 and 2015.

Year	Total DVC Records (Scotland)
2009	1144
2010	1203
2011	1190
2012	1561
2013	1479
2014	1315
2015	1587

The monetary cost estimate described by Putman¹ is based on UK data from 1999 to 2005 which estimated that every year:

- at least 42,500 DVCs occur in the UK, causing almost £17m of material damage;
- at least 425 DVCs involving human injuries occur in the UK, causing over £36m costs related to medical treatment etc.;
- Approximately 19% of the collisions occur in Scotland¹. (The number derived from this approximation is higher than the figures in Table 5.2 as reported incidents represent a small proportion of all incidents).

Based on these estimates and assuming that the ratio of collision in Scotland compared to all of the UK remained similar, DVCs cost at least £10m (£53m*19%) per year in Scotland. Adjusted to 2016 prices, the cost is estimated to be at least £13.8m.

Lyme disease

Lyme disease is a complex problem, dependent on multiple factors such as habitat suitability for ticks and transmission/non-transmission hosts. Deer are major tick hosts – albeit not transmission hosts – for Lyme disease (L. Gilbert, personal communication, June 2016), and tick populations are higher where deer are present. There is some evidence pointing to an increase in the prevalence of tick-borne Lyme disease in Scotland, and deer and other upland herbivores have been implicated in the spread of this. Recent work (Millins *et al*, *in press*²¹) suggests that management of deer populations by exclusion fencing or culling for biodiversity and woodland regeneration is generally likely to decrease tick abundance and Lyme disease risk.

There is a wide range of cost estimates attributable to Lyme disease. A 2003 study in Scotland⁶ found that annual costs for diagnosis, treatment and loss of healthy time were approximately £331,000 (1999 prices; over £500,000 in 2016), based on an equivalent of 368 Lyme disease patients per year. The Putman report suggests that reported cases in

Scotland rose to 605 in 2010^{*} and cites a USA study from 1998 which found that the cost of each case was over \$36,000 (£24,000) – equivalent to £39,000 in 2016. If applied to Scotland, this would mean an annual cost of over £23 million (605 multiplied by 39,000).

The 2003 Scotland study seems more applicable, as it analysed actual costs in Scotland; we think that £500,000 is a reasonable estimate of the annual cost of Lyme disease. It is a conservative estimate because it is likely that Lyme disease is under-reported in this country (Health Protection Scotland¹³). Recent research by the Johns Hopkins Bloomberg School of Public Health, USA (February 2015)²² suggests prolonged impact of the tick-borne illness in some patients is greater and more widespread than previously understood which would also support the finding that the current estimate of cost is probably under-estimated. However, the contribution of deer to the disease organism – and the associated costs of treatment etc. – cannot be isolated as there are many other relevant factors, and further research is needed in this area.

Research indicates that there is no compelling evidence to suggest that wild deer present a risk in the transmission of bluetongue virus and bovine tuberculosis¹.

Costs of Deer Management

The costs of deer management include management to prevent or reduce damage and management to support income-generating activities, such as sport shooting.

Access

Stalking on the open hill is associated with some constraints on public access within the framework of the Scottish Outdoor Access Code, which advises hill-walkers to “take reasonable steps to find out where stalking is taking place” during the red deer stag season, and to “avoid crossing land where stalking is taking place”. The Access Code advises land managers to “be aware of where recreational use is likely” and to “tell people...where stalking is taking place”. The “[Heading for the Scottish Hills](#)” service, which is hosted by SNH on the Scottish Outdoor Access Code website, helps to promote this two-way communication. The Access Code promotes more ‘light touch’ access management during the hind cull and for stalking activity in woodland.

The use of fencing for deer management could also result in constraints on public access, which depend on the local context and the type of fencing involved. The potential for adverse effects is greatest when electric fences are used in open-hill settings, generally to exclude deer from grouse moors, and the National Access Forum and Moorland Forum have developed joint good-practice guidance which aims to minimise the impacts of such fences.

It is possible to identify potential measures of inconvenience (e.g. ‘person days exclusion from walking’), but the monetary cost would be very difficult to assess¹¹, and there are no current data which would allow either type of impact to be accurately quantified.

^{*} This cannot be verified. The reference given by Putman (<http://www.documents.hps.scot.nhs.uk/giz/10-year-tables/lyme.pdf>) no longer works. The latest figures provided by the NHS (<http://www.hps.scot.nhs.uk/resourcedocument.aspx?resourceid=1455>) state that there were only 308 new cases in 2010 and 200 in 2015 [Accessed 30 September 2016].

Operational and capital expenditure

Operational expenditure on deer management in Scotland between 1 April 2013 and 31 March 2014 – expressed in 2016 prices – was estimated to be £36.4 million (per the PACEC report). The main elements of this were staff costs (£17.1m), property rent and maintenance (£4.8m), vehicle fuel and repairs (£3.7m), professional services such as accountancy (£2.3m), maintenance of roads and tracks (£1.9m) and utility and phone bills (£1.8m). Over the same period, capital expenditure was estimated at £6.3 million. This included vehicle costs (£3.0m), roads and tracks (£0.8m) and buildings (£0.6m), but excluded expenditure on fencing, which is set out below.

Overall operational and capital expenditure was therefore £42.6 million (i.e. £36.4m plus £6.3m), and the total includes approximately £5.8 million of public expenditure by FES⁷, who manage 9% of Scotland's land area. The remainder was private expenditure, although there is probably some double-counting with the Scottish Rural Development Programme funding.

The expenditure estimates are based on a PACEC questionnaire to land managers, from which 186 responses were received, representing more than 1.8 million hectares of land in Scotland. Respondents were asked to, "please detail only expenditure associated with deer management". However, separating costs of deer management from all other costs is difficult in practice, and there was no independent verification of PACEC's estimates.

It is not possible to determine what proportion of the £42.6 million expenditure relates to sport shooting. According to the PACEC report, deer management takes place for a variety of reasons, the main one being to ensure that the deer population does not exceed the carrying capacity of the land (over 90% of respondents cited this). Protection of woodlands (77%) and the provision of sport shooting opportunities (76%) were also important. Almost all respondents (99%) shot deer.

Fencing

Woodland managers have mostly adopted the management option of erecting of deer fences, usually supported by public grant schemes, to protect commercial plantations and where the impacts of deer populations on woodlands are considered as unacceptable.

There is some information available to show the extent of these fences and their cost to the public purse. We estimate that between 1990 and 2013 at least 13,500km of deer fencing funded by the public grant schemes was erected to protect woodland across Scotland. From 2003 to 2012 public-sector funding on deer fencing was £23.3m²⁰, with the 2010-12 average at £4.8 million⁸ (in 2016 prices). This comprised £1.4 million direct expenditure by FES, and £3.4 million via the SRDP Rural Priorities Scheme. Overall, from 1990 to 2013, we estimate (from various grant scheme records) the total expenditure related to deer fencing (in 2016 terms) is at least £100m. In addition, some fencing is paid for privately, but the scale of this is unknown and likely to be small in comparison with publically-funded fencing. Further information on the future cost implications of this current and potential future fencing is set out in Chapter 4 in section 4.2 on Environmental Impacts of Deer on Woodlands.

Scottish Rural Development Programme funding

The Scottish Government, SNH and Forestry Commission Scotland administer a number of incentives to facilitate and encourage sustainable deer management. The principal ones are

Agri-Environment Climate Scheme (AECS) deer options and the Environmental Collaborative Action Fund (ECAAF). ECAAF promotes landscape-scale environmental projects by groups of farmers, foresters and other land managers. It includes deer management as one of its priorities.

As these are new schemes, no figures are available on the likely uptake. Under the previous programme the uptake of options (in the five years to April 2014) where there was a deer element is shown in Table 5.3⁹. Average funding per year in 2016 prices was approximately £0.8 million.

Table 5.3. SRDP funding for deer management 2009 to 2014

Option description	Cases with option	Approved funding
Wildlife Management on Upland Peatland sites	48	£1,153,823
Woodland Improvement Grant – reducing deer impact	155	£2,401,710

Monitoring, regulation and administration

The costs of the Deer Commission for Scotland in 2009/10 were £1.8 million¹⁴. This included Section 7 Agreements, monitoring and red deer counts, Joint Working Sites and authorisations for night time and out of season shooting. SNH staff also carried out deer management work in 2009/10 (e.g. providing advice) costing around £0.2million.

Following the DCS/SNH merger in 2010, all costs have been absorbed into SNH's budget, and have decreased in recent years: there were one-off costs and efficiency savings associated with the merger, and in the past few years overall SNH expenditure has decreased. Total SNH expenditure on deer management is now approximately £1.5million per annum, including overhead costs.

Benefits Associated with Wild Deer and their Management

The presence of wild deer and their management generates income and contributes to employment. There are also a range of more 'intangible' benefits. Benefits are summarised in Table 5.4.

Table 5.4. Summary of benefits associated with deer and deer management (2016 prices)

Description	Public or private benefit?	Estimated annual benefit (£)	Source(s)	Comments
Sale of deer carcasses and processed venison	Private / public	£7.5 million	PACEC (2016) ²	Mainly a private benefit (although includes £1.6m income to FES ⁷).
Sporting income	Mainly private	£7.1 million	PACEC (2016) ²	Includes £0.2m income to FES ⁷
Stalking rents and other income from deer management	Mainly private	£3.0 million	PACEC (2016) ²	
Direct employment	Public	722 paid FTE jobs	PACEC (2016) ²	Also 124 unpaid FTE jobs Some double-counting with the monetary benefits shown in this table
Secondary employment	Public	uncertain	PACEC (2016) ²	Secondary employment arises because of indirect and induced effects
Deer watching/tourism	Public	£0.1 million	Putman (2012) ¹	The monetary estimate relates only to activities where 'deer watching' is the main purpose
Rural culture	Public	uncertain		Maintenance of traditional skills and knowledge; community identity and culture
Landowner benefits	Private	uncertain		Pleasure from stalking; maintenance of links between landowner and community
Public health benefits	Public	uncertain		Opportunities to go outdoors either to watch or stalk deer
Existence value	Public	uncertain		

Income from deer stalking and venison

The 2016 PACEC report estimated deer-related revenues in Scotland between 1 April 2013 and 31 March 2014. The direct sale of carcasses for processing (£6.8 million in 2016 prices) and sale of processed venison direct to wholesalers or retailers (£0.7m) are major sources of income.

Stalking deer, particularly red deer in the uplands, attracts sporting clients and generated income of £7.1 million. In addition to this, recreational stalking leases and permissions were estimated to generate income of £2.4 million. Other income from deer management was approximately £0.6 million.

In total, PACEC found that all income from deer management in 2013/14 was £17.7 million². Most of this was private income for estates, although FES received income of £1.8 million (£1.6m from deer carcass sales, £0.2m sporting income) from its deer management activities in 2014/15⁷.

Employment

Direct employment

Managing deer provides employment opportunities. The PACEC report found that deer management is associated with 722 full-time equivalent (FTE) paid jobs and 124 FTE unpaid jobs². Over three quarters of the paid FTEs (548 out of 722) are stalkers/keepers. We do not know how many of the jobs would exist in the absence of deer management.

As set out above, operational expenditure (which is mainly a private cost for landowners) was estimated to be £36.4 million in 2013/14, of which staff costs represented £17.1 million. It is clear that deer management employment is not necessarily contingent upon income, and that many estates run their activities at an economic loss.

Secondary employment

Deer management activity has a 'ripple effect' on the wider economy. For example, game processing businesses and retailers depend on venison. Those who shoot deer will spend additional money on firearms, clothing, travel and accommodation etc. In their 'economic impact assessment' of deer management in Scotland, PACEC calculated that such secondary (indirect and induced) expenditure may be as much as £100 million per year, supporting more than 1,500 FTE paid jobs. Whilst recognising that 'secondary' employment because of deer management is likely to be significant, the background to PACEC's calculations are not explicit and therefore cannot be tested.

We also note that damage caused by deer (such as damage to trees, and contribution to Lyme disease) will have 'ripple effects' on the wider economy, including negative employment effects. We do not know the extent of such effects.

Deer watching/tourism

Deer watching is part of the growing interest in ecotourism: 'Catching a glimpse of deer is a highlight of many visits to the NFE'¹⁵. The value of deer in this type of activity is difficult to judge. However, a report by DCS in 2009¹⁶ set out some details from which the Putman report concluded that the income derived from deer watching was approximately £110k per year (£135k in 2016 prices). This is very much a minimum estimate as it only includes activities where 'deer watching' was a major focus. Wildlife watching in Scotland has been valued at £138m per year¹⁷ (2010 prices), and this includes deer.

Rural culture and other benefits

Deer management plays a role in sustaining and maintaining rural communities, especially those which are remote. It does so by providing employment, which in turn can support families to live in these areas and sustain rural schools and businesses. Deer management can also empower communities by providing them with the opportunity to participate in how their local land is managed, e.g. the need to consult relevant local interests in Deer Management Plans is included in the 'DMG Benchmark', published by ADMG in 2014. There are centuries of tradition associated with stalking, and the maintenance of traditional skills and knowledge is an important social benefit.

There are a number of private benefits for landowners. These range from the pleasure they (and their family and friends) get from stalking, to maintaining links with the local community. It also includes venison which is kept for private consumption¹¹. Deer can help to maintain the capital value of sporting estates¹. However, this is influenced by many factors (including in part the number of stags), so it has not been assessed in this review.

All of the benefits described so far in this section are related to the 'use' of deer. A further potential benefit is the non-use ('existence') value of deer; of simply knowing that deer live in Scotland, even without use. This is a controversial category of economic value and we are not aware of any studies related to Scottish deer. However, the value can be significant¹⁸, especially for iconic species such as red deer.

SNH commissions an annual Scottish Nature Omnibus (SNO) survey of a small sample of the general public to help ascertain the public's views and behaviours on a range of subjects relevant to SNH's work. The list of topics covered includes questions about wildlife and wildlife management. With regards to deer, the main findings from the 2015 survey¹⁹ show that deer remain the wildlife species which the public most associate with Scotland (around 60% of respondents). Deer (along with red squirrel) are also the species which people in Scotland remain most concerned about (22% and 24% respectively). Those concerns for deer relate to hunting, shooting and culling (72%). Other issues such as lack of food, concerns over road safety or loss of habitat were also mentioned, but by far fewer respondents.

6. Planning and Implementation of Deer Management

6.1 Review of Deer Management Group Plans

Key Findings

1. Overall, the results for both the benchmark criteria and the public interest criteria were significantly better in 2016 compared with 2014. Each one of the 101 criteria (from both the benchmark and the public interest categories) had a greater number of plans performing well (i.e. rated green) in 2016 compared with the 2014 results.
2. There is considerable variability in performance among the DMGs. The best DMG plan was rated green in 91% of public interest criteria while the DMG plan with the poorest performance had no public interest criteria rated green and 78% rated red.
3. There has been substantial improvement in the communications categories across both the benchmark and public interest criteria, with ADMG playing an important leadership role. The majority of upland DMGs now have publically available DMPs and have undertaken some public consultation.
4. The results of the assessment capture a picture of improvements in quantifying and auditing resources through the planning process. Progress is less positive in linking planning with implementation through identifying specific actions to resolve management issues.
5. Fewer than 50% of DMGs adequately identify actions in their plans to manage herbivore impacts on designated features or improve native woodland condition.
6. Fewer than 25% of DMG plans adequately identify sustainable levels of grazing for habitats in the wider countryside.

Introduction

Chapter 2 described the current structures for deer management in Scotland. This section describes progress between 2014 and 2016 that DMGs have made in the development and implementation of effective deer management plans.

Although some DMGs have been in existence for 40 years or so, it is only since 2008 with the publication of the 'Scotland's Wild Deer: A National Approach' (WDNA) strategy that wider public interests have become more prominent in the planning and management of deer. 'Public Interest' refers to something in which the people of Scotland as a whole have an interest. The WDNA set out a series of 17 objectives relating to a high-quality robust and adaptable environment, sustainable economic growth and social wellbeing. These 17 objectives developed into the 14 public interest categories (see Annex 4) and are described in broad terms in the [Code of Practice on Deer Management](#) which was published in early 2012. In August 2014, SNH published [Deer Management Plans: Setting out the Public Interest](#) which describes the relationship between the 14 public interest categories and the contribution of upland deer management plans towards delivering the public interest. The 14 public interest categories are further subdivided into 56 criteria and are set out in detail in Annex 4.

SNH has worked closely with the ADMG on developing a process for assessing DMG effectiveness, looking at how DMGs function and the extent to which they achieve the range of public interests and the ADMG benchmark criteria. The assessment process was jointly developed in early 2014 in partnership with the ADMG, with two key aims in mind:

1. to support DMGs and identify how individual groups can function more effectively (through aligning with the ADMG Benchmark) and also to consider how they are contributing to certain aspects of public policy (derived largely from the WDNA);
2. to provide a baseline from which progress on development and production of effective environmentally responsible DMPs, which had been sought from Scottish Ministers, could be measured.

The 15 ADMG benchmark categories and associated 45 criteria are set out in Annex 1. There is some overlap between the 45 benchmark criteria and the 56 public interest criteria.

SNH undertook an assessment of DMGs in 2013/14. The aim was to provide baseline information on how the 44 DMGs were functioning. The plan assessments were carried out in partnership with the Chair and Secretary of each DMG. The [report](#), published in 2014, outlines the results of the DMG plan assessment process.

For every plan, each benchmark and public interest criterion (101 in total) was assessed and a summary of performance allocated using a red/amber/green (RAG) rating as follows:

<p>Red signifies that the DMG plan is not meeting that specific criterion; Amber means that delivery is only partial or variable in quality; Green performance is good.</p>
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Following the Rural Affairs, Climate Change and Environment Committee enquiry into deer management in late 2013, the Minister for Environment agreed to review progress towards developing effective and environmentally responsible management plans by the end of 2016. In order to support DMG's to deliver on the public interest objectives, the Scottish

Government provided £200,000 towards the further revision and update of deer management plans for upland DMGs. There were 35 applications to SNH for financial support. Grants totalling £161,412 were awarded to the 35 DMGs who applied.

Draft plans from DMGs were reviewed by SNH and feedback was provided. During the months of May and June, SNH staff undertook an assessment of either the finalised plan or the most developed draft available at that point against the public interest criteria and the ADMG benchmark criteria. The assessment was made using the RAG rating system as this was a simple tool for summarising the range of DMG performance and progress. SNH staff ensured there was agreement and consistency over what constituted a particular RAG rating. Expert judgements were based on the degree of evidence presented in the DMP in relation to each criterion, with particular focus on the level of specific, detailed actions to provide confidence in implementation. The rationale for each judgement was discussed in detail with the relevant DMG, and an ADMG regional representative where possible. Quality assurance in the process was provided by SNH Operations Managers. The results for 2016 will be published shortly.

In order to document the progress of DMG plans between 2014 and 2016, two main questions were posed:

1. How has the delivery of the ADMG benchmark and public interest criteria changed over time?
2. Do the changes identified between 2014 and 2016 DMG plan assessments represent an overall improvement?

As the ADMG benchmark criteria and the public interest criteria were developed separately and at different times there is some overlap between them. For this reason, the benchmark criteria and the public interest criteria were analysed separately using the same methods.

To address the first question, the assessment results were analysed for each individual criterion in a simple, descriptive manner. This was based on counts of each RAG status in each criterion each year, as well as summaries of positive change (red to amber, amber to green or red to green), negative change (green to amber, amber to red or green to red) and no change (red, amber or green in both assessment years).

The second question was addressed using all the results for the benchmark criteria and all the results for the public interest criteria. Statistical multivariate analysis (specifically non-linear principal component analysis followed by a paired t-test) was used to determine whether the assessment results for the benchmark criteria and public interest criteria were significantly different in 2016 compared with results from 2014. In order to ensure the analysis was robust, a different type of statistical analysis was also conducted using a simpler scoring method and a non-parametric matched pairs Wilcoxon test.

Both types of statistical analysis gave the same result, confirming that there has been a statistically significant improvement in the DMG assessments between 2014 and 2016. This improvement is seen in both the benchmark criteria and the public interest criteria. The changes recorded are relative to the assessment results from 2014 and illustrate the general direction of travel. Results from the assessments are outlined below.

Changes in ADMG Benchmark Criteria between 2014 and 2016

Overall, out of a possible 1980 records (44 DMG plans x 45 criteria), for the benchmark criteria:

- 41.3% (i.e. 817 records) improved between 2014 and 2016
- 54.4% (i.e. 1077 records) showed no change
- 4.3% (i.e. 86 records) deteriorated.

The improvement shown in the assessment rating between 2014 and 2016 includes changes from red to amber, or amber to green or red to green. No change in the RAG rating for individual criteria between the two assessment years has also been analysed. Annex 5 illustrates this for a small sample of criteria.

There was no obvious pattern in which criteria improved the most. The top three benchmark criteria showing the greatest improvement between 2014 and 2016 were:

- 35 plans improved for - "The DMP should identify the public interest aspects of deer management",
- 34 plans improved for - "All DMGs should have a training policy and incorporate it in the DMP",
- 34 plans improved for – "DMGs should include a communications policy in their DMP.

Nor was there any clear pattern in the criteria where the RAG rating deteriorated between 2014 and 2016. The three benchmark criteria which showed the greatest deterioration were:

- 7 plans deteriorated for – "All DMGs should agree a target deer population or density which meets the collective requirements of Members without detriment to the public interest",
- 5 plans deteriorated for – "Where applicable, the plan should include a rolling five-year population model",
- 5 plans deteriorated for – "DMPs should include a section on habitat monitoring methods and procedures, and record annual results so as to measure change and record trends".

For all of the 45 benchmark criteria, more DMG plans were rated green in 2016 compared with the results in 2014. Owing to the overlap between the benchmark criteria and the public interest criteria, and the requirement of the commission from the Minister to SNH to consider the public interest with a specific focus on the natural heritage, the results for a sample only of benchmark criteria are shown below. More detailed analysis is provided on the public interest criteria. The graphs illustrate the changes between 2014 and 2016. Horizontal lines on the graphs represent 25%, 50% and 75% of the total number of DMGs. The category and criterion numbers correspond with those listed in Annex 1.

ADMG benchmark category 2. Membership

Criterion 2.1 All property owners within a deer range should be part of a DMG, including private and public landowners; also, where possible, agricultural occupiers, foresters, crofters and others on adjoining land where deer may be present. In some cases this may extend to householders with private gardens.

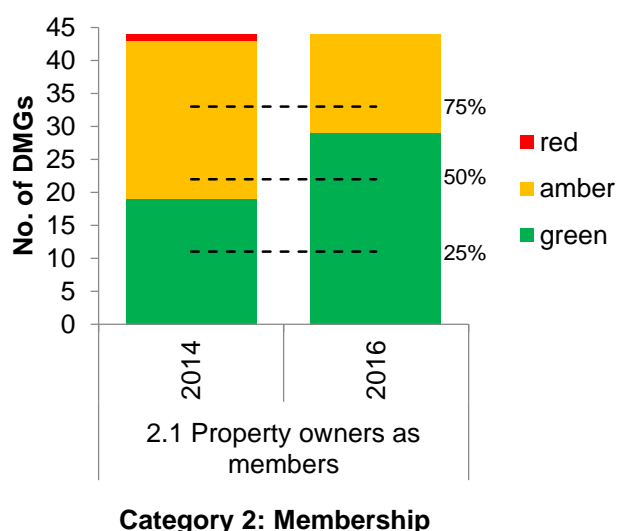


Figure 6.1. Number of DMGs with each colour status in criterion 2.1. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 3. Meetings

Criterion 3.2 For effective collaborative management to take place it is important that all DMG Members should attend every meeting or be represented by someone authorised to make appropriate decisions on their behalf.

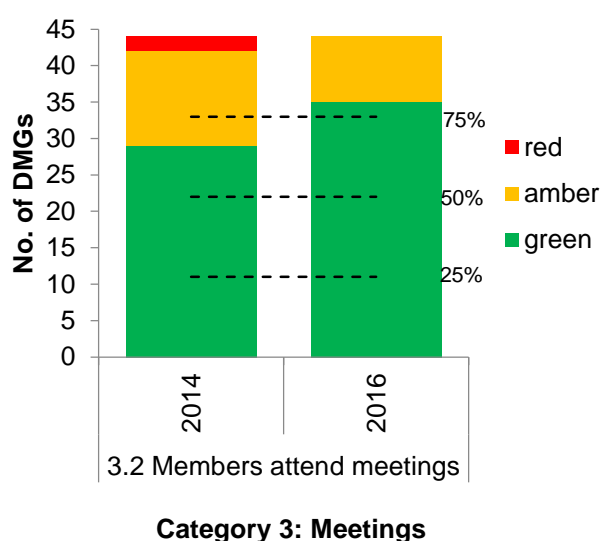
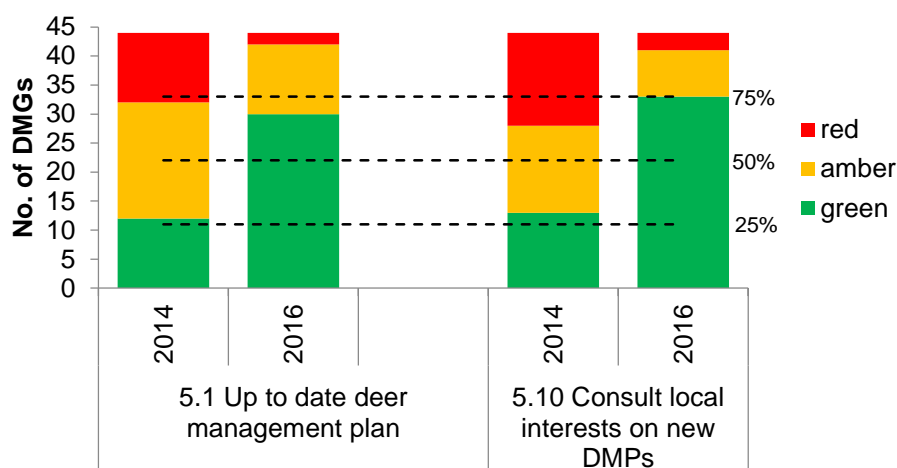


Figure 6.2. Number of DMGs with each colour status in criterion 3.2. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 5. Deer management plans

Criterion 5.1 All DMGs should have an up-to-date, effective and forward-looking deer management plan (DMP).

Criterion 5.10 Relevant local interests should be consulted on new DMPs and advised of any changes as they come forward.

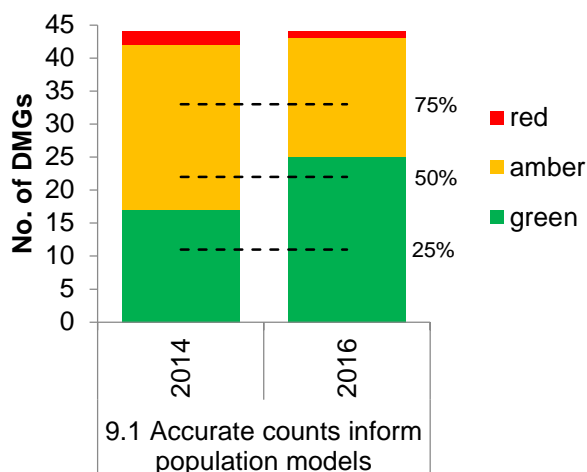


Category 5: Deer management plans

Figure 6.3. Number of DMGs with each colour status in criteria 5.1 and 5.10. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 9. Data and evidence gathering – deer counts

Criterion 9.1 Accurate deer counting forms the basis of population modelling. An ethos that reflects this should be in evidence.



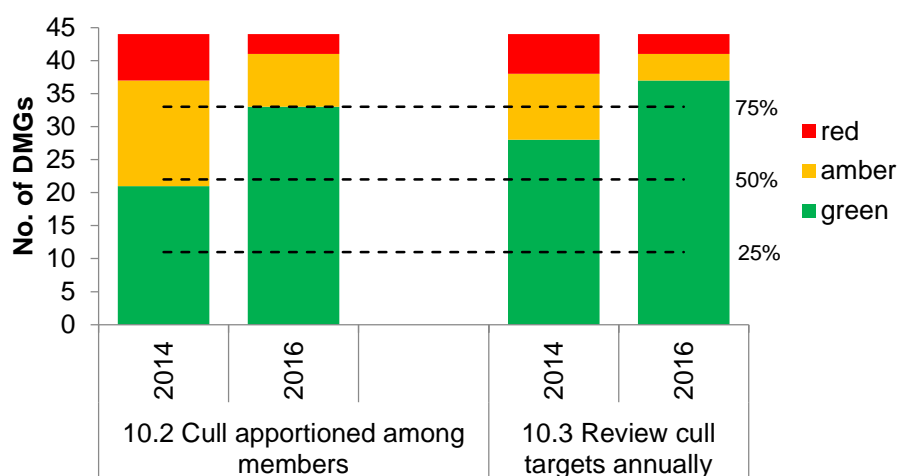
Category 9: Deer counts

Figure 6.4. Number of DMGs with each colour status in criterion 9.1 Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 10. Data and evidence gathering – culls

Criterion 10.2 The cull should be apportioned among members to meet the objectives of the DMP and individual management objectives while maintaining the agreed target population and favourable environmental condition.

Criterion 10.3 The group cull target should be reviewed and, if necessary, adjusted annually.

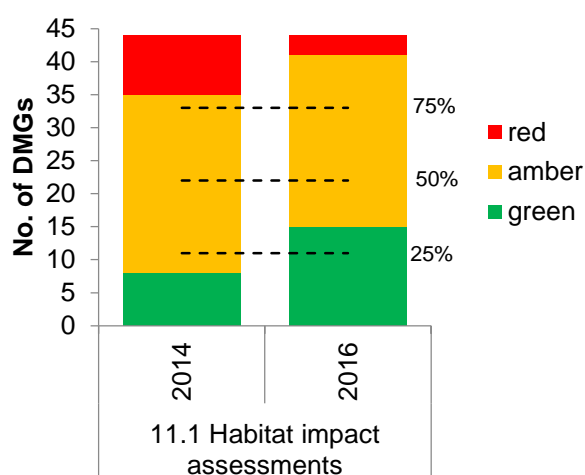


Category 10: Culls

Figure 6.5. Number of DMGs with each colour status in criteria 10.2 and 10.3. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 11. Data and evidence gathering – habitat monitoring

Criterion 11.1 DMGs should carry out habitat monitoring. Habitat Impact Assessments (HIA) measure progress towards agreed habitat condition targets on both designated sites and the wider deer range.



Category 11: Habitat monitoring

Figure 6.6. Number of DMGs with each colour status in criterion 11.1. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 12. Competence

Criterion 12.1 It is recommended that in addition to DSC1, deer managers also attain DSC2 or equivalent.

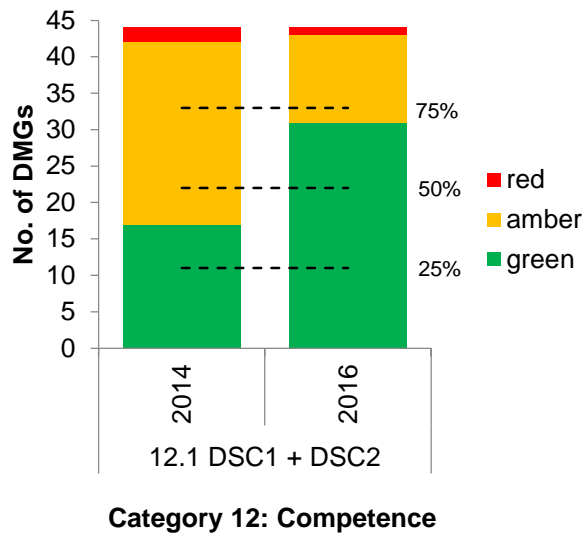


Figure 6.7. Number of DMGs with each colour status in criterion 12.1. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

ADMG benchmark category 15. Communications

Criterion 15.3 A deer management plan should be accessible and publicly available, and local consultation during its development is advised.

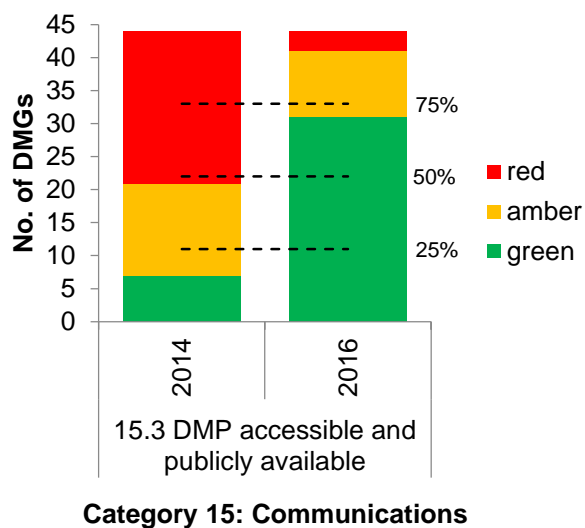


Figure 6.8. Number of DMGs with each colour status in criterion 15.3. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

Change in Public Interest Categories between 2014 and 2016

Overall, out of a possible 2464 records (44 DMG plans x 56 criteria) for the Public Interest criteria:

- 62.5% improved between 2014 and 2016
- 32% showed no change
- 5.5% deteriorated.

The improvement shown could be a change in the assessment rating of the criteria from either red in 2014 to amber in 2016, or amber to green or red to green. No change in RAG rating for individual criteria between the two years has also been analysed. Annex 5 illustrates this for a small sample of criteria.

There was no clear pattern relating to which criteria improved the most. The top three interest criteria which showed the most improvement were:

- 42 plans improved for carrying out an assessment against the benchmark;
- 37 plans improved for quantifying the extent of the carbon-sensitive habitats within the DMG range;
- 35 plans improved for establishing overall extent of woodland and determine what proportion is existing native woodland.

There was no obvious pattern in the criteria where the RAG rating deteriorated between 2014 and 2016. The three criteria showing the greatest deterioration were:

- 7 plans showed deterioration for identifying required impact targets for habitat types
- 6 plans showed deterioration for minimising negative economic impacts
- 6 plans showed deterioration assessing the economic costs associated with management changes.

For all of the 56 public interest criteria, more DMG plans achieved a green rating (good performance) in 2016 compared with 2014.

The results are summarised below using mean scores for each of the 14 public interest categories. Criteria scores were calculated using 0 for a red rating, 1 for an amber rating and 2 for a green rating. The calculation involved taking the mean score of all criteria in the category for each DMG plan, followed by the mean score of all DMG plans in the category. The mean scores for each public interest category are provided in Annex 6. The extent of improvement between 2014 and 2016 is illustrated in Table 6.1. For the purposes of illustrating the changes, the range of scores is simplified as follows:

Mean Score

0 - 0.5	= ★
0.6 – 1.0	= ★★
1.1 – 1.5	= ★★★
1.6 – 2.0	= ★★★★

Table 6.1. The simplified range of mean scores for the 14 public interest categories. The categories most relevant to the natural heritage are highlighted in bold.

Category		Range of Mean Scores	
		2014	2016
1	Actions to develop mechanisms to manage deer.	★ ★	★ ★ ★ ★
2	Actions for the delivery of designated features into Favourable Condition.	★ ★	★ ★ ★
3	Actions to manage deer to retain existing native woodland cover and improve woodland condition in the medium to long term.	★ ★	★ ★ ★
4	Actions to demonstrate DMG contribution to the Scottish Government woodland expansion target of 25% woodland cover.	★ ★	★ ★ ★
5	Actions to monitor and manage deer impacts in the wider countryside.	★ ★	★ ★ ★
6	Actions to improve Scotland's ability to store carbon by maintaining or improving ecosystem health.	★	★ ★ ★
7	Actions to reduce or mitigate the risk of establishment of invasive non-native species.	★ ★	★ ★ ★ ★
8	Actions to protect designated historic and cultural features from being damaged by deer e.g. by trampling.	★ ★	★ ★ ★
9	Actions to contribute to delivering higher standards of competence in deer management.	★ ★	★ ★ ★ ★
10	Actions to identify and promote opportunities contributing to public health and wellbeing.	★ ★	★ ★ ★ ★
11	Actions to maximise economic benefits associated with deer.	★ ★	★ ★ ★
12	Actions to minimise the economic costs of deer, and ensure deer management is cost-effective.	★	★ ★ ★
13	Actions to ensure effective communication on deer management issues.	★ ★	★ ★ ★ ★
14	Actions to ensure deer welfare is taken fully into account at individual animal and population level.	★ ★ ★	★ ★ ★ ★

Due to the requirement of the commission from the Minister for SNH to consider the public interest with a specific focus on the natural heritage, the results for public interest categories 1–7 are analysed in detail below. Figure 6.9 shows the RAG for all the public interest categories in 2016. Categories 2,3, 4, 5 and 6 have a lower percentage of green ratings compared with the other categories (although note category 12 has similar results to category 5).

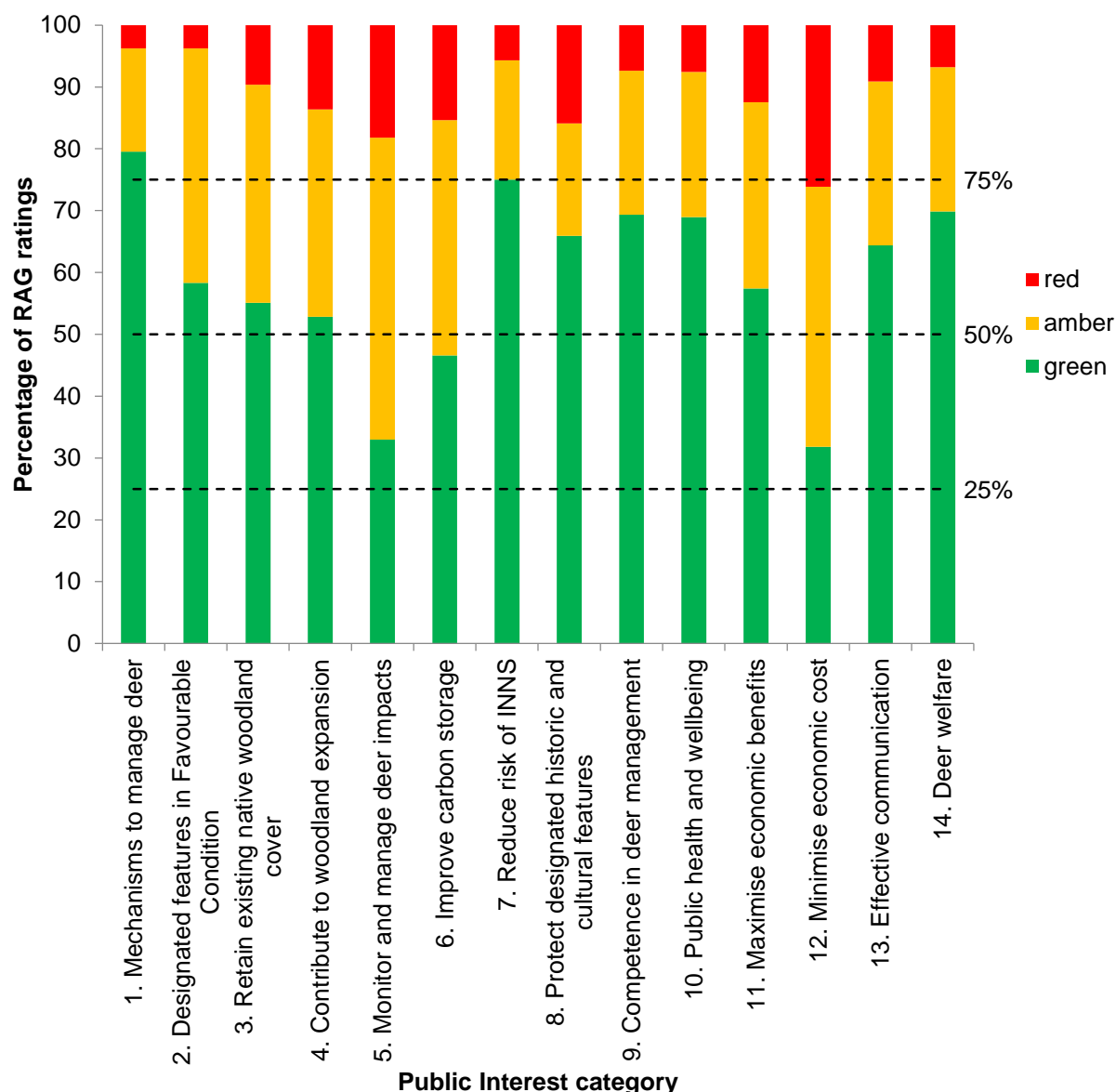


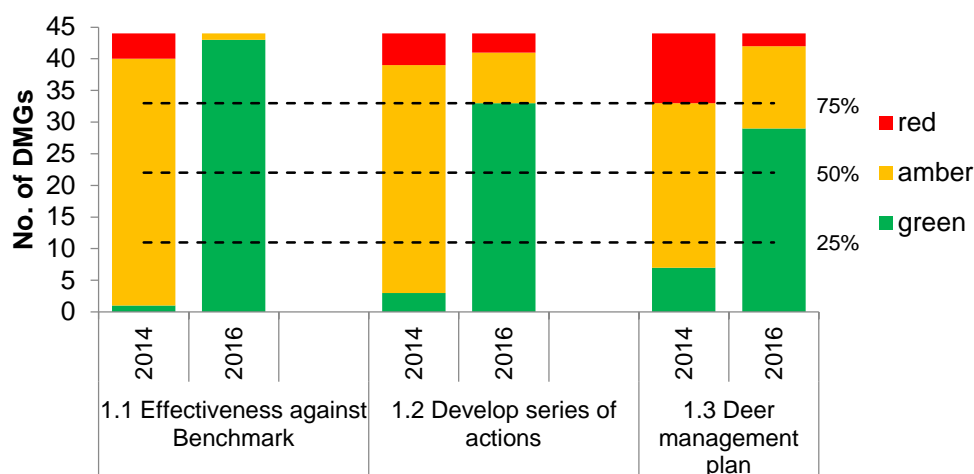
Figure 6.9. Percentage of RAG ratings for each public interest category for 44 DMG plans in 2016. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of RAG ratings in each category.

The graphs below illustrate the RAG results for every criterion within public interest categories 1-7. The graphs show the number of DMG plans rated red/amber/green in both 2014 and 2016.

Annex 7 shows the results for the remaining public interest categories i.e. 8 – 14. Annex 8 contains graphs showing the changes, i.e. improvement or deterioration across all the plans for each public interest category.

Public interest category 1. Actions to develop mechanisms to manage deer

- 1.1. Carry out an assessment of effectiveness against the Benchmark.
- 1.2. Develop a series of actions to be implemented and assign roles.
- 1.3. Produce and publish a forward-looking, effective deer management plan which includes the public interest elements relevant to local circumstances. The plan should contain an action plan which sets out agreed actions and monitors delivery. Minutes of DMG meetings should be made publicly available.



Category 1: Mechanisms to manage deer

Figure 6.10. Number of DMGs with each colour status for each criterion in category 1. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs.

Out of the 14 public interest categories, category 1 shows the greatest improvement in the assessment results between 2014 and 2016. Between 64% and 95% of plans demonstrated an improvement from 2014 to 2016 across the three individual criteria (see Annex 8).

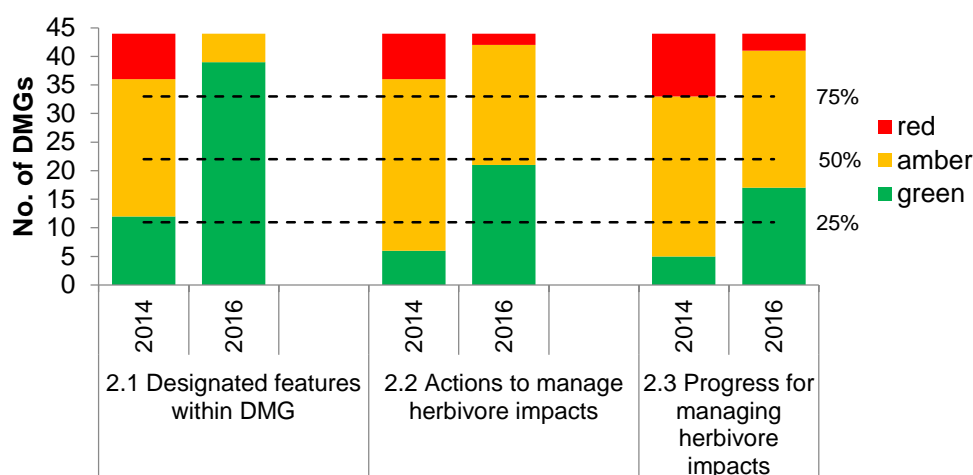
Criteria 1.2 and 1.3 capture the shift in the number of DMGs with forward-looking DMPs and action plans. A limitation to the progress demonstrated in criterion 1.3 (66% of plans were assessed as being forward looking and effective deer management plans) was timescale – i.e. plans were assessed in May and June, although not all plans had been completely finalised.

An example of an assessment for a plan performing well against criterion 1.3 is given below:

“Green – ‘5 yr plan complete (2016 - 2021) which covers private and public objectives. Published in February 2016 for consultation. Minutes to be uploaded to website from now on’ (Glen Strathfarrar)”

Public interest category 2. Actions for the delivery of designated features into Favourable Condition

- 2.1 Identify designated features, the reported condition and herbivore pressures affecting designated sites in the DMG area.
- 2.2 Identify and agree actions to manage herbivore impacts affecting the favourable condition of designated features.
- 2.3 Monitor progress and review actions to manage herbivore impacts affecting favourable condition.



Category 2: Designated features in to Favourable Condition

Figure 6.11. Number of DMGs with each colour status for each criterion in category 2. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

The extent of improvement in this category varies across the three criteria. In relation to identifying designated features and the reported condition (criterion 2.1), 66% of plans showed an improvement from 2014 to 2016. The extent of improvement was less for the other two criteria (39% of plans improving for criterion 2.2 and 43% of plans improving for 2.3).

In 2016, 48% of DMGs showed good progress in identifying and agreeing actions to manage herbivore impacts affecting the favourable condition of designated features (criterion 2.2). 39% of plans were performing well in relation to monitoring herbivore impacts and reviewing actions (criterion 2.3).

An example of an assessment for a plan delivering well against criteria 2.2 is given below:

“Green – ‘Hind reductions underway in Calder Valley aimed at reducing summer impacts over Monadhliaths SAC. Agreed habitat management actions being implemented at Creag Meagaidh, Kinveachy SAC under FGS scheme. Draft woodland management plan at Glen Tarf SSSI’ (Monadhliaths)”

Public interest category 3. Actions to manage deer to retain existing native woodland cover and improve woodland condition in the medium to long term

- 3.1 Establish overall extent of woodland and determine what proportion is existing native woodland.
- 3.2 Determine current condition of native woodland.
- 3.3 Identify actions to retain and improve native woodland condition and deliver DMG woodland management objectives.
- 3.4 Monitor progress and review actions to manage herbivore impacts.

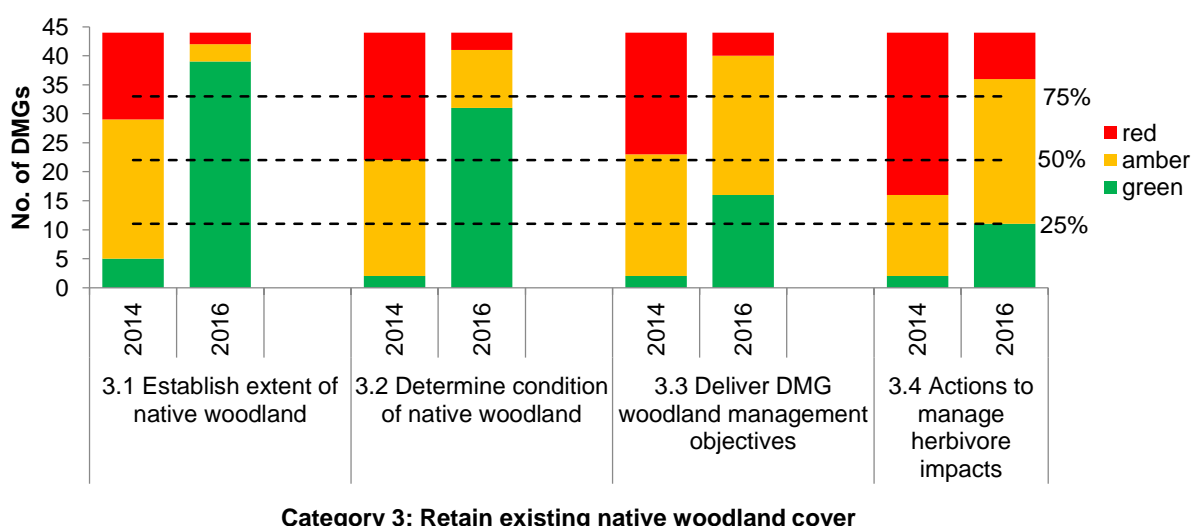


Figure 6.12. Number of DMGs with each colour status for each criterion in category 3. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

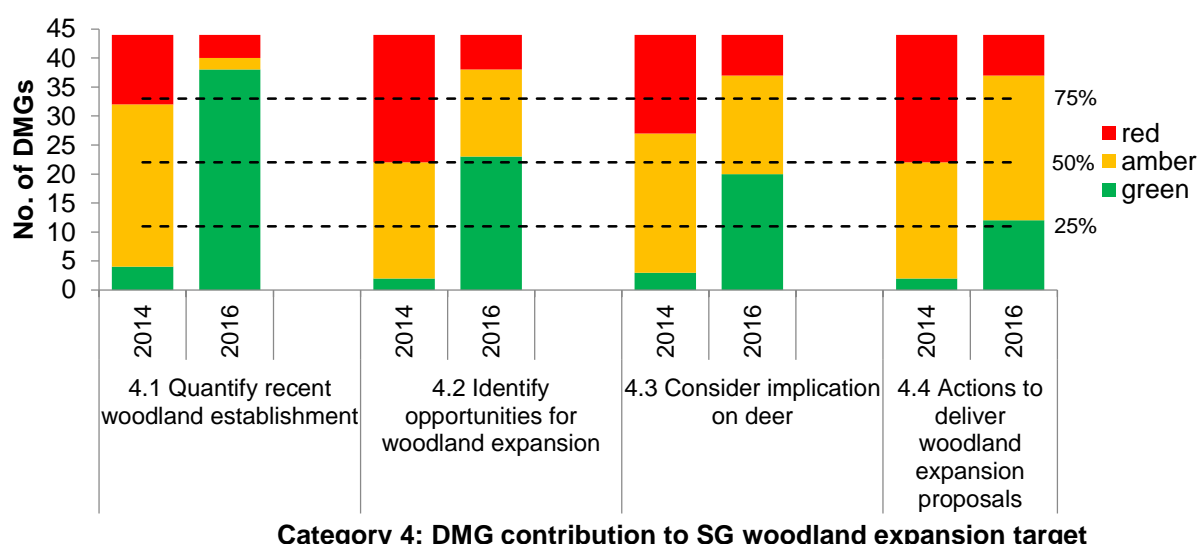
Across both the public interest woodland related categories (categories 3 and 4), criteria relating to the extent of native woodland cover and quantifying recent woodland establishment showed significantly more improvement than actions to identify opportunities for retaining/improving condition, or for expansion.

In 2016, a greater number of DMGs performed well in determining the extent and condition of native woodland compared with the number performing well to improve native woodland condition and monitor progress. The results for criteria 3.3 and 3.4 was 36% and 25% respectively. An example of an assessment for a plan performing well against criterion 3.3 is as follows:

***“Green** – ‘Plan observes that group have 65% of native woodland in low or medium categories, exceeding WDNA target of 60% by 2020; plus following action: PIA 3.1 Review existing woodland sites using maps and consider any actions necessary that may encourage future regeneration’ (Glenelg)”*

Public interest category 4. Actions to demonstrate DMG contribution to the Scottish Government woodland expansion target of 25% woodland cover

- 4.1. Identify and quantify extent of recent woodland establishment (through SRDP (last 5 years) and through other schemes).
- 4.2. Identify and quantify opportunities and priorities for woodland expansion over the next 5-10 years.
- 4.3. Consider at a population level the implication of increased woodland on deer densities and distribution across the DMG.
- 4.4. Implement actions to deliver the woodland expansion proposals and review progress.



Category 4: DMG contribution to SG woodland expansion target

Figure 6.13. Number of DMGs with each colour status for each criterion in category 4. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

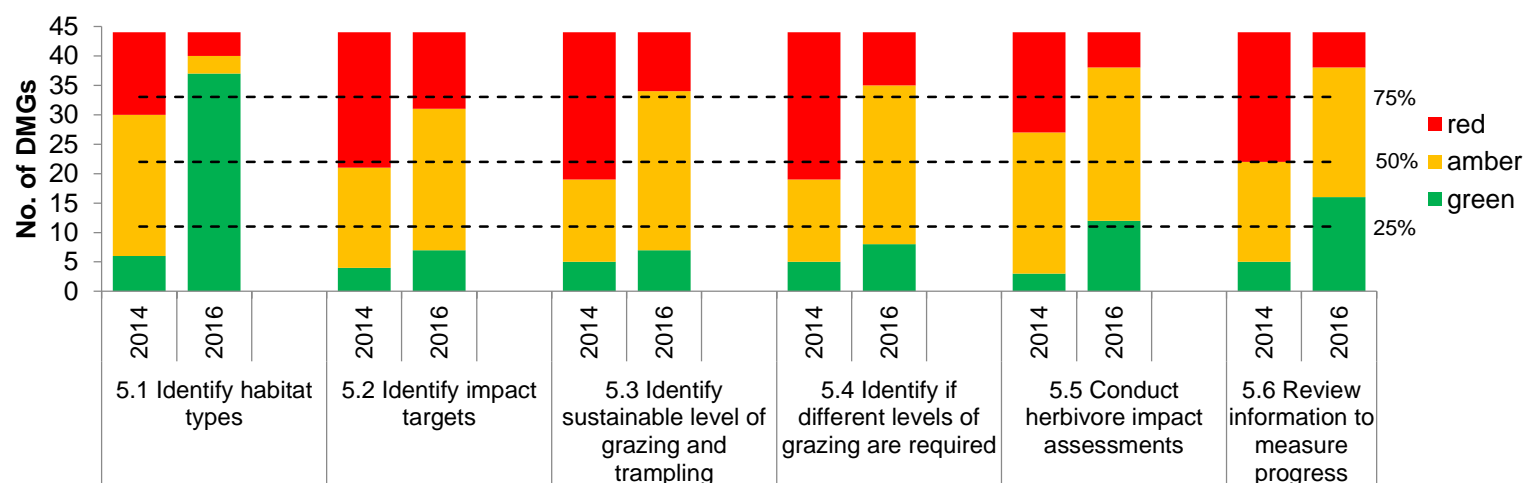
The 2014 baseline across the whole category was particularly low with only a few plans being assessed as performing well. In 2016, the highest percentage of plans performing well was 86% (criterion 4.1) and the lowest was 27% (criterion 4.4). An example of an assessment for a plan performing well against criterion 4.2 is given below:

“Green – ‘60 + 90Ha identified. Ardtornish looking at more’ (Morvern)”

Further progress across criteria 4.2, 4.3 and 4.4 requires a shift to considering woodland condition and expansion on a DMG-scale, with implications for deer management across the wider deer range. SNH has transferred a significant amount of data relating to both public interest category 3 & 4, but a number of DMGs continue to be challenged by understanding how to integrate the Long Term Forest Plan progress across individual properties with the wider collaborative perspective in this planning process.

Public interest category 5. Actions to monitor and manage deer impacts in the wider countryside

- 5.1 Identify and quantify the habitat resource by broad type.
- 5.2 Identify required impact targets for habitat types.
- 5.3 Quantify a sustainable level of grazing and trampling for each of these habitat types.
- 5.4 Identify where different levels of grazing may be required and prioritise accordingly.
- 5.5 Conduct herbivore impact assessments, and assess these against acceptable impact ranges. Where necessary, identify and implement actions to attain impacts within the range.
- 5.6 Regularly review information to measure progress and adapt management when necessary.



Category 5: Monitor and manage deer impacts

Figure 6.14. Number of DMGs with each colour status for each criterion in category 5. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

This category related to deer impacts in the wider countryside shows the least improvement out of all of the 14 public interest categories (Annex 6 provides the category mean scores). The extent of improvement is low, particularly across those criteria that link results of monitoring to reviewing management, suggesting that DMGs require further support in developing the capacity to interpret and use results as a management decision-making tool – for example, identifying impact target ranges and understanding their role as a trigger for management changes.

Within the category, identify and quantify the habitat resource (criterion 5.1) shows the greatest improvement (75% of plans improving). Identifying required impact targets for habitat types (criterion 5.2) shows least improvement (36% of plans improved).

Fewer than 25% of plans were performing well against criteria related to herbivore impact targets and sustainable levels of grazing (5.2, 5.3 and 5.4).

27% of plans demonstrated good progress in conducting herbivore impact assessments and assessing these against impact ranges (criteria 5.5). A limiting factor in some DMG's potential to do this was their lack of baseline data as they begin to embark on monitoring programmes.

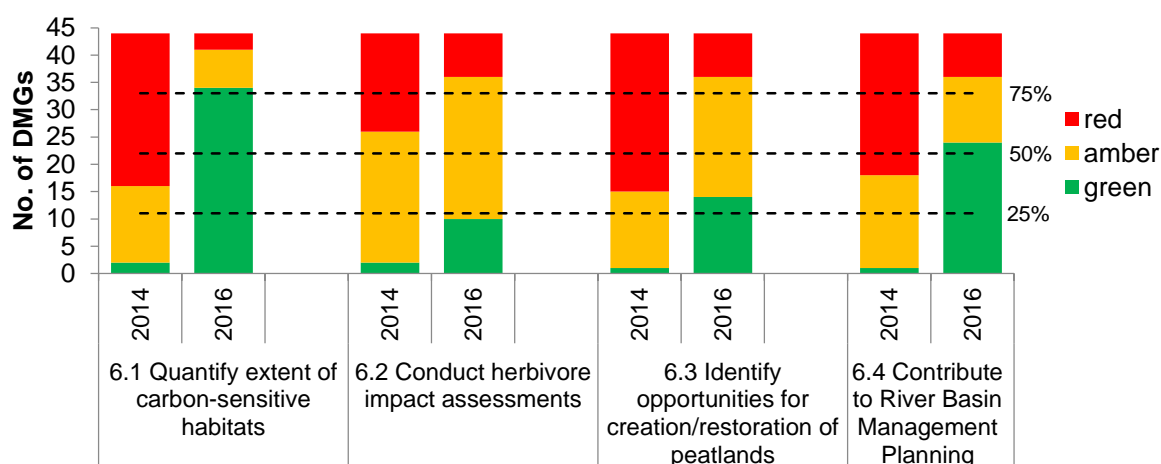
36% of plans were assessed as delivering well with regard to reviewing information to measure progress (criterion 5.6). An example is given below:

“Green – ‘HIA and repeat HIA carried out by Strathconon and Scardroy estates, population reduction identified based on results and actioned in plan. Remaining estates programmed and committed to commence HIA in 2016 and repeat in 2019. DMG as a whole has elected to reduce the density from 17.7 to 14.7 in response to impacts and neighbouring DMG requirements’ (South West Strathconon)”

A critical challenge that limited the performance relevant to this criterion (5.6) was the lack of detailed mechanisms for using and interpreting monitoring results at a DMG-scale. A further challenge limiting monitoring progress in some instances has been the implication of one or two larger members not committing to a monitoring programme, thereby limiting the overall Group score for these criteria.

Public interest category 6. Actions to improve Scotland's ability to store carbon by maintaining or improving ecosystem health

- 6.1 Quantify the extent of the carbon-sensitive habitats within the DMG range.
- 6.2 Conduct herbivore impact assessments, and assess these against acceptable impact ranges for these sensitive habitats. Identify and implement actions to attain impacts within the range.
- 6.3 Identify opportunities for the creation/restoration of peatlands.
- 6.4 Contribute as appropriate to River Basin Management Planning.



Category 6: Improve Scotland's ability to store carbon

Figure 6.15. Number of DMGs with each colour status for each criterion in category 6. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

The significant increase (84%) of plans improving in criterion 6.1 (quantifying extent of carbon-sensitive habitats) demonstrates the extent to which focus has been on understanding this resource at an individual DMG scale. This area of work continues to evolve and would benefit from further development.

Although there has been substantial improvement in this public interest category, the 2014 baseline was low across all the four criteria in terms of plans assessed as delivering well and remains low for two of the four criteria in 2016.

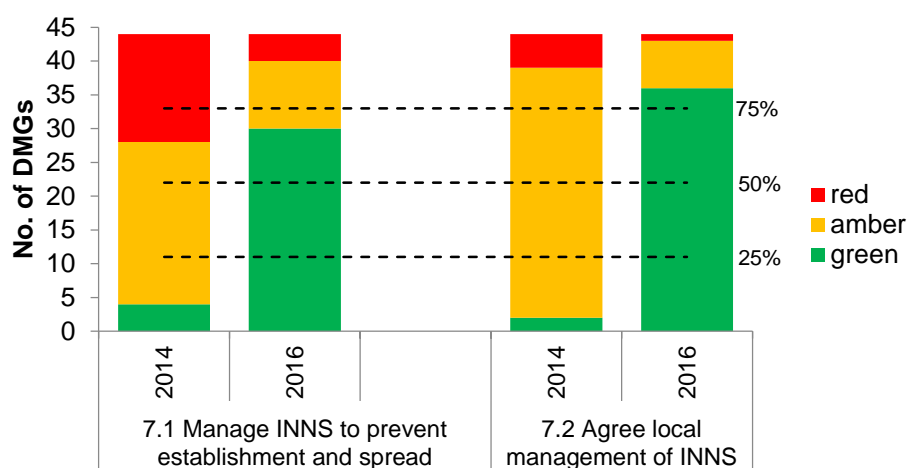
Criterion 6.4 (contributing to River Basin Management Planning) shows a sizeable improvement, much of which is attributable to a commitment to collaborating as opposed to an improvement in cross-sector collaboration in real terms.

An example of an assessment for a plan performing well against criterion 6.4 is given below:

"Green – 'River Basin Management Planning and plans referenced, group undertaking to ensure water quality rating is maintained at "good" status' (Black Mount)"

Public interest category 7. Actions to reduce or mitigate the risk of establishment of invasive non-native species (INNS)

- 7.1 Manage invasive non-native species (e.g. muntjac) to prevent their establishment and spread e.g. report sightings of muntjac to SNH.
- 7.2 Agree on local management of other non-natives which may be utilised as a resource e.g. sika, fallow, goats, to reduce their spread and negative impacts.



Category 7: Reduce/mitigate risk of INNS

Figure 7.16. Number of DMGs with each colour status for each criterion in category 7. Horizontal lines on the graph represent 25%, 50% and 75% of the total number of DMGs

Category 7 (together with category 1) shows the greatest improvement and provides an example of where some criteria were easier to achieve through the planning process than others. The formal development of an agreed policy perspective as part of the DMP has resulted in a significant shift in performance here.

In total, 73% of plans showed an improvement in preventing of the establishment of non-native species (criterion 7.1) and 68% of plans were rated as performing well. 80% of plans showed improvement regarding agreements on management of other non-natives (criterion 7.2) with 82% of plans rated green. An example of an assessment for a plan making good progress against criterion 7.2 is given below:

“Green – ‘Position on sika set out in the plan to reflect the group's aspirations in terms of them being a resource is reflected on in the plan’ (West Sutherland East)”

DMG Plans

In addition to looking at the range of results across the public interest categories (Figure 6.9), the spread of results across the 44 DMG plans was reviewed. Figure 6.17 shows the 44 plans ranked in order of the number of public interest criteria that were rated green. DMGs are variable in their performance. The “best” DMG plan achieved a green assessment in 91% (i.e. 51 out of 56) of the public interest criteria with the remaining five criteria rated as amber. The DMG plan needing to improve the most had no public interest criteria rated green and 78% (i.e. 44 out of 56) rated red. The remaining 12 criteria were rated amber. It can be seen that overall performance is good, with only a few plans of significant concern.

The spread of RAG ratings across all 44 DMG plans for the 45 benchmark criteria is illustrated in Figure 6.18. The plans are presented in the same order as that presented in Figure 6.17 and show that 82% of DMG plans were performing well in 50% or more of the ADMG benchmark criteria. As with the results above, it can be seen that overall performance is good, with only a few plans of significant concern.

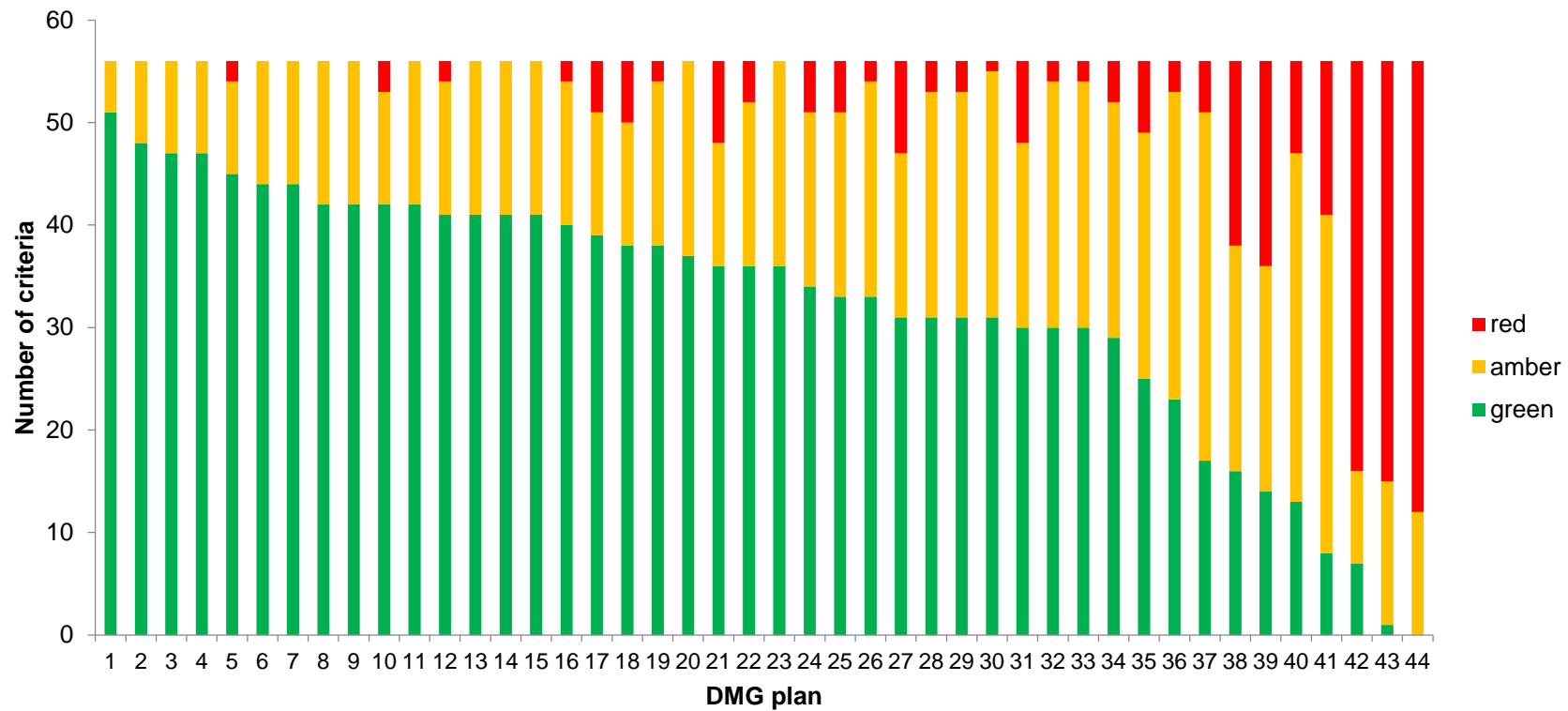


Figure 6.17. Variation in scores for 44 DMG plans for 56 public interest criteria, ranked in order of decreasing number of criteria with a green status.

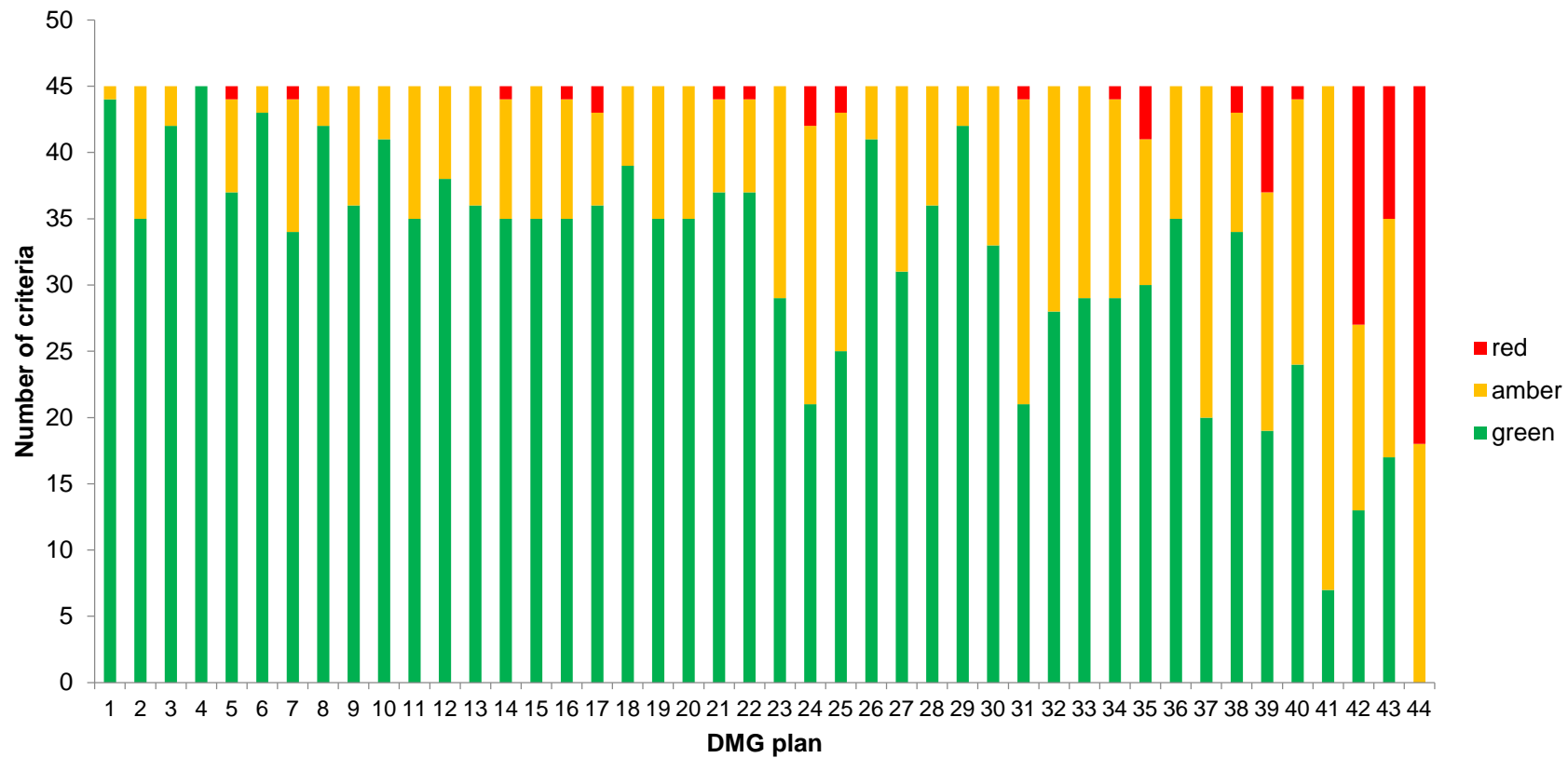


Figure 6.18. Variation in scores for 44 DMG plans for 45 benchmark criteria. The order of DMGs corresponds to the order in the public interest criteria.

DMG Assessment Results – Overview

In terms of overall performance, there is considerable variation not only among DMGs, but also across the different categories. Most DMGs have performed well against most public interest and benchmark categories, although the results in the previous sections demonstrate progress has not been uniform. Notable examples are the considerable improvement in quantifying the extent of carbon-sensitive habitats, but by contrast, limited improvement in identifying sustainable levels of grazing.

There is a complex interdependency of the indicators involved in the data which should be borne in mind, as well as consideration of the catalysts for change and barriers to progress. The relationship between the benchmark and the public interest indicators is also important to Group's functioning, and therefore their ability to make progress across the public interest categories.

Some key themes emerged from the assessments which highlight where particular progress has occurred or where constraints and barriers have been identified.

Openness, transparency and engagement

Categories across both the benchmark and public interest criteria relating to effective communication have generally demonstrated considerable improvement. The vast majority of upland DMGs now have publicly-available DMPs and have undertaken some form of public consultation. Overall, the planning process has resulted in an increase in the communications internally between members of DMGs, and externally with local communities and wider communities of interest.

Individual vs collective

Considering public interest criteria at a collaborative scale is a challenge for some DMGs. This is particularly the case for those criteria which, historically, have not been considered a collaborative, landscape-scale matter. For instance, in part due to its largely commercial nature, woodland expansion has occurred at an individual land-holding scale. SNH shared a large amount of data with DMGs throughout this planning period to support DMGs in considering woodland expansion at the group level, but this remains a new way of thinking for many DMGs and their individual members.

Training is an area of particular improvement as efforts to contribute to higher standards of competence in deer management have been increasingly considered as a collaborative DMG concern, rather than for individual land-holdings.

Understanding of public Interest

Developing the criteria and assessment process has provided a clearer overview of the wider outcomes DMGs were expected to address. The results of the assessment demonstrate good progress in quantifying and auditing resources through the planning process. There has been less progress in linking planning with implementation through identifying specific actions to resolve management issues. Some criteria are easier for some DMGs than others, depending on the degree of effort required to resolve current issues or tensions.

Public funding and support for delivery of public interest

The uncertainty and opaqueness of the funding support schemes, and the commercial nature of some of the management and contractual obligations of funding, have been identified in a number of groups as constraints to setting out clear timescales and mechanisms for delivery.

Conversely, assisted by peatland restoration carried out under the Peatland Action Fund (through which significant amounts of money have been invested), the carbon-related public interest category has shown some of the greatest progress.

Although the assessment results demonstrate an improvement in planning and of monitoring in the wider countryside, progress within these indicators was less pronounced than in many other categories. This is particularly the case for those criteria which link monitoring results to reviewing and identifying monitoring actions, suggesting that DMGs may need further support in developing the capacity to interpret and use results as a management decision-making tool.

6.2 Review of Section 7 Agreements

Key Findings

1. Section 7 Control Agreements are 'voluntary'. They can only be secured if all the relevant parties agree to the proposed measures and the terms can be varied at any time. The voluntary approach requires considerable time investment by SNH and estate staff.
2. The success of Section 7 Control Agreements is measured not just in terms of deer numbers or culls achieved, but ultimately by habitat improvement/recovery response.
3. Agreements have been in place for periods ranging from 3 to 10 years. Overall, a reduction in deer numbers has been achieved across Section 7 Control Agreement areas.
4. Deer density targets have been met for six Agreements; but for five of the 11 Agreements deer density targets have not been met.
5. Habitat targets have been met for three Agreements, partially met for two, but for six of the 11 Agreements, habitat targets have not yet been fully met.
6. Herbivore impacts are increasing in three of the 11 Agreements reviewed.

Introduction

This section describes the use of Section 7 Control Agreements, provides information from a recent review of current and historic Agreements in Scotland and the extent to which they are meeting their objectives.

Voluntary Deer Control Agreements under **Section 7** of the Deer (Scotland) Act 1996 and compulsory deer Control Schemes (under **Section 8**) are SNH's principal intervention powers in deer management. These legislative provisions set out a process through which SNH can negotiate, agree or impose measures relating to the management of deer.

Section 7 of the Deer (Scotland) Act 1996 as amended allows SNH to secure an Agreement with owners and occupiers regarding management measures which are required where SNH is of the view that deer have caused, are causing, or are likely to cause:

- damage to woodland, agricultural production or the natural heritage
- injury to livestock (by serious overgrazing or other competition)
- danger or potential danger to public safety.

The policy context in which this tool is used has evolved since the Deer (Scotland) Act 1959 where the role of Agreements was largely exercised to protect agricultural interests from marauding deer damage. The Deer (Scotland) Act 1996, ensured that natural heritage was more explicitly recognised in the legislation and, since 2002, Control Agreements have principally been used to address damage to sites designated for nature conservation. More recently the Wildlife and Natural Environment Act 2011 has added further criteria where Control Agreements may be sought to include damage to interests which may be of a social or economic nature.

Section 7 Control Agreements describe the area covered by the Agreement, the measures required (e.g. annual targets for culls and consequently reducing deer densities and impacts on habitats), and the time limits within which the measures should be taken and who undertakes the measures. They are 'voluntary', and can only be secured if all the relevant parties agree to the proposed measures, with the terms being varied at any time. Negotiation of Section 7 Control Agreements requires a considerable investment of time by SNH and estate staff. Estimated SNH annual spend across all Section 7 Agreements is on average £250k.

At present, there are eight Section 7 Control Agreements in Scotland (a further three are no longer extant), all of which relate to the protection of habitats on sites designated for nature conservation. Figure 6.19 shows the location of these agreements. These were negotiated between SNH (or the Deer Commission for Scotland before 2010) and landowners.

Where it is not possible to secure a Section 7 Control Agreement or if an Agreement is not being followed, Section 8 of the Deer (Scotland) Act 1996 allows SNH to make a Control Scheme whereby owners/occupiers are required to undertake the specified measures. Proposed Section 8 Control Schemes must be confirmed by the Minister before they come into operation. If owners/occupiers fail to carry out the required measures, SNH can undertake the measures and seek to recover its expenses from the relevant owner/occupier. No Section 8 Control Schemes have been implemented since the introduction of the Deer (Scotland) Act 1996 or before 1996, when the Red Deer Commission operated voluntary control schemes under the Deer (Scotland) Act 1959.

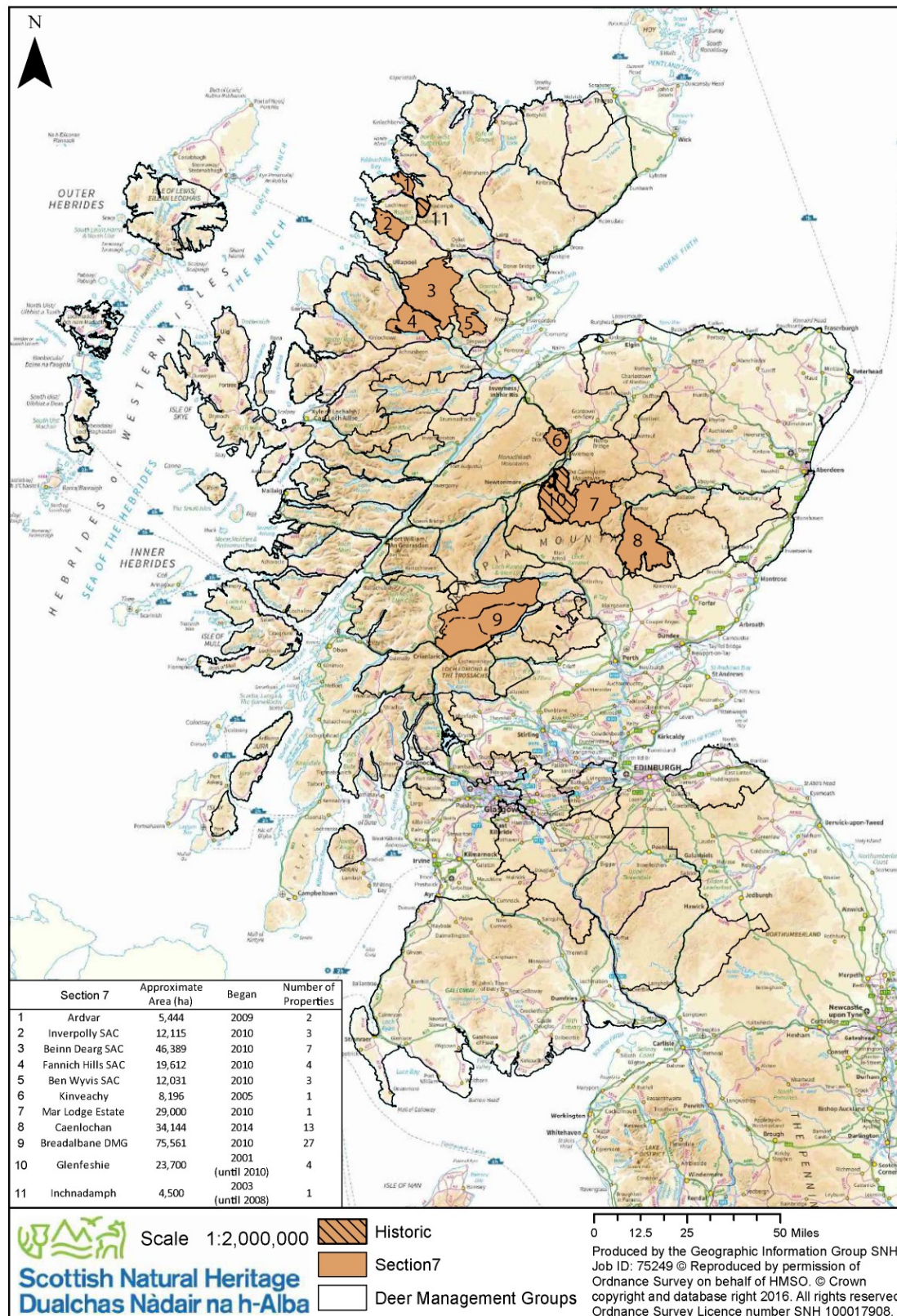


Figure 6.19. The location of both current and historic Section 7 Control Agreements.

Table 6.2 provides details about each Control Agreement, start and end dates, number of properties within each Agreement and other information such as the area covered by the Agreement. Although there are 11 current and historic agreements, the table lists thirteen, as two Agreements were superseded and replaced by new amended Agreements.

Table 6.2. Current and Historic Section 7 Control Agreements (including Agreements that have been superseded).

Section 7 Control Agreement	Start Date	End Date	Status	Reason – To prevent damage to	Number of designated features affected by grazing and trampling	Extent (ha)	Number of properties	Deer Management Group
Glenfeshie Catchment	2001	2010	Concluded	SAC woodland, SSSI	2 SAC, 1 SSSI	23,700	4	Cairngorm/Speyside
Ichnadamph	2003	2008	Concluded	SAC upland, SSSI	7 SAC	4,500	1	West Sutherland East
*Caenlochan	2003	2013	Expired (new Agreement in 2014)	SAC upland, SSSI	Individual property habitat targets	25,337	9 (10 after Glenisla property split) 12 with an area extension of Glenprosen and Glenhead properties.	East Grampians Sub Groups 1 and 2
Kinveachy	2005	2015	Current (extended for 2016)	SAC woodland, SSSI	2 SAC, 1 SSSI	8,196	1	Monadhliaths
*Drumrunie Estate	2006	2009	Superseded (extended in 2010 with Inverpolly and Eisg-Brachaidh estates, forming the current Inverpolly Agreement)	SAC upland and woodland, SSSI		5,265	1	West Sutherland Loch Inver South Sub Group

Ardvar	2009	2014	Dissolved in 2012	SAC woodland, SSSI	1 SAC, 1SSSI	5,444	2	West Sutherland Assynt Peninsula Sub Group
Inverpolly SAC	2010	2015	Current (extended for 2016)	SAC upland and Woodland, SSSI	10 SAC, 3 SSSI	12,115	3	West Sutherland Lochinver South Sub Group
Beinn Dearg SAC	2010	2015	Current (extended for 2016)	SAC upland and woodland, SSSI	14SAC, 3 SSSI	46,389	7	North Ross
Ben Wyvis	2010	2015	Current (extended for 2016)	SAC upland and, woodland SSSI	7 SAC, 5SSSI	12,031	3	North Ross
Breadalbane	2010	2015	Current (extended for 2016)	SAC upland, SSSI	27 SAC, 17 SSSI	75,561	27	Breadalbane
Fannich Hills SAC	2010	2020	Current	SAC upland, SSSI	7 SAC, 1SSSI	19,612	4	West Ross
Mar Lodge Estate	2010	2020	Current	SAC woodland, SSSI	2 SAC, 1 SSSI	29,000	1	East Grampians Sub Group 5
Caenlochan	2014	2019	Current	SAC upland, SSSI	14 SAC, 18 SSSI	34,144	13	East Grampians Sub Groups 1 and 2

*agreement expired or superseded and replaced by a new amended Agreement

The existing suite of Control Agreements is primarily focused on designated sites affected by wild deer, and success is measured not just in terms of deer numbers or culls achieved, but ultimately by habitat improvement/recovery response. Herbivore Impact Assessments (HIAs) are an integral part of the Section 7 Control Agreement process which allows the monitoring of habitats over time in relation to herbivore impacts. Targets (and a timeframe within which targets should be met) are set for habitats with regard to the level of impact from herbivores – i.e. grazing and/or browsing.

Context in which Section 7 Control Agreements Operate

Control Agreements are delivered by a steering group of interested parties, and data are used to identify issues and support management decisions (primarily relating to the setting of cull targets and population levels to achieve habitat targets). Monitoring is undertaken to review progress towards meeting the targets and this information is used to support further management measures.

We have reviewed 11 Section 7 Control Agreements to assess their effectiveness. The review considers changes in deer density, results of herbivore impact assessments, and results of Site Condition Monitoring for each Agreement. Annex 9 provides a summary for each of the reviewed Section 7 Control Agreements.

One agreement (Ardvar) was dissolved in 2012, following ineffective attempts at reconciling differing deer management objectives to bring the deer population down to levels which allow the woodland and its understorey to recover. Discussions are underway with the Assynt Peninsula DMG Sub-Group to demonstrate that it can manage the deer population collaboratively through the voluntary approach.

Deer Numbers, Densities and Count Results

Deer counts have been undertaken throughout the term of the Agreements to monitor the changes in deer numbers within each area. The frequency of counts is variable between Agreements. The results are shown in Table 6.3 for the current agreements and Table 6.4 for the historic agreements.

Table 6.3. Deer density changes across the eight current agreements.

Control Agreement	Starting Density (nos/km ²)	Most Recent Density (nos/km ²)	Target Density (nos/km ²)	Target Met	Population reduction
Ben Wyvis	14.3 (spring)	10.3 (spring)	8-10 (spring)	Yes	(-28%)
Fannich Hills	13.8 (spring)	10.9 (spring)	11 (spring)	Yes	(-21%)
Beinn Dearg	14.6 (spring)	13.5 (spring) 15.6 (Summer)*	12-16 (summer)	Yes	(-8%)
Inverpolly	5.4 (spring)	4.7 (spring)	4 to 5 (spring)	Yes	(-11.2%)
Breadalbane	17.1 (spring)	11.4 (spring) 13.6 (summer)*	12.8 (summer)	No	(-33%)

Caenlochan 2003-2013	45 (summer)	29.2 (summer)*	19 (summer)	No	(-35%)
"	30.2 (spring)	21.4 (spring)	16.4 (spring)	No	(-29%)
Mar Lodge Estate Moorland Zone	6.7 (spring)	6.4	5.6	No	(-3%)
Mar Lodge Estate Regeneration Zone	Zero deer policy has seen a large reduction in utilisation of the woodland.			N/a	Yes
Kinveachy	11.8	5.8	2 to 4	No	(-70%)

*Summer populations are modelled based on spring count. ** Under negotiation

Table 6.4. Deer density changes across the three historic agreements.

Historic Agreements	Starting Density (nos/km ²)	Density at End of Agreement (nos/km ²)	Target Density (nos/km ²)	Target Met	Population reduction
Inchnadamph SAC	24.9	18.6	8	N/A Required impacts reduced	(-26%)
Glenfeshie Estate	8.7	0.8	5	Yes	(-93%)
Ardvar	12.1	11.0	7.25	No (agreement dissolved in 2012)	(-9.5%) (latest counts show deer density is now increasing)

The count data show that all the Section 7 Control Agreements have achieved reductions in deer populations. For Ben Wyvis, Fannich Hills, Beinn Dearg and Inverpolly, the density targets have been achieved, although the reduction culls took four or five years to achieve, rather than the three years set out in the agreement. The population targets have not (yet) been met for five Agreements.

Annex 10 provides details of deer counts and densities for each control agreement. Locally, within some parts (estates) of control areas there have been substantial reductions in deer densities, but overall densities are still higher than committed to in the Control Agreements.

Site Condition Monitoring Results

Figure 6.20 summarises the reported condition of features for each Section 7 area from 2005 – 2016 (covering three SCM cycles).

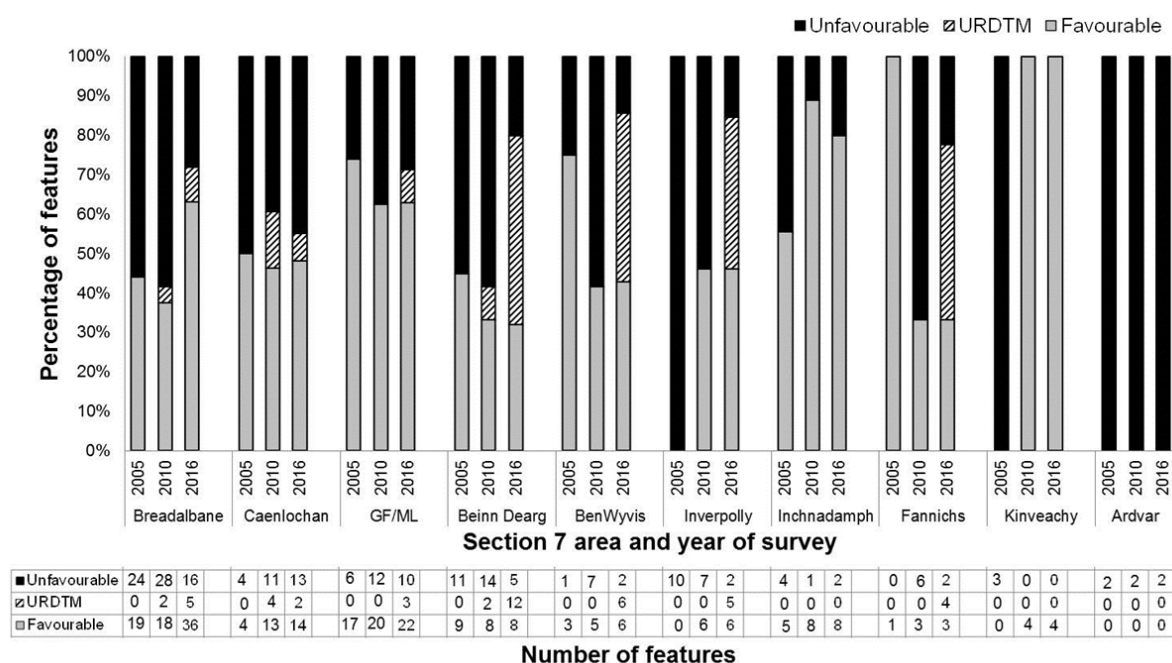


Figure 6.20. Percentage of features in unfavourable, unfavourable recovering due to management (URDTM), and favourable condition at 11 Section 7 Control Agreement sites for three survey years. The numbers of features in each category, at each site, are listed in the table below the plot.

Between 2005 and 2016, there has been an increase in the percentage of feature areas classed as ‘favourable’ on four Section 7 Control Agreement areas (Breadalbane, Inverpolly, Inchnadamph and Kinveachy). Three Agreement areas (Caenlochan, Beinn Dearg and Ben Wyvis) have shown an increase in the percentage of features classed as “unfavourable but recovering due to management”.

Three Agreement areas show that the number of features classed as unfavourable increased between 2005 and 2016 (Caenlochan, Ben Wyvis and Glen Feshie/Mar Lodge).

These generalised figures mask a complex picture of changes over the three sampling periods and the range of habitats sampled.

Herbivore Impact Assessment Results

For those designated sites with features which are unfavourable because of grazing and trampling impacts, we have additional data derived from monitoring in the form of Herbivore Impact Assessments (HIAs). These provide more detailed baseline information on the state of habitats against which changes can be measured over the duration of Control Agreements.

Whilst the SNH SCM programme assesses the 'condition' of a natural feature (e.g. favourable or other), HIA methods assess herbivore impacts on upland habitats. The survey method includes the assessment of grazing, browsing and trampling using a range of small-scale field indicators for generic habitat types which cover open moorland and summit ground in the uplands.

The impacts are categorised into three classes – high, moderate or low – which indicate the directly-observable effects of impacts on the structure and composition of the habitat. Each habitat type has a set of targets which can be used to judge overall impacts and changes in herbivore impacts on sites between years.

Table 6.5 summarises the results for HIAs for the 11 Section 7 Control Agreements. The full results are provided in Annexes 11 and 12. For a given site, plots have been sampled and defined and impacts by herbivores (through grazing/browsing and trampling, principally by deer and/or sheep) described as 'low', 'low-moderate', 'moderate', 'moderate-high' or 'high'. Over the years, we have re-visited these sites and re-assessed the plots. If the number of plots with 'low' impacts increases, we are detecting signs of improvement. Conversely, where numbers of high-impacted plots are being recorded, this indicates signs of habitat deterioration related to herbivores. In the Annexes, the **green** and **red** arrows depict improvements or deterioration over time. The left-hand plots in Annex 11 show these data. By looking at different habitats we can further judge the changes in impacts, as habitats vary in their sensitivity to grazing/browsing and trampling.

Although HIAs evaluate levels in grazing, browsing and trampling, with changes being readily observable from impacts on the structure and composition of the habitat, the condition of some habitats can take 5-10 years to respond to reductions in grazing (e.g. wind-clipped heaths). This needs to be considered when making judgments on improvements in habitat condition. The Site Condition Monitoring results are summarised in Figure 6.20 above.

Through HIA monitoring, habitat targets for herbivore impacts allow an assessment of whether or not deer management, through heavier culls, is being successful. Given the spatial variability in habitat use by deer, heavy culls (and associated disturbance) in some parts of large sites are resulting in habitat damage due to deer trampling. Where a high percentage of plots are improving in condition and meeting or exceeding targets, the management can be deemed successful. The right-hand plots in Annex 11 show these data.

Annex 12 presents data for woodland habitats. Most of the data relate to assessment of changes in tree seedling heights and the percentage browsed – both reliable indicators of changes in deer browsing impacts.

Table 6.5. Summary of the results of Herbivore Impact Assessments (HIAs).

Section 7 Control Agreement	Habitat targets fully met?	Herbivore impacts	Herbivores present	Population target met?
Glen Feshie Catchment 2001 - 2010	YES (woodland habitats)	Impacts reduced		YES
Inchnadamph 2003 - 2008	YES (met for 3 of 3 upland habitats)	Impacts reduced		N/A
Mar Lodge 2010 - 2020	YES (woodland habitat targets met, and for 3 of 4 upland habitats)	↓ reducing	deer, hares	NO (although population reduction achieved in woodland regeneration zone)
Inverpolly 2010 - 2016	PARTIAL (met for 3 of 3 upland habitats, woodland habitat targets not met)	variable (low - moderate impacts for upland habitats, high impacts for woodland habitat)	deer, hares, sheep	YES
Ben Wyvis 2010 - 2016	PARTIAL (met for 2 of 4 upland habitats)	variable (impacts increasing on blanket bog and dry heath)	deer, hares	YES
Kinveachy 2005 - 2016	NOT YET (woodland habitats)	↓ reducing	deer, hares	NO
Caenlochan 2003 - 2013 & 2014 - 2019	NOT YET (met for 2 of 7 upland habitats)	variable (impacts vary on different habitats)	deer, hares, sheep	NO
Breadalbane Hills 2010 - 2016	NOT YET (met for 1 of 7 upland habitats)	variable (impacts reducing in some areas)	deer, hares, sheep	NO
Ardvar 2009 - 2012	NOT YET (woodland habitats)	↑ increasing	deer	NO
Beinn Dearg 2010 - 2016	NOT YET (met for 0 of 4 upland habitats)	↑ increasing	deer, hares	YES
Fannich Hills 2010 - 2020	NOT YET (met for 1 of 3 upland habitats)	↑ increasing	deer, hares	YES

Three Section 7 Control Agreement areas have shown improvements in habitat condition, (Glen Feshie, Inchnadamph and Mar Lodge), deer density targets have been met where applicable and herbivore impacts are reducing.

Two other Section 7 Control Agreement areas are showing partial success (Inverpolly and Ben Wyvis), where deer density targets have been met, the herbivore impacts are variable across the site and most of the habitat targets have been met. At Inverpolly, tree seedling regeneration is still suppressed due to herbivore impacts, but upland habitat targets are

being met and there is an overall trend of reducing impacts of herbivores. On Ben Wyvis, herbivore impacts have increased recently, but the habitat targets have been met for two, and are very close to being met for the other two.

Four Agreements (Inverpolly, Ben Wyvis, Beinn Dearg, Fannich Hills) have not yet fully met the habitat targets despite population targets having been met. Explanations for this include the time lag involved in habitats responding to management and uncertainties in how long habitats take to respond. Hence, we have referred to targets as 'not yet' met, though some may never be met under the present grazing regime. However, our judgement is that whilst overall habitat targets for Inverpolly and Ben Wyvis are partially met, those for the other two sites are not, with some habitats far below the target. In some instances, these results may be due to a purposefully cautious approach to setting population densities at the beginning of an Agreement in order to secure the voluntary approach. Section 7 is, after all, recognised as an adaptive approach, with the original density being reviewed in the light of habitat monitoring.

For three Agreement areas, (Kinveachy, Caenlochan and Breadalbane), the deer density targets have not been met and the habitat targets are not being met.

On the three other areas (Ardvar, Beinn Dearg and Fannich Hills) habitat targets are not being met, and there are indications of adverse impacts on habitats worsening, although deer density targets for two of these Agreement areas have been met. In light of the latest HIA results, these two agreements will be reviewed.

Upland and woodland habitat condition varies considerably across sites. In assessing whether habitat condition targets are being met we have been mindful of this, and recognise that some of the impacts arise in response to seasonal and spatial variability in deer (and sheep) movements. Some habitat features extend over extensive areas and fall under several ownership units. Accordingly, land management practices can vary across these units, and what is done on one can directly impinge on another. Within a Section 7 Agreement area, some owners may well meet a habitat target on their land, yet the overall area's target is missed because one other part has been heavily grazed or browsed.

We recognise that in making a judgement on the success or failure of a Section 7 Agreement a complex range of factors influence the habitat condition at any time. Nevertheless, the evidence indicates that for a number of the Section 7 Agreements progress has not been adequate to reverse the negative impacts of herbivores and additional measures would be needed to deliver the objectives.

7. Evaluation and Conclusions

7.1 Evaluation

This evaluation is based on an assessment of the evidence provided in the preceding chapters.

In line with the commission set for this review, this evaluation has focused on the impacts of deer on the natural heritage. We recognise that there is a range of other deer interactions with areas of public interest which would warrant further considered analysis. However, this is outwith the scope of the commission set for this review.

Undertaking this evaluation has been challenging as there is no agreed threshold against which to judge successful delivery of deer management. In addition, the evaluation is complex due to the diversity of delivery approaches across Scotland, the different length of time these have been established, and the varying sensitivity of natural ecosystems to deer densities. We have therefore relied on the principles set out in the Code for Deer Management and *'Scotland's Wild Deer: A National Approach'* and measured delivery success based on the extent to which effective collaborative action is demonstrated in accordance with these principles.

Deer Populations

Overall, the review indicates that populations of red deer have grown substantially since the 1960s. The latest analysis of the evidence estimates that the density of red deer in the uplands has increased from approximately 8 deer/km² in the 1960s to a peak of around 13 deer/km² in 2000-01. Since 2000-01, growth in the population appears to have tailed-off with present densities of around 12.5 deer/km².

While red deer densities appear to have stabilised, there are marked variations across the country and densities remain high in many parts of the uplands. This continues to be a barrier to maintaining a healthy ecosystem which is one of the core principles set out in *'Scotland's Wild Deer: A National Approach'*. In addition, research from the Isle of Rum National Nature Reserve illustrates that reduced deer densities have positive impacts on red deer reproductive biology and may therefore deliver beneficial outcomes for sporting managers.

Within the National Forest Estate, there has been an estimated decline in deer numbers of 24% since 2001, which appears to be driven by increased culling of woodland deer – mainly roe deer, although the overall population trends within the lowlands are less clear.

The data on deer populations are incomplete, with uncertainty over national population estimates for both red and roe deer. Trends for red deer are being examined at local and landholding levels. This will give a comprehensive overview of their current national and regional status and trends. We are also analysing drivers of change in deer densities, including changes in sheep numbers and deer cull returns. Data indicate declines in sheep numbers are not uniform. The areas with the largest declines after changes to CAP support (post-2005) include Lochaber, the Western Isles, Argyll and Bute islands, Ross and Cromarty, and Skye and Lochalsh.

This further analysis will be complete in early 2017 and will allow us to assess how changes in management practices are affecting deer densities, nationally and regionally. At the local level, this will allow managers to make more effective links to impacts on the ground and help them reach informed decisions about adaptive management.

Environmental Impacts

The review has assessed information from a number of key sources to determine the impact of deer on the natural heritage. However, we have not analysed all the potential impacts of deer on the natural environment. Further analysis is required to assess all the interactions between deer and the natural heritage, including important areas such as the impact of deer on moorland and carbon-rich soils. Impacts on peat are likely to become increasingly prominent as Scotland works to combat the adverse consequences of climate change.

Investigations undertaken to support the Native Woodland Survey of Scotland found that more than a third of all native woodlands were in an unsatisfactory condition due to herbivores, with almost three-quarters of these recording a marked presence of deer. The trend for woodland deer overall is uncertain, but there is widespread agreement that current deer numbers are suppressing the recovery of some native woodlands, which studies have shown has negative impacts on woodland bird species diversity.

The review identifies a number of environmental impacts arising from deer populations within designated sites where more detailed investigation has been undertaken because of their national or international importance.

In general, we have seen improvements in tackling the condition of designated features on areas of nature conservation importance. This is reflected in the overall improvement in the proportion of features in favourable condition. However, the data show that grazing, browsing and trampling by deer and sheep are a major cause of features remaining in unfavourable condition. Distinguishing between the effects of deer and sheep can be difficult, but the more detailed herbivore impact assessments which have been undertaken for many sites, as well as data from the Native Woodland Survey of Scotland, show that impacts from deer are preventing recovery or enhancement of important habitats across Scotland.

The Site Condition Monitoring (SCM) information shows the status of designated features within areas covered by DMGs. SCM data shows that the proportion of features in favourable and recovering condition is 10% lower in areas covered by DMGs, and 12% lower in areas covered by Lowland Deer Groups, compared with features in the rest of Scotland. There are a number of contributory factors accounting for these differences, but the findings suggest that levels of collaboration and joint planning have not yet been effective in enhancing the overall condition of features on designated sites.

Where deer have caused damage to protected areas, SNH has provided additional support to help land managers, including providing funding for population monitoring, herbivore impact assessments, deer management plans, and advice on implementing plans and analysing the results. In areas of particular natural heritage concern, discussions have led to the implementation of Section 7 Control Agreements. This process that has been in use over areas of Scotland where SNH is of the view that deer have caused, or are likely to cause, damage to the natural heritage.

This review has assessed the effectiveness of Section 7 Control Agreements in delivering their objective of improving the condition of protected areas. We have also used this assessment to gain an insight into how well the common model of deer management underpinning Section 7 Agreements and the DMG planning process is likely to lead to further performance improvements across the existing DMGs. It should, however, be noted that delivery of Section 7 Control Agreements is complex. This is due to the need to address multiple features with different grazing requirements and to engage with many owners to improve the condition of habitat condition. An adaptive approach is therefore taken to help support early engagement and improvement. The point of transition to a Section 8 Control Scheme is not straightforward and requires careful consideration to determine when voluntary approaches have failed. This work requires substantial support from SNH and it is unlikely to be feasible to replicate this across the wider sector without a very significant increase in support from the public sector, with associated resource costs. Our assessment therefore takes a view on how well the existing voluntary approaches are likely to deliver more widely across Scotland without the intensive support made available through Section 7 Control Agreements.

An analysis of the 11 existing Section 7 Control Agreements shows that they have led to an increased level of engagement among deer managers and more integrated management planning. This has been a catalyst for reducing deer populations within the Agreement areas. The evidence so far shows that these measures have only partly achieved their primary objectives of meeting deer density targets, reducing herbivore impacts and meeting associated habitat targets. We recognise positive progress has been made, although the review indicates that experience to date would predict further improvements are likely to be slow.

In the lowlands, there is a lack of both data on deer numbers and detailed information on impacts on the natural heritage. The potential for future impacts here may increase given the practical challenges of deer management in an urban environment and the less-well-established framework for collaboration.

Current Deer Management Practice

The current approaches to deer management vary substantially across Scotland depending on the type of management structures in place, their maturity and the level of knowledge as well as the skill and commitment among individual landowners and managers. It should be noted that there remain significant areas of Scotland where no collaborative management structures exist. The evaluation has sought to take account of the diversity of the current picture in seeking to assess how effective approaches to deer management have been, or could be, in delivering environmentally sustainable deer management.

The evaluation looks in more detail at the deer management practice underway within Deer Management Groups and the emerging lowland deer management approaches. The efforts by the Association of Deer Management Groups to support the improvements in DMG performance and roll-out of management structures in the lowlands has had a notable effect on recent levels of engagement and delivery across the deer management sector.

Deer Management Groups (DMGs)

The current model of deer management has evolved over many years, with the origins of the legislation and local organisation based around managing a sporting resource. Since 1959, legislation has increasingly been enacted to address the damage caused by deer to agriculture and forestry. More recently, there has been an increased focus on managing deer to realise multiple benefits. This is articulated in the vision for sustainable deer management set out in 'Scotland's Wild Deer: A National Approach'. First published in 2008, its 20-year vision promotes widespread understanding of sustainable deer management so as to achieve a high quality, robust and adaptable environment, sustainable economic development and social wellbeing.

Management in the uplands has traditionally focused on DMGs which are intended to underpin collaborative management. There are, however, some areas of the uplands not covered by DMGs. More recently, an adapted version of this approach has expanded through much of lowland Scotland. DMGs are voluntary, but the expectations of the role they might play in accomplishing sustainable deer management has grown, particularly following the development of the '*Code of Practice on Deer Management*' in 2011. This defined guiding principles which emphasised collaboration and management at an appropriate geographical scale and promoted the concept of deer management having regard for public interests.

In recent years, there has been an increased understanding of the role that the natural environment plays in underpinning Scotland's economic growth, by providing natural resources, as well as supporting its international environmental reputation. '*Scotland's Biodiversity - a Route Map to 2020*' was developed in 2014 and sets out clear ambitions to deliver substantial improvements to the natural environment by 2020. These include a particular focus on restoration of peatlands and native woodland, creation of new native woodland and ensuring protected areas are in good condition. Heavy grazing by deer and other herbivores is recognised as one of the key pressures on biodiversity. There is also a growing realisation of the role herbivore management can play in protecting watersheds and riverbanks to reduce downstream flooding risks.

The Rural Affairs, Climate Change & Environment Committee considered evidence on deer management in autumn 2013 and emphasised the expectation that DMGs would improve their planning and operation, and in doing so help meet the biodiversity challenge set by Government. The Committee recognised that some DMGs had deer management plans in place, but it considered that the pace of change was too slow for all DMGs having demonstrably effective and environmentally-responsible management plans in place. The Committee considered that the end of 2016 was a reasonable date by which all DMGs would have adopted environmentally-responsible deer management plans, and demonstrated how they are ensuring positive outcomes for deer populations and the natural heritage.

This review has assessed progress of DMGs in enhancing their management planning and operations. We have recorded a substantial improvement across most DMGs, with good attendance at meetings and improved governance structures in place. Notably, the vast majority of upland DMGs now have publicly-available deer management plans and have undertaken some form of public consultation. Overall, the planning process has resulted in an increase in the communications internally among members of DMGs, and externally with local communities and wider communities of interest. Inevitably, there is some variation among groups in approaches taken and timescales. The Association of Deer Management Groups (ADMG) has promoted and encouraged these improvements and has been a strong and effective advocate of improved ways of working.

Our assessment generally found that DMGs show good performance in quantifying and auditing resources through the planning process. There has been less progress in linking planning to implementation through identification of specific actions to resolve management issues. The review therefore concludes that it remains a challenge for many DMGs to agree actions, such as managing herbivore impacts, or to deliver environmental improvements at a collaborative Group-scale.

There has not been a detailed assessment of the barriers to improved deer management practice and this is likely to require more investigation into the current mixture of incentives and regulation available to deer managers. However, our initial analysis suggests that difficulties in achieving coherence between individual landowners' management objectives within a DMG explains much of the varied progress seen within DMGs, with some finding it hard to reconcile competing objectives among their membership. The uncertainty about funding support schemes and the commercial nature of some of the management has made it difficult for some Groups to identify clear timescales and mechanisms to achieve improved delivery of public benefits. These barriers to implementation should not be expected to prevent effective planning of actions.

Overall, we found that there has been good progress in preparing plans across the sector in the last two years and should this continue, DMGs will be better placed to accomplish sustainable deer management over the coming years. However, there has been less improvement in identifying actions for both managing and improving habitats and wildlife, and undertaking appropriate habitat monitoring to inform future cull targets and deer management. While the positive progress is encouraging, we remain concerned that tangible improvements on the ground will not meet the expectations of the RACCE Committee for the rapid implementation of environmentally-responsible management plans and consequential enhancement of the natural heritage.

Lowland Deer Management

Deer in the lowlands are an area of importance for SNH, other public agencies and private interests, as deer increasingly interact with urban populations. The data on deer numbers are incomplete. However, there is circumstantial evidence that the occupied range has increased. This may in part be due to the increase in suitable habitat through the expansion of woodland planting.

The range of impacts of deer in the lowlands is different from that in the uplands. Work on vehicle collisions with deer indicates an increasing trend in incidents in urban areas. However, population expansion may lead to more opportunities for the public to enjoy seeing deer in open spaces.

The Native Woodland Survey of Scotland reported that a third of all native woodlands were in unsatisfactory condition due to herbivore impacts, with about half of these situated in the 'lowlands'. Deer were recorded as a significant presence in 73% of native woodland areas, and are limiting native woodland expansion.

It is clear that the current approaches to deer management in the lowlands are different to those in the uplands. Within some of these models there has been increased collaboration and understanding of the need for a strategic approach to planning, although it is still too early to assess whether these will be effective. However, there remain large gaps in the coverage of lowland deer management structures and collaboration is not consistent across

all the existing Lowland Deer Groups. In addition, there have been difficulties in ensuring that key stakeholders, including public bodies, engage with the process.

The improvements in the pace of change in parts of Scotland are encouraging, but the mixed picture of delivery across Scotland and within individual DMGs, along with the current geographical gaps in management structures, point to uncertain improvements and timing in the attainment of wider public benefits across the country from current deer management practices.

Wider Social and Economic Impacts

The focus of this review was to assess the effectiveness of deer management in protecting the public interest, with a specific focus on the natural heritage. The broader policy context set out in *'Scotland's Wild Deer: A National Approach'* promotes the conservation and control of deer to contribute to a high quality environment, as well as to wider social and economic wellbeing. In recognition of the important wider role deer play, we have also reviewed wider impacts and our analysis shows that social and economic benefits from deer are substantial.

While the review recognises that deer provide many economic benefits, including substantial employment and consequential economic activity in rural areas, present management approaches appear to lead to high social and economic costs which outweigh the current benefits. Available information suggests that if deer densities were lower across much of Scotland the benefits arising from deer could be largely maintained, and many of the costs (such as deer-vehicle collisions and impacts on forestry productivity) reduced leading to overall enhanced delivery of public benefits.

7.2 Conclusion of Assessment

We conclude that there has been substantial progress shown by DMGs over the last two years in improving their overall performance and commitment to the planning process. This includes strengthening the way they operate, accepting the requirements for planning, good governance and stakeholder engagement.

Some DMGs, however, have not managed to define collective actions to deliver change on the ground. Unless this is addressed, their capacity to deliver improvements to natural heritage outcomes through the implementation of effective deer management plans will be limited. We therefore conclude that while recent efforts by DMGs, supported by ADMG, have improved DMG performance and planning, the current, mixed level of commitment to joint action does not provide confidence that the implementation of these management plans will deliver the desired level of environmental enhancements, or wider public benefits, across Scotland. In addition, management structures are missing across significant areas of Scotland and the lowland deer management group model is relatively new and largely untested.

Our assessment of Section 7 Control Agreements shows that targets for reducing deer numbers and improved habitat condition have been slow to be addressed and are not uniformly met across all the existing 11 Agreements. Recent (and on-going) analysis of deer population densities and trends show that, nationally, deer densities have remained high

over the last 15 years. Deer densities are variable across DMGs, but have continued to rise or remain high over extensive areas of the red deer range and are at a level which will continue to prevent many natural heritage objectives being achieved.

Our wider analysis of the data highlights the scale of the task required to ensure that deer management is effective in improving the condition of both protected areas and woodland in the wider countryside. Available data on deer populations and site condition monitoring indicate that voluntary collaborative action has not been able to tackle these issues comprehensively to date, and it is therefore uncertain whether these deficiencies can be addressed effectively in future. Significant support has been offered within Section 7 Control Agreement areas to help deliver deer management plans, monitoring and plan culls and while this has led to reduced number of deer, population targets have only been reached in half of the Agreement areas.

This review has not attempted a full assessment of the socio-economic impacts of deer management. However, previously published information on the economic impact of deer shows that they make an important contribution to the Scottish economy, particularly in rural areas. The wider costs associated with deer management, such as road traffic accidents, remain high and many costs have yet to be quantified fully. We have not analysed how different models of deer management may contribute to the economy.

The scale of action needed to address deer impacts on the natural environment across Scotland, and thereby ensure its enhancement, is large.

While we recognise that implementation of improved deer management planning will take time to lead to corresponding changes to the natural environment, the review indicates that longer-term improvements may not be forthcoming without additional measures to enhance sustainable deer management in Scotland. Work on options to address current deficiencies will require further discussion and collaboration with the deer sector and a range of stakeholders. SNH is committed to supporting this future work. It will be important to build on good practice to learn lessons and deliver improvements elsewhere. Recent improvements are encouraging. Nevertheless our assessment of the evidence underpinning this review does not enable us to be confident that present approaches will bring about early improvements in the natural heritage or deliver other potential public benefits. In particular, it is unlikely that the present approach to deer management will be able to make a significant contribution to addressing the specific challenges, such as habitat restoration and improved ecological connectivity outlined in 'Scotland's Biodiversity - a Route Map to 2020' which underpins the Government's ambitions for the natural heritage.

8. References

1 Introduction

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9. Glossary

AECS	Agri-Environment Climate Scheme
BTO	British Trust for Ornithology
CAP	Common Agricultural Policy
DCS	Deer Commission for Scotland
DMG	Deer Management Group
DMP	Deer Management Plan
DVC	Deer-Vehicle Collision
ECAF	Environmental Collaborative Action Fund
FCS	Forestry Commission Scotland
FES	Forest Enterprise Scotland
FTE	Full-Time Equivalent
HIA	Herbivore Impact Assessment
JHI	James Hutton Institute
LAs	Local Authorities
LDG	Lowland Deer Group
LDNS	Lowland Deer Network Scotland
NFI	National Forestry Inventory
NWSS	Native Woodland Survey of Scotland
PACEC	Public and Corporate Economic Consultants
RACCE	Rural Affairs, Climate Change and Environment Committee
RAG	Red/Amber/Green
RDC	Red Deer Commission
SAC	Special Area of Conservation
SCM	Site Condition Monitoring
SNO	Scottish Omnibus Survey
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPCA	Society for the Prevention of Cruelty to Animals
SRDP	Scottish Rural Development Programme
SSSI	Site of Special Scientific Interest
URDTM	Unfavourable Recovering Due to Management
WANE	Wildlife and Natural Environment (Scotland) Act 2011
WDNA	Scotland's Wild Deer: A National Approach