

**13<sup>th</sup> MEETING OF THE STANDING COMMITTEE***03 - 05 July 2018, The Hague, the Netherlands*

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**DRAFT AEWA INTERNATIONAL SINGLE SPECIES MANAGEMENT PLAN  
FOR THE GREYLAG GOOSE (*Anser anser*)****Northwest/Southwest European population****Introduction**

This draft International Single Species Management Plan (ISSMP) for the Greylag Goose (*Anser anser*) was developed in response to the AEWA Action Plan that provides for developing International Single Species Management Plans for populations which cause significant damage, in particular to crops and fisheries and to AEWA Resolution 6.4 that requested the establishment of a European multispecies goose management platform and process to address sustainable use of goose populations and to provide for the resolution of human-goose conflicts targeting as a matter of priority Barnacle (*Branta leucopsis*) and Greylag (*Anser anser*) Geese.

The management plan was compiled by a team of international experts under the coordination of the European Institute for the Management of Wild Birds and their Habitats (OMPO), Aarhus University/EGMP Data Centre, as well as the Rubicon Foundation and was supported financially by the French Ministry for Ecological and Inclusive Transition, the Francois Sommer Foundation and the French National Hunting Association.

The first draft of the biological assessment as well as the results of the questionnaire survey concerning threats and problems to Greylag Goose, was presented at a stakeholder workshop in October 2017, in Paris, and has gone through rigorous consultations with international experts.

A revised second draft, including a proposed framework for action was sent for consultation to the participants of the stakeholder workshop on 9 March 2018. At the same time, this draft was submitted to the 14<sup>th</sup> Meeting of the AEWA Technical Committee (10-13 April 2018) for review.

Following the feedback provided during the consultation process, this third draft was produced for further consultation with the Range States at the 2<sup>nd</sup> Barnacle Goose and Greylag Goose Management Planning Workshop on 19 June 2018, in Leeuwarden, the Netherlands. Following the workshop, a fourth draft will be produced, as necessary, and circulated for formal consultation with the governments of the relevant Range States.

The final draft of the Greylag Goose ISSMP is expected to be submitted to the 7<sup>th</sup> Session of the Meeting of the Parties to AEWA (4-8 December 2018), for adoption.

**Action requested from the Standing Committee**

The Standing Committee is requested to review and approve this draft ISSMP for submission to the 7<sup>th</sup> Session of the Meeting of the Parties to AEWA, pending the incorporation of comments received during 2<sup>nd</sup> Barnacle Goose and Greylag Goose Management Planning Workshop and the formal consultation with the Range States.

# Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

**DRAFT**

## **AEWA International Single Species Management Plan for the Greylag Goose (*Anser anser*)**

*Northwest/Southwest European population*



Third draft, May 2018

**Draft for consultation with the Range States**

## **Adopting Frameworks:**

Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

The preparation of the International Single Species Management Plan for Northwest/Southwest European population the Greylag Goose (*Anser anser*) was co-financed by the French Ministry of Environment (Ministère de la Transition écologique et solidaire), the François Sommer Foundation as well as by the French National Hunting Federation.

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[http://www.unep-awea.org/sites/default/files/awea\\_ggmpws\\_inf\\_1\\_4\\_prov\\_part\\_list\\_rev1.pdf](http://www.unep-awea.org/sites/default/files/awea_ggmpws_inf_1_4_prov_part_list_rev1.pdf)

## **Range States that replied to the questionnaire survey on management issues and threats to the Greylag Goose:**

Belgium, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden.

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## **Date of adoption: # December 2018**

**Lifespan of Plan:** The lifespan of this International Single Species Management Plan is 10 years (2019 – 2028). It should be reviewed every 10 years (first revision in 2028). An emergency review will be undertaken if there is a significant change to the NW/SW European population covered in this plan, before the next scheduled review.

### **Milestones in the production of the Plan:**

Stakeholder workshop: *4-6 October 2017, Paris, France*

- 1st draft: Presented to participants of the stakeholder workshop of *4-6 October 2017, Paris, France*
- 2nd draft: Presented for consultation with Range States and stakeholders on *9 March 2018*  
Submitted to the 14<sup>th</sup> Meeting of the AEWA Technical Committee, *10-13 April 2018, Bonn, Germany*
- 3<sup>rd</sup> draft: Presented to Range States for discussion at the Barnacle Goose and Greylag Goose Management Planning Workshop on *19 June 2018* in Leeuwarden, the Netherlands and the 13<sup>th</sup> meeting of the AEWA Standing Committee in *July 2018*
- 4<sup>th</sup> draft: To be circulated for formal consultation with the governments of the Range States (dates tbc)
- Final draft: To be submitted to the 7<sup>th</sup> Session of the Meeting of the Parties to AEWA (MOP7) *4-8 December 2018, South Africa*

### **AEWA European Goose Management Platform:**

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**Photo cover:** Greylag Goose (*Anser anser*) © Szabolcs Nagy

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**Legal Disclaimer:** This International Single Species Management Plan has been developed to facilitate the cooperation amongst Parties to minimize or mitigate the damage to crops and humans risk caused by the NW/SW European population of Greylag Goose in accordance with Paragraphs 4.3.3 and 4.3.4 of Annex 3 of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA).

## KEY ABBREVIATIONS

<b>AEWA</b>	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
<b>AFMP</b>	Adaptive Flyway Management Programme
<b>EGM IWG</b>	European Goose Management International Working Group
<b>EGMP</b>	AEWA European Goose Management Platform
<b>FCS</b>	Favourable Conservation Status
<b>FRV</b>	Favourable Reference Value
<b>ISSMP</b>	International Single Species Management Plan
<b>IWC</b>	International Waterbird Census
<b>MU</b>	Management Unit
<b>SDM</b>	Structured Decision Making
<b>SPA</b>	Special Protection Areas (EU Birds Directive)

## KEY TERMS

Adaptive Management	Adaptive management is an approach to natural resource management that emphasizes learning through management where knowledge is incomplete, and when, despite inherent uncertainty, managers and policymakers must act. Unlike a traditional trial and error approach, adaptive management has explicit structure, including a careful elucidation of goals, identification of alternative management objectives and hypotheses of causation, and procedures for the collection of data followed by evaluation and reiteration. The process is iterative, and serves to reduce uncertainty, build knowledge and improve management over time in a goal-oriented and structured process" (Craig R. Allen and Ahjond S. Garmestani 2015).
Accommodation or refuge area	Specifically designated goose foraging areas to accommodate geese and where farmers receive incentives to tolerate the presence of geese in large numbers , in order to alleviate human-wildlife conflicts and to allow the maintenance of the population at desired levels. Sometime also called as “go” areas.
Fundamental objectives	Objectives that express what matters to stakeholders, representing a direction of change.
Group / Segment	The terms group or segment are used when referred to a part of a population that shares the flyway (i.e. may become a management unit of an ISSMP).
Key sites	Supporting internationally important numbers of the species (i.e. over 1% of the flyway population). These can be designated sites in response to AEWA, Bern Convention and the EU Birds Directive obligations, but also include Important Bird Areas identified for the species that are not yet designated.
Management Unit	Defined in Annex 5 to this document.
Means objectives	Represent means to achieve one or more fundamental objectives.
Multi-criteria decision analysis	Framework for deliberations to evaluate the consequences of alternative strategies. It combines scientific information with social objectives to reach a preferred decision alternative.
Population	When the term population is used with a name of a country the term refers to the national population of a species. The AEWA title of the population, i.e. <i>Northwest/Southwest European</i> population, is used when the text refers to the entire flyway population.
Satisfactory level	A target level of population agreed by the Range States in the EGM IWG above the favourable reference value while taking into account other requirements of the fundamental objectives based on a multi-criteria analysis.
Sensitive areas	Areas determined by the national authorities as being sensitive to the presence of geese because of other interests such as human health, air safety, special areas

	designated for the protection of other flora and fauna sensitive to the presence of geese.
Sensitive crops	Crops that have higher than usual value per unit and would suffer loss of market value if grazed and trampled by geese during their normal occurrence in the area and consequently high economic losses can be expected if grown in areas regularly used by geese. This category does not include widespread and relatively lower economic value crops even if a large proportion of goose damage occur in such habitats.
Serious/ Significant damage	<p>In those instances, in which birds can only be legally killed by way of derogation, it is for each Range State to decide whether it wishes to grant derogations for damage-prevention purposes and, if it does so, to demonstrate that there is a risk of ‘serious damage’ to crops/forests/fisheries/livestock/water.</p> <p>The ISSMP both envisage the following action to improve consistency in states’ decision-making regarding derogations and the consistency of their justifications: “Create a toolbox for decisions in relation to determining significant damage (including metrics, benchmarking, verification, monitoring, various management techniques to prevent damage, compensation) (Action B3 in the ISSMP).</p> <p>The use of derogations can be applied in terms of preventing serious damage to crops, i.e. relating to an economic interest. However, it should also be noted that the Birds Directive does not specify whether damage should be assessed in financial or production terms. Nor does it define what constitutes ‘serious damage’, and this concept needs to be understood in relative terms.</p>

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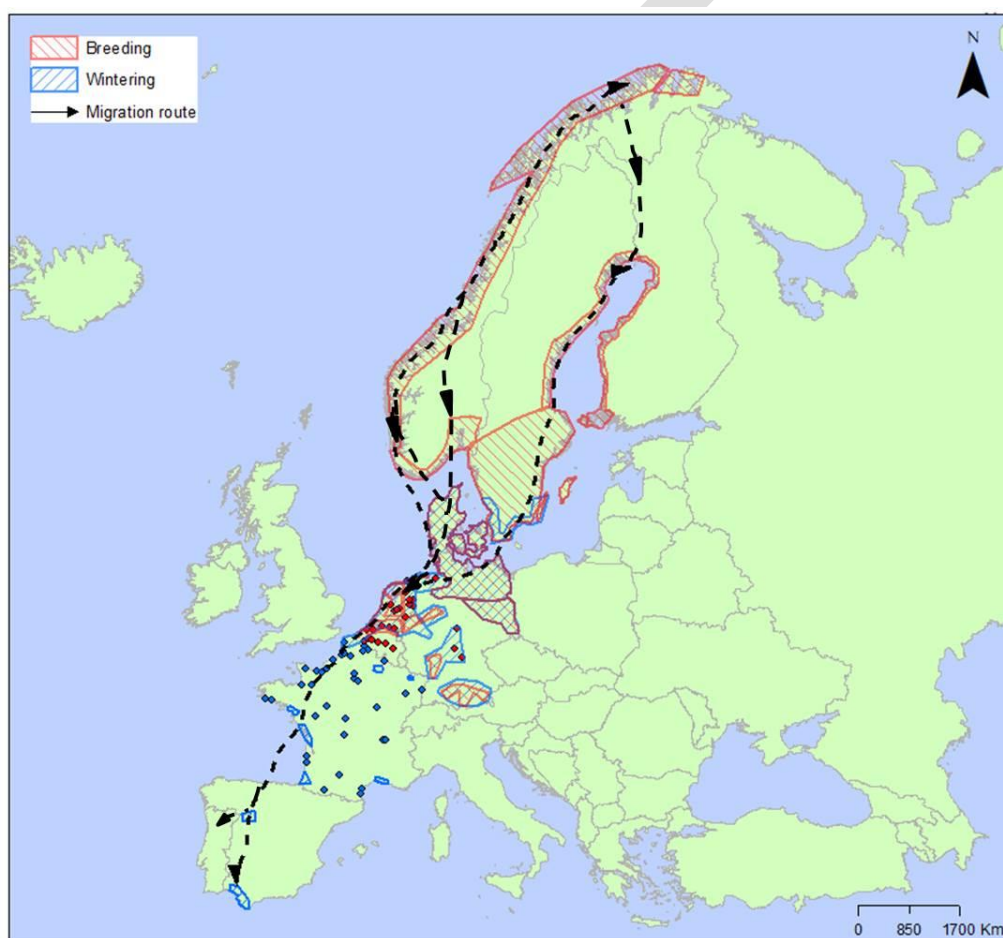
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## 1 BASIC DATA

Within Europe, two subspecies of the Greylag Goose *Anser anser* have been recognised: *Anser anser anser* divided into four bio-geographic populations (Iceland, British/Irish resident, Northwest/Southwest Europe and Central Europe) and *Anser anser rubrirostris* with two populations (Black Sea and Caspian Sea) (Madsen et al. 1999; Mitchell et al. 2012). This International Single Species Management Plan (ISSMP) covers the Northwest/Southwest (NW/SW) European population of Greylag Geese, for which the principal Range States are Norway, Sweden, Finland, Denmark, Germany, Netherlands, Belgium, France and Spain (Figure 1, Table 1). Geese from this population also occur regularly in Poland, Czech Republic and Portugal, but as the numbers are below 1% of the population<sup>1</sup>, they are not included as principal Range States.

This management plan covers the wild and naturalised<sup>2</sup> individuals of the nominate subspecies within the range of the population, but does not include the domestic form or its phenotypically or otherwise (e.g. location, behaviour) recognisable descendants.



**Figure 1.** Annual distribution and main migration routes for the NW/SW European population of the Greylag Goose including breeding (red/right to left lines) and wintering (blue/left to right lines) areas, as well as areas which are both used during the breeding and wintering period (purple/lines in both directions)

As described in Annex 1, the population includes migratory and resident segments that may require differentiated management throughout their annual cycle. During the implementation phase of this management plan, management units (the concept of management units is defined in Annex 5) will be

<sup>1</sup> According to the AEWA guidance on species action planning, 1% of the population is defined as the threshold for determining Principal Range States.

<sup>2</sup> The term ‘naturalised’ is used here following Holmes & Stroud (1995) and the term in the context of this management plan includes birds originated from re-establishment, self-establishment, introduction and feral origin.

determined and agreed by the AEWA European Goose Management International Working Group based on still on-going analysis of available population size estimates, movements and hunting data to meet population-level goals.

**Table 1.** *Biological status of the Greylag Goose in the principle Range States*

Range states	Resident individuals	Migratory individuals		
		<i>Breeding</i>	<i>Stop-over</i>	<i>Wintering</i>
<b>Belgium</b>	x	x	x	x
<b>Denmark</b>		x	x	x
<b>Finland</b>		x		
<b>France</b>	x	x	x	x
<b>Germany</b>	x	x	x	x
<b>Netherlands</b>	x	x	x	x
<b>Norway</b>		x	x	x <sup>3</sup>
<b>Spain</b>	x	x	x	x
<b>Sweden</b>	x	x	x	x

**Table 2.** *Summary of international conservation and legal status of the Greylag Goose*

	NW/SW European population
<b>Red list status (IUCN)</b>	Least Concern (LC)
<b>AEWA status</b>	C1
<b>CMS</b>	Appendix II
<b>CITES</b>	This species is not currently listed in the CITES Appendices.
<b>Bern Convention</b>	Appendix III
<b>EU Birds Directive</b>	Annex IIA; Annex IIIB

## 2 FRAMEWORK FOR ACTION

### Introduction<sup>4</sup>

This ISSMP was commissioned in accordance with paragraph 4.3.4. of the AEWA Action Plan, which provides that AEWA's Contracting Parties “*shall cooperate with a view to developing Single Species Management Plans for populations which cause significant damage, in particular to crops and to fisheries*”<sup>5</sup>, and in response to operational paragraph 9 of AEWA Resolution 6.4, which requested the UNEP/AEWA Secretariat to establish a multispecies goose management platform and process to address sustainable use of goose populations and to provide for the resolution of human-goose conflicts targeting as a matter of priority Barnacle (*Branta leucopsis*) and Greylag (*Anser anser*) Geese. Development of an ISSMP for the NW/SW European population of the Greylag Goose was deemed necessary because it has increased by more than seven times,

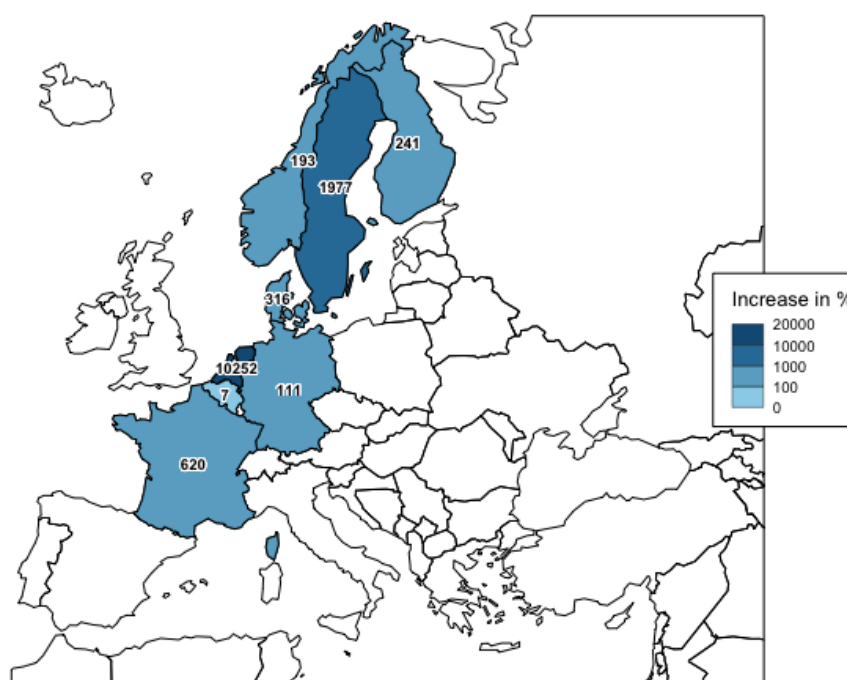
<sup>3</sup> The number of wintering Greylag Geese in Norway varied between less than 1,000 and more than 10,000, however based on colour-ring/neckband readings the vast majority of these birds are from the Icelandic population and have therefore not been included (A. Follstad *pers. comm.*).

<sup>4</sup> During the development of this plan, it has been recognised that the structured decision-making process is more suitable for the management plans than the traditional planning framework used for action plans. Therefore, the structure of the management plans slightly differs from the structure set out for the action plans in the AEWA action planning guidelines.

<sup>5</sup> The AEWA Action Plan does not define specifically what constitutes ‘significant damage’. However, Contracting Parties’ request that the Agreement’s Secretariat coordinate the development of an International Single Species Management Plan for the Greylag Goose suggests that they consider the damage being sufficiently significant to be addressed through coordinated action. See description in Key Terms (page 9).

from an estimated 120,000-130,000 individuals in the 1980s (Madsen 1987) to around 960,000 individuals in the 2010s (Fox and Leafloor 2018) and concerns have been expressed regarding increasing agriculture conflicts and air safety (see Annex 1 and Annex 2 for details). Figure 2 shows large differences in the growth of national breeding numbers in the period of 1980 - 2012. Most national populations have at least doubled, but the breeding numbers have increased by 19 times in Sweden and by 102 times in the Netherlands where all goose species have been protected since 2001, but subject to killing under derogations since the 2010s. There is a close correlation between the abundance of the species and payments to farmers (Figure 5 in Annex 2). Risk to air safety is also increasing with increasing goose numbers, especially in the vicinity of large international airports such as Kastrup in Copenhagen, Denmark (Figure 6 in Annex 2) and Schiphol in Amsterdam, the Netherlands (Figure 7 in Annex 2). These conflicts are set to increase with the further rapid increase of the population. According to the provisional calculations presented in Annex 3, the population is projected to double by 2023 (i.e. in five years) and exceed 6 million individuals within 25 years (Figure 8 in Annex 3). This projection matches well with the results of a spatially explicit population model produced for the Netherlands and predicts that Greylag Goose numbers in the country can grow up to 2.8 million individuals (Baveco et al. 2012). Although the vast majority of the Dutch birds are resident, the Netherlands is an important staging and wintering area for birds breeding further north and east and some of them migrate further south, particularly to Spain. Therefore, harvest and derogation killing measures need to be coordinated across the flyway of the population to accommodate the diverse ecological, recreational and economic interests associated with this population.

**Figure 2.** Reported long-term (i.e. 1980 - 2012) national breeding population trends for the NW/SW European

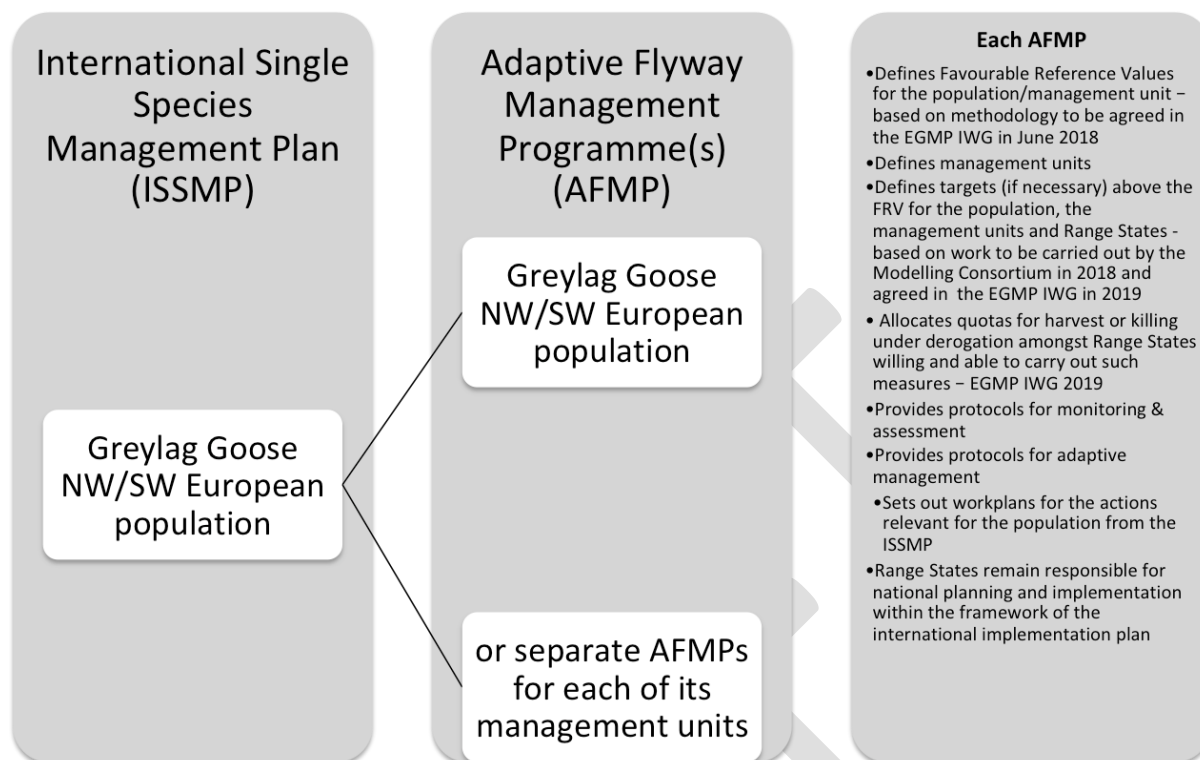


population of Greylag Goose based on the supplementary material<sup>6</sup> to BirdLife International (2015). The figures presented in the map are the geometric means of the reported minimum and maximum percentage increase in Table 2 of the supplementary material.

This ISSMP and the related Adaptive Flyway Management Programme (AFMPs) aim to establish an agreement amongst Range States on the strategic goal and objectives of the conservation and management of

<sup>6</sup> [http://datazone.birdlife.org/userfiles/file/Species/erlob/supplementarypdfs/22679889\\_anser\\_anser.pdf](http://datazone.birdlife.org/userfiles/file/Species/erlob/supplementarypdfs/22679889_anser_anser.pdf)

the NW/SW European population Greylag Goose and, if necessary, its management units<sup>7</sup>. This intention is fully compatible with the provisions of both Article II(1) of AEWA<sup>8</sup> and Article 2 of the Birds Directive<sup>9</sup> and Bern Convention.<sup>10</sup> The compatibility of the plan with these international instruments is further elaborated in the rest of this chapter and in Annex 4.



**Figure 3.** Relationship between this management plan and the Adaptive Flyway Management Programme(s) (AFMPs).

This ISSMP only addresses the strategic issues in general terms to provide a mandate for developing AFMPs. These AFMPs will be adopted and then revised annually by the European Goose Management International Working Group (EGM IWG). Therefore, implementation details or issues that may require revision in the future, such as Favourable Reference Values, indicators, management targets for the population /management units, if necessary at all, and tasks related to the actions agreed in the management plan, will be elaborated in the AFMPs (Figure 3).

This plan follows the principles of Structured Decision Making (SDM, Gregory et al. 2012), which recognizes that management plans should strike a balance between multiple fundamental objectives. This approach is compatible with the spirit of Article 2 of the Birds Directive and Article 2 of the Bern Convention, both of which recognise various conservation and societal requirements and that it might be necessary to adapt population levels to such requirements. The fundamental objectives can be achieved through various means and process objectives. One means objective may contribute to several fundamental objectives. (e.g. protection

<sup>7</sup> Application of differential treatment to management units within the population will be further assessed and decided by the EGM IWG during the development of the AFMPs

<sup>8</sup> “Parties shall take co-ordinated measures to maintain migratory waterbird species in a favourable conservation status ...”

<sup>9</sup> “Member States shall take the requisite measures to maintain the population of the species referred to in Article 1 at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level.”

<sup>10</sup> “The Contracting Parties shall take requisite measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements and the needs of sub-species, varieties or forms at risk locally.”

of the Special Protected Areas (SPAs) not only provides protection to a significant proportion of the population, it also provides ecosystem services linked to recreation for people who enjoy watching geese.)

## Goal

**Maintain the population in a favourable conservation status while taking into account ecological, economic and recreational interests.**

Favourable reference values for population size, habitat and range are to be established in the population-specific Adaptive Flyway Management Programme by the European Goose Management International Working Group (EGM IWG), respecting the requirements of international instruments listed in Table 2 above.

## Fundamental Objectives

This plan recognises seven fundamental objectives<sup>11</sup> based on the stakeholders' perspectives expressed at the management planning workshop (Paris, October 2017). Fundamental objectives do not need to be shared by all stakeholders, they express what is important for certain interest groups. Following the standards of structured decision-making they are presented with a direction of change although it is recognised that these directions may conflict with one another. The plan and its associated programmes aim to resolve trade-offs between them.

***I. Maintain the population at a satisfactory level***<sup>12</sup>

Satisfactory level of the population is to be agreed by the Range States in the EGM IWG above the favourable reference values and taking into account the other requirements of fundamental objectives II-VI based on multi-criteria analysis.

***II. Minimize agricultural conflicts***

The agriculture damage is a composite element of the broader human-goose agriculture conflict. Thus, by addressing the conflict, rather than the damage alone, the plan takes a more holistic approach to dealing with all elements of the issue at stake, which include (1) actual damage, (2) perception of damage and (3) tolerance to damage. This also provides the opportunity for a more flexible approach to mitigating the conflict with a gradient of possible balance between the interdependent elements described above.

***III. Minimize the risk to public health and air safety***

It is recognised that these risks are either localised (as air safety) or not well-understood. Nevertheless, they are legitimate concerns of some stakeholders and therefore represent a valid fundamental objective.

***IV. Minimize the risk to other flora and fauna***<sup>13</sup>

It is recognised that this risk is rather localised and local actions may suffice at current population levels.

***V. Maximise ecosystem goods and services***

Here, the plan recognises ecosystem services not related to hunting. Ecosystem services related to the latter are reflected in Fundamental Objective VII.

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<sup>11</sup> The order of objectives does not imply any prioritisation.

<sup>12</sup> Satisfactory means in this context an agreed population size range above the favourable reference value that satisfies various ecological, economic and recreational interests.

<sup>13</sup> Including habitats, ecosystem functions.

**VI. Minimize costs of goose management**

Preventing significant damages to agriculture and risk to public health and air safety through land management, scaring or exclusion, compensating farmers for the damages that have already occurred or for measures to be taken to prevent such damages, paying them incentives for managing their land according to the needs of the species, carrying out killing of animals or destroying their eggs under derogation by paid agents of the competent authorities, managing, administering and inspecting goose management actions are all examples of the costs associated with goose management. As Figure 5 (in Annex 2) shows, the cost of Greylag Goose management is closely linked to the population size in countries where such data is available.

**VII. Provide hunting opportunities that are consistent with maintaining the population at a satisfactory level**

The Greylag Goose is listed on Annex II (Part A) of the Birds Directive and consequently it can be legally hunted under Member States' national legislation throughout the territory of the European Union, in accordance with the provisions of Article 7 of the Directive. Hunting is similarly allowed under the species' listing on Appendix III of the Bern Convention and the NW Europe/South-west Europe population's inclusion in Column C of AEWA's Table 1 (for further detail, see Annex 4). This fundamental objective is linked to satisfying legitimate interest in hunting the species sustainably.

Appropriate indicators for assessing the progress towards achieving the fundamental objectives will be developed by the EGM IWG during the development of the AFMP.

**Means objectives**

Means objectives represent ways to achieve the fundamental objectives. This management plan has four means objectives complemented by a set of process objectives (expressing ways to run the process to realistically achieve the objectives).

The four means objectives were identified after a wider range of management options were considered. The selected means objectives represent a complementary intervention logic: (1) protect the population at internationally important key sites and fulfil site protection obligations under Article 4.2 of the Birds Directive and similar provisions of the Bern Convention and AEWA, (2) prevent or (3) manage localised damages to agriculture, other flora and fauna and risks to human health and air safety and (4) if necessary, reduce or prevent the further increase of agricultural damages and the associated increase of management costs through regulating the population.

Other management options, such as agricultural extensification and strengthening predator populations to control the species, were considered but not suggested for immediate application. The potential impact of agriculture extensification on goose populations and the society is complex and yet insufficiently understood. Strengthening predator populations to control the species could be considered in the longer term, but would not offer a viable option to resolve the problem in the short-term. Side-effects on other species in unfavourable conservation status such as meadow birds, cf. the International Multi-Species Action Plan for the conservation of breeding waders of wet grasslands in Europe (Leyrer et al. 2017), should be also carefully considered. Therefore, increasing the understanding on how agricultural extensification and strengthening predator's populations could help in goose management is included into this ISSMP under actions A.5 and A.6 as medium and high priority respectively.

**1. A network of safe key sites is maintained throughout the population's range**

This means objective aims to ensure that Range States meet their site protection obligations under Article III(2)(d) of the AEWA Agreement text and paragraph 3 of the AEWA Action Plan, Article 4 of the Bern Convention and Article 4(2) of the EU Birds Directive (in the EU Member States). This

site network already encompasses a very high proportion of the staging and wintering numbers of the species. Thus, this network will act as a rather sizeable safety net that ensures the viability of the population above the Favourable Reference Values and ensures that it continues to provide valued ecosystem services. This objective also addresses the obligations of EU Member States to maintain SPAs in good ecological condition for the species they have been designated for and to avoid significant disturbance of the species at such sites.

2. **Geese are kept away from sensitive areas**<sup>14</sup>

This objective aims to avoid damages to agriculture and other flora and fauna and risks to human health and air safety by using various means, such as deterring, diverting e.g. through habitat management or avoiding, locally in areas determined by the national authorities as being sensitive to the presence of geese.

3. **Conflicts and risks in sensitive areas are managed**

This objective recognises that it is impossible to keep geese away from all sensitive areas, but some risks and conflicts can also be managed through other measures such as payments, adaptation of operations and communication measures.

4. **The population is kept between agreed minimum and maximum targets**

This objective recognises that several of the fundamental objectives are linked to the population size and therefore suggests maintaining the population between agreed minimum and maximum targets. On the one hand, setting a minimum target for each management unit would aim to guarantee that the population is maintained in favourable conservation status (and that Range States consequently remain in compliance with Article II (1) of AEWA, Article 2 of the Birds Directive, and Article 2 of the Bern Convention), while providing ecosystem goods and services, including hunting opportunities. On the other hand, setting maximum targets (at least in parts of the range) is important to prevent widespread damage to agriculture in case of exponentially growing populations while there is still sufficient capacity to control them, and to limit the further growth of goose management costs.

Importantly, although the killing of Greylag Geese is allowed under AEWA, the Bern Convention and the Birds Directive, these instruments impose limits on the periods during which, and the methods by which, this can occur. Parties to the Agreement and the Convention, and EU Member States, which resort to using lethal control measures (including within the context of an International Single Species Management Plan) must ensure that these measures comply with their legal obligations (see Annex 4 for further detail).

In addition, Article 7 of the Birds Directive requires EU Member States to ensure that the practice of hunting “*complies with the principles of wise use and ecologically balanced control of the species of birds concerned*”, and the European Commission has advised that “*“Ecologically balanced control” implies that the measures taken should be ecologically sound and in proportion to the problem to be solved, taking into account the conservation status of the species involved*”.<sup>15</sup> This need for proportionality should be taken into consideration in the formulation of any maximum population targets.

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<sup>14</sup> Areas determined by the national authorities as being sensitive to the presence of geese because of other interests such as human health, air safety, special areas designated for the protection of other flora and fauna sensitive to the presence of geese

<sup>15</sup> European Commission (2008), Guidance document on hunting under Council Directive 79/409/EEC on the conservation of wild birds “The Birds Directive” at para. 2.4.33.



## Process objectives

This management plan has five process objectives that relate to the shared management of the population.

### **A. Knowledge is available to support shared goose management**

The adaptive management of the shared population requires coordinated monitoring and assessment to support shared periodical decision-making. Coordinated comparative studies are needed to support future refinement of the management strategies. Importantly, Parties to AEWA have undertaken various legal commitments concerning the collection and communication of data (details in Annex 4) and this objective specifies how these commitments could be fulfilled in the framework of this plan.

### **B. Experience and expertise are shared**

This objective aims to improve the effectiveness of management by sharing experience and expertise on key topics.

### **C. Acceptance of goose management is increased**

The public opinion concerning goose management can be highly polarised and often represents an obstacle to rational and cost-effective management measures. Creating a better acceptance can thus contribute to the de-escalation of the conflict.

### **D. Relevant national legislation is harmonised**

Implementation of a dynamic management framework requires frequent (annual) update of hunting regulations in the light of monitoring data.

### **E. Sufficient resources secured on long-term basis**

Adaptive management of the population is not possible without long-term funding to maintain the capacity for monitoring, assessment and implementation.

**Table 3. Framework for action**

FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
I V VII	1. A network of safe key sites is maintained throughout the population's range	1.1 Provide adequate protection to key sites of international importance under Article 4(2) of the Birds Directive in the EU and other relevant instruments in other Range States throughout the range of the populations and maintain them in good ecological status	Essential	Short / Rolling	National authorities

<sup>16</sup> *Essential*: the sustainability of the management cannot be guaranteed without the action, *High*: actions that guarantee achieving the means objective, *Medium*: actions that contribute to achieving the means objective, *Low*: explorative actions that are unlikely to contribute to achieving the means objective within the life-time of the management plan.

<sup>17</sup> *Immediate*: launched within the next year, *Short*: launched within the next 3 years, *Medium*: launched within the next 5 years, *Long*: launched within the next >5 years, *Ongoing*: currently being implemented and should continue, *Rolling*: to be implemented perpetually.



FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
		1.2 Promote goose-based eco-tourism at selected key sites	Medium	Medium	National authorities, NGOs
II III IV	2. Geese are kept away from sensitive areas	2.1 Take key sites for geese into account in land use planning and growing of sensitive crops <sup>18</sup>	High	Immediate / Rolling	National authorities
		2.2. Provide accommodation areas to reduce risks and conflicts at sensitive areas through e.g. subsidies <sup>19</sup>	Medium	Medium/ Rolling	National authorities
		2.3 Apply scaring and land management techniques to reduce the attractiveness of sensitive areas (e.g. vicinity of airports) to geese <sup>20</sup>	High	Short / Rolling	National authorities
II III IV	3. Conflicts and risks in sensitive areas are managed	3.1. Reduce risk posed by goose migration to air safety through operational measures such as radar surveillance <sup>21</sup>	High	Short / Rolling	National authorities
		3.2 Establish an internationally coordinated programme to assess agricultural damage including monitoring and assessment protocols	High	Short	National authorities
		3.3 Liaise with farmers affected by goose damages to reduce agricultural conflicts	High	Short / Rolling	National authorities

<sup>18</sup> Avoidance

<sup>19</sup> Diversion

<sup>20</sup> Deterrence

<sup>21</sup> Adaptation

FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
I II V VI VII	4. The population is kept between minimum and maximum targets	4.1 Establish hierarchical population targets at flyway, management unit and national levels iteratively to ensure national targets are consistent with the flyway targets and with legal requirements at all levels	Essential	Short	AEWA EGM IWG
		4.2 Establish an internationally coordinated population management programme encompassing monitoring, assessment and decision-making protocols	Essential	Short	AEWA EGM IWG
		4.3 Improve effectiveness of population control measures through experimenting with different timing and methods	High	Medium	Research institutes
		4.4 Promote best practices of goose hunting including timing to minimize damage and disturbance to other species	Medium	Medium / Rolling	National authorities and National hunting federations
		4.5 Maintain low crippling rates	High	Medium / Rolling	National hunting federations
		4.6 Develop hunting techniques to further reduce crippling	Medium	Long / Rolling	Research institutes/ National hunting federations

FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
All	A. Knowledge is available to support goose management through a shared knowledge-base	A.1 Produce and update periodically spatially explicit population size estimates based on agreed international monitoring building on citizen science capacity	Essential	Short / Rolling	AEWA EGMP DC
		A.2 Maintain an annually updated bag statistics database including goose harvested by any means	Essential	Ongoing / Rolling	AEWA EGMP DC
		A.3 Maintain a spatially explicit database on goose damage to agriculture, other flora and fauna and risk to air safety	Essential	Medium / Rolling	National authorities with periodic reporting to the AEWA EGMP DC
		A.4 Collect demographic (mortality, reproduction, differential migration and connectivity) data from an agreed representative sampling framework across the range	High	Short / Rolling	AEWA EGMP DC
		A.5 Analyse the impact of various agricultural policy scenarios and measures (Nitrate Directive, agri-environmental measures, various production incentives including to biofuels) on goose populations and on goose damage	High	Long	Research institutes
		A.6 Assess the role of predators (e.g. White-tailed Eagle, Red Fox) in regulating goose populations	Medium	Long	Research institutes
All		B.1 Produce best practice guide	Medium	Short	AEWA

FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
	B. Experience and expertise are shared	on establishing refuge areas (size, management, subsidies)			Secretariat with EC DG ENV and EU member states
		B.2 Provide guidance on conflict resolution and how to make this consistent with the European legal framework, including the CAP	High	Short	AEWA Secretariat with EC DG ENV and EU member states
		B.3 Create a toolbox for decisions in relation to determining significant damage (including metrics, benchmarking, verification, monitoring, various management techniques to prevent damage, compensation)	High	Short	AEWA Secretariat with EC DG ENV and EU member states
		B.4 Provide guidance on implementation of population management protocols at national level	Medium	Medium	AEWA Secretariat with EC DG ENV
All	C. Acceptance of goose management is increased	C.1 Develop and implement communication strategy and plan	Medium	Short / Rolling	AEWA Secretariat National authorities
All	D. Relevant national legislation is harmonised	D.1 Range States review their national legislation in the light of the framework legal guidance document developed under the EGMP	High	Short	National authorities
All	E. Sufficient resources secured on long-term basis	E.1 Range States contribute on a regular basis to the budget of the EGMP	Essential	Ongoing / Rolling	National authorities
		E.2 National and regional governments secure the necessary funds for the	Essential	Rolling	National authorities

FOs	Means objectives	Actions	Priority <sup>16</sup>	Time scale <sup>17</sup>	Organisations responsible
		implementation of the actions at national and sub-national levels			

DRAFT

## ANNEX 1 BIOLOGICAL ASSESSMENT

### Distribution throughout the annual cycle

Individuals from the NW/SW European population of Greylag Goose breed mainly in Norway, Sweden, Finland, Denmark, Germany, the Netherlands and Belgium (Nilsson et al. 1999). Traditionally, Finnish breeding Greylag Geese have been assigned to the Central European population. However, ring recoveries show that birds caught in western Finland belong to the NW/SW flyway and birds from the Gulf of Finland region belong to the Central flyway (Saurola et al. 2013). Additionally, it is suggested that there is an exchange between individuals of the NW/SW European population and the Central European population from other geographical areas (British or Black Sea populations) (Calderon et al. 1991; ONCFS 2014). Following Huntley et al. (2007), the potential current range of Greylag Geese based on climatic conditions matches well their actual distribution.

During autumn migration, Norwegian breeding birds migrate to staging areas in Sweden, Denmark, Germany and the Netherlands (Figure 1), where they arrive between September (or even late July/early August in Germany) and in late November (ONCFS 2014). Neck banding and GPS tracking of Greylag Geese breeding in north-eastern Norway shows that geese leave their breeding areas in late August/early September flying along the Bothnian coast of Sweden and possibly the western coast of Finland before staging in southern Sweden for a month and then move to Denmark and the Netherlands (M. Boos 2016; Boos and A. Follestad *pers. comm.*). Finnish breeders in the Bothnian Bay and Swedish breeders along the Baltic coast either skip staging areas in Denmark and migrate directly to the Netherlands (Nilsson et al. 1999), or they stay in south Sweden during winter.

In recent years, overwintering migratory geese have increasingly been observed amongst resident breeding birds in Germany, Denmark and southern Sweden. During the peak of autumn migration in November, a high proportion of the Greylag Goose flyway population is staying in the Netherlands (K. Koffijberg *pers. comm.*). Many of these birds are thought to be resident Dutch breeders, out of which less than 10% of individuals have been estimated to migrate further south in winter (Voslamber et al. 2010). Norwegian Greylag Geese leave the Netherlands after mid-November and migrate to the traditional core wintering areas in France and Spain (Andersson et al 2001; ONCFS 2014). However, not all Norwegian geese migrate to France or Spain but now winter in the Netherlands, Germany and Denmark. It is suggested that individual migration strategies may change from year to year (Boos 2016). Despite an observed northward shift during the wintering period among birds breeding in Sweden, some Swedish breeders still winter in Spain. More than 25% of the Swedish autumn population now remains in Sweden during mild winters (Nilsson 2013). Wintering numbers in Spain have increased annually by 4% between 1987 and 2009, compared to 13% in the Netherlands, 19% in France, 32% in Denmark and 36% in Sweden (Ramo et al. 2015).

These results confirm a shift in the centre of gravity of the winter range to the northeast, confirmed by earlier studies in Sweden, Norway and the Netherlands (Nilsson 2006). Wintering birds are also increasingly dispersed in northern countries, compared to the more concentrated aggregations within Spain and France. Furthermore, autumn migration is occurring later in the year (Nilsson 2006; Ramo et al. 2015), while spring migration occurs earlier in the year (Fouquet et al. 2009).

Data obtained from neck-banded and GPS tagged birds (Boos 2016) suggests that during spring migration, geese leaving Spain and France move into staging areas in the Netherlands, staying in the Netherlands between mid-February and mid-April, before returning to their breeding areas, with a trend towards an earlier arrival (Pistorius et al. 2006a, b, Nilsson 2007, 2008). Geese that are wintering further north, e.g. in the Netherlands, Denmark or Germany, may arrive in early March to southern Norway (A. Follestad *pers. comm.*).

This shift of gravity and change of the migratory propensity in general may have been stimulated by the introduction of feral Greylag Geese to some extent. In the 1950-60s Greylag Geese were successfully reinforced in the Netherlands and Belgium (Lensink et al. 2013), and in the 1970s, in some places along the

Channel and the Atlantic coast in France (Issa & Muller 2015). Hereafter the Dutch breeding population grew with an average rate of 20% per year between 1961 and 2009, with most of these birds being resident (Voslamber et al. 2010). In Belgium, the reintroduction has attracted an increasing number of wild Greylag Geese, many of which have stayed there to breed (Nilsson et al. 1999). Overall, the Northwest/Southwest European population of Greylag Geese shows no clear genetic structure (Pellegrino et al. 2015).

Non-breeding immature geese and unsuccessful adult breeding geese traditionally undertake a moult migration to replace their flight feathers at sites that are generally remote from nesting concentrations throughout the flyway. Significant aggregations during various stages in the past decades, include those at Oostvaardersplassen in Flevoland, the Netherlands, formerly supporting up to 62,000 geese from Germany, the Baltic region and southern Sweden (Dubbeldam & Zijlstra 1996), up to 50,000 on Saltholm in Øresund between Denmark and Sweden (Aarhus University, Denmark unpubl.), 27,000 in Hornborgasjön, Sweden, and up to 30,000 along the Norwegian coast (NINA, Norway unpubl.) drawing predominantly from local breeders, but also individuals from southern Scandinavia. However, more recently, smaller much more widely distributed moulting concentrations have become established, at least in the Netherlands, Germany and Denmark, indicating an emergence of more local moulting sites (K. Koffijberg, J. Madsen *pers. comm.*).

### **Habitat requirements**

Greylag Geese nest in dense emergent vegetation or on inaccessible small islands in all types of wetlands ranging from relatively nutrient-rich to oligotrophic character, from the sub-arctic, through the boreal to wetlands, even in the most intensified agricultural areas within Europe. In the Netherlands and parts of western Germany, Greylag Geese also increasingly inhabit urban habitats. Outside the breeding season, Greylag Geese tend to feed on a wide range of farmland, semi-natural and wetland habitats, but aggregate to roost on wetlands with open water, including freshwater, brackish and estuarine areas as well as sheltered marine bays. Due to this reason, their foraging sites can be highly diverse, including wet grassland and flooded meadows, coastal salt marshes, stubble fields and areas of waste root crop where geese glean grains and tubers, but they increasingly also exploit dry reseeded grasslands.

### **Survival and productivity**

Greylag Geese pair in their first or second year and first breeding occurs from age of three years (Cramp and Simmons 1977; Kampp and Preuss 2005). Studies of captive and collar-marked free-living birds suggest lifelong monogamy as long as partners survive, with pairs remaining together throughout the calendar year (Nilsson and Persson 2001). Without any distinction between naturalised and wild bird, egg-laying begins in February in France (Schricke 2018), late March to early April in Denmark (Kampp and Preuss 2005) and mid-April to early May in central Norway (Pistorius et al. 2006b). Females lay a single clutch of 4-7 (average 6) eggs (Cramp and Simmons 1977) annually, although destroyed clutches can be replaced (especially if lost early in the season). Scandinavian birds produce an average of 3.1 fledglings from a mean clutch size of 5.3 eggs per pair (Schricke 2018). Incubation lasts 27-28 days and goslings fly after 50 to 60 days (Cramp and Simmons 1977). The parents moult before goslings are capable of flight (non-breeders earlier), so the main flightless period is from late June to mid-July in Denmark, from late May to late June in western part of Germany and the Netherlands (Loonen et al. 1991), and until early August in Norway. Juveniles remain with their parents until the adults return to breeding sites in spring (Cramp and Simmons 1977; Ogilvie 1978; Rutschke 1987).

Long-term local productivity data is available since 1984/1985 from southern Sweden, where the breeding population was established in the late 1960's. This data shows declines in productivity as the population continues to increase, suggesting density dependent effects on the production of young, primarily driven by reduced propensity rather than declines in clutch/brood sizes (Nilsson 2016). A similar trend is observed for the breeding population in the Netherlands (B. Voslamber, unpubl.). Age-ratio data from the Netherlands suggest declining percentage of first-year birds in late summer (Hornman et al. 2016), but there is a large

variation among regions with different stages of colonisation (saturated versus recently established populations).

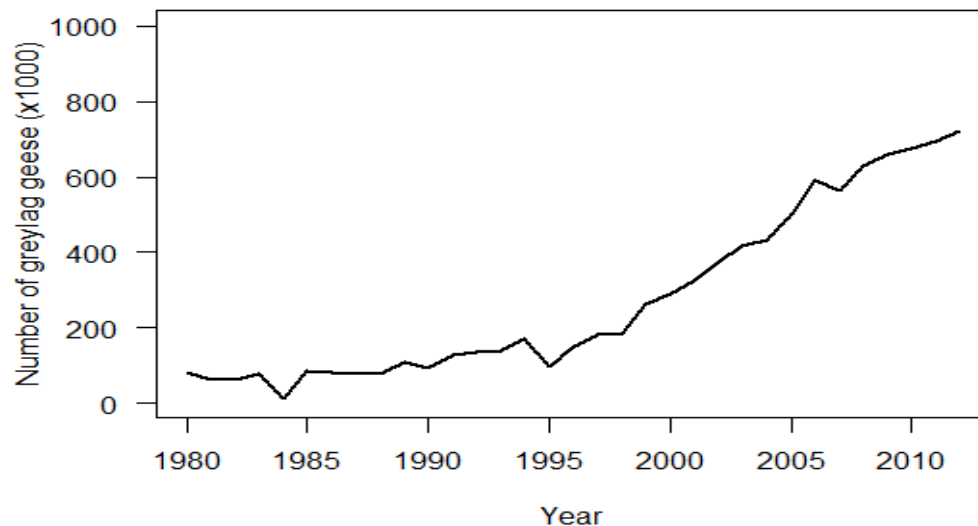
In the Netherlands, data from van Turnhout et al. (2003) in Ooijpolder indicated a juvenile survival from 0.87 to close to 1 during the year while adult survival (higher than 0.95) is relatively stable during year. A long-term population study in Denmark from 1954 to 1994 showed an increase in juvenile survival rate from *c.* 0.50 to *c.* 0.64, while adult survival slightly increased with greater annual fluctuations (mean of 0.70 for females and 0.77 for males) (Kampp and Preuss 2005). Juvenile survival rates in the southern Sweden and Norwegian populations since 1984/1985 have varied between 0.49 (and declining in Norway) and 0.60 (and increasing in Sweden). Declining and variable adult survival rates over the same period in the Norwegian population contrasted constant adult survival rates amongst the Swedish population (Pistorius et al. 2007). Significant inverse relationship was found between summer survival and breeding latitude in Norway, with northern birds having lower survival rates than those from southern areas (Pistorius et al. 2006a). Survival rate varied between winter quarters: during 1985/86 and 1991/92 adult survival rate of Swedish neck collared geese was higher among Dutch wintering birds (0.92 amongst adults, 0.85 for juveniles) than those wintering in Spain (0.81 and 0.71 respectively) (Nilsson and Persson 1993, 1996; Nilsson et al. 1999), probably due to differences in hunting pressure. Likewise, in a mainly sedentary local population in the Netherlands survival was higher in years without shooting (0.90 and 0.87 for adults and juveniles, respectively) than in years with offtake (0.85 and 0.80, respectively) (Baveco et al. 2013), suggesting a higher effect of hunting on juveniles. However, other factors such as predation pressure, food availability and shorter migration distance (and therefore an earlier return to breeding sites), may also contribute to differences in survival rate (Nilsson and Persson 1993; Pistorius et al. 2006a, 2007).

### **Population size and trends**

The NW/SW European population increased from *c.* 30,000 individuals in the mid-1960s, to 120,000-130,000 in the mid-1980s (annual growth of *c.* 13%) (Madsen 1987), the January count totals reaching *c.* 700,000 in 2012 (Figure 4). However, January counts tend to underestimate the true size of the population, since not all sites can be counted annually. The sum of the breeding pairs is 85,176-117,188 pairs based on national estimates submitted to the Article 12 reporting under the EU Birds Directive (EEA 2015), *i.e.* 577,115-1,110,725 individuals using a multiplier factor (Schekkerman 2012) to convert pairs into total individuals. Koffijberg (in litt., 2014), using a partly different dataset, has estimated 692,162-1,168,407 individuals. The average number of the regularly counted sites of the International Waterbird Census (IWC) was 526,673 individuals in the period between 2008-2012. After accounting for missing counts the total average was 897,898 individuals. These numbers are in line with the total national estimates of wintering birds that add up to 649,782-904,739 individuals in mid-January (European Topic Centre on Biological Diversity, in prep.). Based on this information, and accounting for individuals outside of the counting areas, Wetlands International (2015) has estimated the population size at 900,000-1,200,000 individuals. This estimate is in line with the estimate of 960,000 individuals in 2014 by Nilsson (in prep), who extrapolated from 2005-2008 data of Ebbinge (2009) using the long-term population growth rate. However, the number of shot or otherwise taken geese per year suggests that even these estimates are likely to underestimate the real pre-harvest population size (see below).

Between 1980 and 2009, the annual growth rate was estimated at 8.5%, compared to 9.1% for 1995-2009 (Fox et al. 2010; Fox et al. 2018). Wintering numbers have increased in all Range States, particularly in Denmark, Sweden and the Netherlands and less dramatically in Spain (Table 4). In the early 1980s, Spain hosted 82% of the total wintering population (*c.* 120,000), but the proportion of birds wintering there had fallen to no more than 20% by 2009 (out of 610,000) (Ramo et al. 2015) despite increases in the absolute numbers.





**Figure 4.** Estimated trend of the NW/SW European Greylag Goose population (mid-January counts), between 1980 and 2012. Data represent national count totals not adjusted for missing counts for all range states in January, with the exception of Norway and Finland (Data source: Sweden: L. Nilsson; Denmark: Aarhus University; Germany: Dachverband Deutscher Avifaunisten; the Netherlands: K. Koffijberg/Sovon Vogelonderzoek Nederland; Belgium: Institute for Nature and Forest (Flanders); France: V. Schricke; Spain: A. Green and Ramo et al. 2015).

**Table 4.** Population size and trends of Greylag Geese. <sup>1</sup>A. Follestad; <sup>2</sup>L. Nilsson; <sup>3</sup>(Tiainen et al. 2015); <sup>4</sup>Aarhus University; <sup>5</sup>(Gedeon et al. 2014); <sup>6</sup>DDA, unpublished; <sup>7</sup>Breeding bird atlas from Sovon, the Netherlands; <sup>8</sup>Institute for Nature and Forest (Flanders); <sup>9</sup>LPO France/IWC; <sup>10</sup>A. Green/B. Molina

Country	Breeding numbers (individuals or pairs)	Quality of data	Year/s of the estimate	Breeding population trend in the last 10 years (or 3 generations)	Quality of data	Max. size of migrating or non-breeding populations in the last 10 years (or 3 generations)	Quality of data	Year(s) of the estimate
Norway <sup>1</sup>	20,000 – 25,500 pairs	Moderate	2016	Increase	Moderate	>100,000	Moderate	2016
Sweden <sup>2</sup>	41,000 pairs	Good	2008	Increase	Good	227,000	Good	2009
Finland <sup>3</sup>	5,600 - 9,000 individuals	Good	2015	Increase	Good	~2,200-3,600	Expert estimate based on partial regional data	2015
Denmark <sup>4</sup>	15,000-17,000 pairs	Good	2015	Increase	Good	170,000 (September)	Good	2004-2015

Country	Breeding numbers (individuals or pairs)	Quality of data	Year/s of the estimate	Breeding population trend in the last 10 years (or 3 generations)	Quality of data	Max. size of migrating or non-breeding populations in the last 10 years (or 3 generations)	Quality of data	Year(s) of the estimate
<b>Germany</b> <sup>5,6</sup>	26,000–37,000 pairs	Good	2005–2009	Increase	Good	80,000 (Dec./Jan.)	Good	2001–2005
<b>the Netherlands</b> <sup>7</sup>	67,000–111,000 pairs	Moderate	2013–2015	Increase	Good	520,000 – 580,000 (Nov./Dec.)	Good	2009/10–2013/14
<b>Belgium (Flanders)</b> <sup>8</sup>	1,500 pairs	High	2002–2015	Stable	High	22,000	High	1991–2016
<b>France</b> <sup>9</sup>	176–221 pairs	Good	2012	Increase	Good	17,756	Good	2016
<b>Spain</b> <sup>10</sup>	minimum 25 pairs and a minimum population of 250 individuals	NA	2016	Stable	NA	86,825 (Andalucia and Castilla Leon)	NA	2017

## ANNEX 2 PROBLEM ANALYSIS

### General overview

With rapid recent increases in population size, breeding, staging and wintering ranges, the Greylag Goose is increasingly conflict with human societal interests (such as agriculture, ecosystem functions and services, air safety and health issues) which need to be balanced against threats to maintain the population at satisfactory level<sup>22</sup>. In this section, we consider these various aspects combined and in isolation.

This analysis is primarily based on responses from Greylag Goose Range States to a questionnaire sent out by the EGMP Data Centre in March 2017. All Range States have replied to the questionnaire. However, it should be noted that the response from Spain is limited to the experiences from the Doñana wintering population. Additional information has been provided by specific countries and stakeholders. Moreover, a literature review has been undertaken by the compilers of this management plan.

### *Damage to agricultural crops and management actions*

Damage to agricultural crops caused by Greylag Geese has been reported by six of the nine Range States (Belgium, Denmark, Germany, Norway, Sweden, the Netherlands). Five of these (Denmark, Norway, Sweden, the Netherlands and Germany (Lower Saxony)) report an increasing trend in the extent of the damage. Cereals are particularly subject to damage, for instance in Sweden, Denmark (ripening cereal), Norway (spring cereal), Belgium and in a large part of the distribution in Germany (winter cereal), whereas pastures are the most affected crop in the Netherlands, Norway and Sweden, and vegetables in Finland. Less affected crops include grass seed, new-sown grassland and beet.

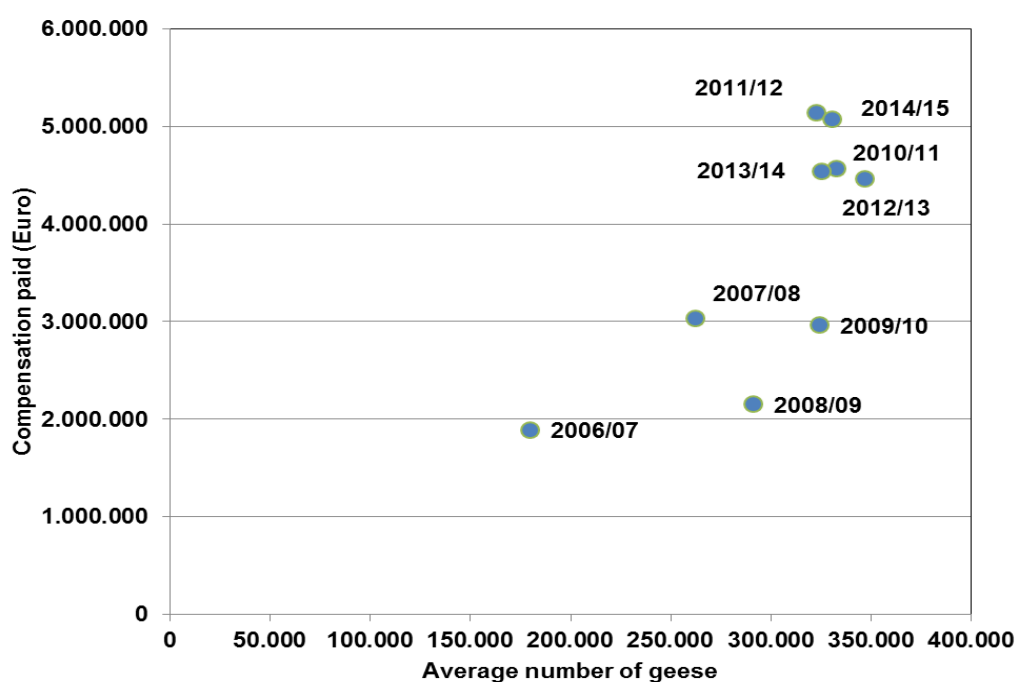
In five Range States (Belgium, Finland, Germany, the Netherlands, Sweden) subsidy schemes or compensation payments have been instigated to alleviate the conflict and/or compensate farmers for losses. In three of these (Belgium, the Netherlands and Sweden), there is a systematic recording of agricultural damage caused by geese.

In Belgium, which supports c. 1% of the breeding and c. 3% of the wintering population, the total annual average level of compensation from 2009 to 2016 was 8,460 EUR (including damages for wintering cereals (19 cases), fertilized grassland (5 cases), permanent grassland (4 cases), grass seeds (4 cases) and beet crops (4 cases)) representing the average damage caused in all compensated cases where Greylag Geese were involved. In Sweden, which supports c. 20% of the breeding population and c. 32% of the winter population mainly during migration, the estimated costs covering damage (all crop types) was c. 65,000 EUR in 2009 in whole country. However, due to changes in policy, damage by Greylag Geese has generally not been subject to compensation since 2010, hence the cost in 2015 had fallen to c. 9,300 EUR in Sweden. Indirect costs are reported in Lower Saxony in Germany, where EU agri-environment subsidy schemes are used in the main wintering areas to create undisturbed foraging areas for the geese. Approximately 24,000 ha of grasslands and tillage are managed under these schemes at a cost of c. 7.0 million EUR/year (for all geese species; however, costs for Greylag Geese only represent a small proportion). In the Netherlands, supporting far the largest national breeding population in the flyway and a high proportion of the non-breeding population at some stage, time series of compensation payments and wintering Greylag Geese numbers are available from 2006/07-2014/15. Preliminary analysis suggests a close correlation between goose abundance and compensation payments both in Sweden<sup>23</sup> and the Netherlands. During this period, the annual compensation paid for damage caused by Greylag Geese has increased from c. 2 million EUR to over 5 million EUR while goose numbers have increased from c. 180,000 to c. 330,000 in the latter (Pearson correlation,  $r=0.76$ , Figure 5). The data support the hypothesis that costs of managing the conflict with agriculture changes with abundance of Greylag

<sup>22</sup> Satisfactory means in this context an agreed population size range above the favourable reference value that satisfies various ecological, economic and recreational interests.

<sup>23</sup> due to changes in policy, damage by Greylag Geese has generally not been subject to compensation since 2010 in Sweden

Geese, even if economic compensation does not exactly reflect the goose damage, as damage to crops caused by geese varies depending on weather conditions, soil types, age of pastures and timing of goose grazing (see Fox et al. 2017). Furthermore, it is not possible to take changes in compensation rates over the years into account in these calculations.



**Figure 5.** Relationship between the estimated monthly average number of Greylag Geese from September to March and sum of compensation paid from September to March (Euro) in the Netherlands from 2006/07-2014/15. Sources: Faunafund (level of damage) and Sovon Vogelonderzoek Nederland (goose data) (K. Koffijberg unpubl. data).

Other (but currently not costed) management actions used to alleviate the problem include local scaring, derogation shooting for crop protection, provision of alternative feeding areas and control of geese in summer (e.g. culling of adults and young, egg collection, egg oiling/pricking and shaking of eggs, Table 5).

Local measures, such as scaring, provision of sacrificial crops, and regional actions, such as provision of go and no-go areas, financial payments, ultimately fail to resolve the conflict with agriculture and may encourage further population growth thereby worsening the problem (see Table 1 in Stroud et al. 2017). Clearly all management actions to reduce the economic effects of goose damage on agriculture are most effective when the interventions have a set of objectives and are coordinated to maximum effect (Williams et al. 2009; Bainbridge 2017, Stroud et al. 2017).

Few countries have implemented national strategies for the management of the Greylag Goose. In Norway, there is a national goose management strategy in place and in Lower Saxony (Germany), a goose management strategy is planned to better reduce conflict through coordination and cooperation. Management strategies are developed and implemented at provincial level also in the Netherlands.

**Table 5.** Management actions taken to alleviate agricultural conflict caused by Greylag Geese. None of the actions are used in Dõnana, Spain. \*since 2010.\*\*Egg oiling/picking/shaking/collection, culling of adults under derogation.

Management action	Finland	Norway	Sweden	Denmark	Germany	Belgium	Netherlands
Local scaring	x	x	x	x	x	x	x
Economic compensation to affected farmers			x*			x	x
Subsidy schemes	EU agro-environment		National		EU agro-environment		Regional
Alternative goose foraging areas	x	x	x		x	x*	x
Hunting (Game species with an open hunting season)	x	x	x	x	x	x	
Derogation shooting	x	x	x	x	x	x	x
Local population control**		x	x		x	x	x

### Ecosystem impacts

All Range States, with the exception of France, have reported some kind of ecosystem impacts caused by Greylag Geese. Most of them show an increasingly adverse effect. Many of these impacts are local problems or differ in intensity seasonally as long as geese migrate away from the considered area (Buij et al. 2017) and justify only localised actions. Ecosystem impacts are summarized in Table 6. Positive impacts are detailed in the Ecosystem services section (see below).

**Table 6.** Summary of ecosystem impacts caused by Greylag Geese

Management issues	Trend over last 10 years	Countries (effect at local (L) or regional (R) scale)	Remarks
Eutrophication of lakes (defaecation)	increasing	Denmark (L), Netherlands (L), Sweden (R)	
	no effect	Belgium, Germany, Spain (Doñana)	
	no data	France, Norway	negative but stable local effect in Norway (in Oslo and Jæren) and Finland
Grazing of lake vegetation (effects on reed vegetation)	increasing	Denmark (L), Germany (L, R), Belgium (L) Netherlands (R), Sweden (R), Spain (Doñana)	negative but stable local effect in Belgium;