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Conserving the Black-tailed Godwit

Legislation, implementation and effectiveness of conservation in Belgium, Germany and the Netherlands

Alterra report 2366
ISSN 1566-7197

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This project was funded by the Dutch Ministry of Economy Affairs
Project code BO-10-001-161

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Wageningen, 2013

Abstract

Kleijn, D. and D. Lammertsma, 2012. *Conserving the Black-tailed Godwit - Legislation, implementation and effectiveness of conservation in Belgium, Germany and the Netherlands.* Wageningen, Alterra, Alterra report 2366. 48 p.; 7 fig.; 53 ref.

The Black-tailed Godwit, *Limosa limosa*, is a near-threatened wader bird with a European breeding distribution that is concentrated in Western Europe. This report summarizes the legal aspects of Black-tailed Godwit conservation and gives a concise overview of the implementation and effectiveness of conservation action that is taken in Belgium, Germany and the Netherlands. In all three countries, conservation initiatives are rarely effective enough to halt the ongoing decline of the species, although there are successful local exceptions. The review concludes with the recommendation to formulate a coherent strategy for Black-tailed Godwit conservation starting with the identification of favourable reference values in each of the three countries.

Keywords: Birds Directive, Conservation Policy, Agricultural Management, Wader.

Cover Photo: Hugh Jansman.

ISSN 1566-7197

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Alterra report 2366
Wageningen, February 2013

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Summary

In 2006, due to the continuing decline of the nominate subspecies of the Black-tailed Godwit *Limosa limosa limosa*, its status on the IUCN Red List of Threatened Species was changes from 'Least Concern' to 'Near Threatened'. In 2008, the AEWA International Single Species Action Plan (SSAP) for the Conservation of the Black-tailed Godwit was published. The short term objective of the SSAP is to halt the current decline and the contraction of the distribution of the nominate subspecies while the long-term objective is to restore all Western Palaearctic populations to a favourable conservation status.

This report is written to provide a first basis for the identification of conservation priorities for the nominate subspecies of the Black-tailed Godwit in the core of the European breeding area: the Netherlands and neighbouring areas in Germany and Belgium. For each of the countries a summary is given of the status and trends of the Black-tailed Godwit and all available information on conservation efforts and their effects is reviewed.

From the perspective of the Black-tailed Godwit, the environmental conditions on farmland in most parts of North-western Europe are deteriorating rapidly. This is caused by habitat destruction, climate change, increased recreational use, but most importantly by the ongoing technological developments in the agricultural sector such as shifts from grassland to maize cultivation, the increasing proportion of work carried out by contract workers (who do not know where birds nest), the increasing speed with which agricultural activities are being carried out, novel slurry application methods and increased drainage. By and large, the scientific evidence is available that can be used to effectively protect and promote Black-tailed Godwits. Most conservation initiatives that are currently implemented meet with limited success or fail altogether in increasing population trends of Black-tailed Godwits. Two case-studies described in this report show that it nevertheless is possible in practice to maintain and promote Black-tailed Godwits sustainably even in densely populated and intensively farmed areas in North-western Europe.

The legal framework for Black-tailed Godwit protection is given by the EU Birds Directive which obliges all member states to maintain the population of wild bird species at a favourable conservation status. This should be ensured by the conservation of a sufficient amount of high quality habitat as well as by the protection of the species themselves. All three countries reviewed in this report therefore have both the instruments and the obligation to conserve Black-tailed Godwits. Nevertheless, in most North-western European areas the Black-tailed Godwit population is declining faster than ever and even the declared stable Belgium population is showing signs of a decline. None of the three countries have formulated clear objectives on the minimum population size that is considered to be a favourable conservation status. None of the countries have a clear strategy on how they want to restore the favourable conservation status of the Black-tailed Godwit. The situation is particularly worrying in the Netherlands, home to about 40% of the European breeding population, because the responsible authorities do not have any control over and do not coordinate in any way the conservation of this species. It is therefore unlikely that the Netherlands is fulfilling the obligations imposed by the Birds Directive to maintain a favourable conservation status for this species.

The lack of national-level favourable reference values seriously hampers effective conservation of Black-tailed Godwits. It makes it impossible to formulate an effective conservation strategy and preclude evaluations whether conservation efforts are effective. The most pressing issues that need to be addressed in each of the three countries are therefore (1) The establishment of clear goals for the (minimum) national population size of the Black-tailed Godwit that needs to be sustainably conserved (i.e. the population size that is considered to be a favourable conservation status) and (2) The establishment of a national species action plan that

describes in which sites, by what measures, in what time frame and by whom the sustainable conservation of the Black-tailed Godwit at the agreed level of the national population size will be achieved. Inclusion of a rigorous monitoring and evaluation process in the national action plan is essential.

During their first meeting (15-16 October 2012 in Abcoude, the Netherlands), the AEWA Black-tailed Godwit International Working Group, including representatives of the national governments of the three countries, therefore recommended that these issues should be addressed with high priority and before the end of the year 2013.

1 Introduction

1.1 Background

The Black-tailed Godwit is a wader species with a widespread but disjunct distribution in the Western Palearctic. Two subspecies occur in this area; *Limosa limosa limosa* with a main breeding range from the Netherlands to Russia and *Limosa limosa islandica* which breeds mainly in Iceland. The populations of both subspecies are migratory and have different migration systems. In the European part of the flyway, subspecies can mix. The species as a whole increased during the first half of the 20th century throughout the Western Palearctic but while the population of the *islandica* subspecies has continued to increase in numbers and expanded its breeding range, the population of the nominate subspecies has shown range contraction and major declines in most key breeding areas during the last decades (Gill et al., 2007).

In 2008, the Western Palearctic population of the nominate subspecies was estimated to number c. 110,000 pairs, while the population of the Icelandic subspecies was estimated to number c. 25,000 pairs (Jensen et al., 2008). About 50% of the population of the nominate subspecies is thought to breed in the Netherlands. Throughout the year, the nominate subspecies uses almost exclusively man-made habitats.

Figure 1

Halting the decline of the nominate subspecies of Black-tailed Godwit Limosa limosa limosa requires detailed insights in the main drivers and mechanisms and how these affect population dynamical processes. Colour-marking adult birds or chicks is an important method through which these insights can be obtained.

Photo: Hugh Jansman.

It breeds in semi-natural and agricultural grassland and meadows and stages and winters in inundated grasslands, rice fields and salt pans in southern Europe, North-Africa and sub-Saharan Africa. The Icelandic subspecies on the other hand breeds largely in natural habitats (e.g. bogs, marshes) on Iceland and stages in natural coastal wetlands and estuaries in North-western Europe and Northern Africa.

In 2006, due to the continuing decline of the nominate subspecies of the Black-tailed Godwit, its status on the IUCN Red List of Threatened Species was changes from 'Least Concern' to 'Near Threatened'. In 2008, the International Single Species Action Plan (SSAP) for the Conservation of the Black-tailed Godwit (Jensen et al., 2008) was published to assist the fulfilment of obligations under the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) and the Council Directive 79/409/EEC on the conservation of wild birds (Birds Directive) of the European Union (EU). The goal of this plan is to restore the 'Least Concern' status of the Black-tailed Godwit on the IUCN Global Red List of Threatened Species. The short term objective of the SSAP is to halt the current decline and the contraction of the distribution of the nominate subspecies while the long-term objective is to restore all Western Palaearctic populations to a favourable conservation status. In addition, the SSAP aims at maintaining the favourable status of the islandica population.

To achieve the goal and objectives, the SSAP aims to address the most urgent issues in a specific, measurable, agreed, realistic and time-bound process. Since many results and proposed conservation actions apply to more than one country, the countries have been grouped into four categories, combining status and threats of the godwit and the political situation of each country: (1) Non-EU Member states, (2) EU Member States with the exception of the Netherlands and neighbouring areas in Germany and Belgium, (3) the Netherlands and neighbouring areas in Germany and Belgium and (4) countries within the migratory and wintering area of the flyway, consisting of EU Member States, non-EU countries as well as countries on the Middle East and in Africa (Jensen et al., 2008).

This report is written to provide a first basis for the identification of conservation priorities for the nominate subspecies of the Black-tailed Godwit in one of these areas: the Netherlands and neighbouring areas in Germany and Belgium. This area currently harbours the largest breeding population in Europe, but at the same time the rate of decline is worryingly high. It was therefore considered important to fast-track the implementation of the SSAP in this particular area. This report gives a concise summary of the status and trends of the nominate subspecies of the Black-tailed Godwit in the Netherlands as well as in neighbouring areas in Germany and Belgium. It lists all available information on conservation efforts targeted at this species, their effects and their impact on maintaining a favourable conservation status for this species. The conservation efforts targeted at the Black-tailed Godwit are furthermore placed in the framework of national and international legislative framework. Finally, to illustrate, if available, for each country a successful conservation case study is described to highlight the factors that determine success or failure.

1.2 Godwit conservation within the EU legal framework

Biodiversity conservation in Europe, and therefore also Black-tailed Godwit conservation, is strongly influenced by a number of international treaties and directives. These directives partly determine how (by means of what instruments) Black-tailed Godwits (and any other species) are being protected in individual European countries. This report therefore starts with a short summary of the legal framework that applies to the conservation of Black-tailed Godwits in the EU. The most detailed specifications have been made in the Birds Directive and relevant parts of this Directive for the conservation of godwits in Belgium, Germany and the Netherlands will be discussed in some detail. Other Directives, Conventions and Treaties that are relevant for Black-tailed Godwit conservation will be discussed more briefly.

All bird species occurring naturally in the wild in EU countries are protected under the Birds Directive (Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds; replaced by Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009). This directive obliges all member states to maintain the population of wild bird species at a level corresponding 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 (article 2). This objective is generally interpreted as a requirement to maintain or restore wild bird populations at a favourable conservation status as defined in the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). A favourable conservation status is achieved when population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

To achieve this, member states are required to take measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of wild birds by means of: (a) the creation of protected areas, (b) the upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones, (c) the re-establishment of destroyed biotopes and (d) the creation of biotopes (Birds Directive, article 3).

Species listed in Annex I of the Birds Directive are subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. Member States are required to classify in particular the most suitable territories in number and size as special protection areas for the conservation of these species (article 4). Member States are furthermore required to take measures to establish a general system of protection prohibiting: (i) deliberate killing or capture by any method, (ii) deliberate destruction of, or damage to, their nests and eggs or removal of their nests, (iii) taking their eggs in the wild and keeping these eggs even if empty, (iv) deliberate disturbance of these birds particularly during the period of breeding and rearing and (v) keeping birds of species the hunting and capture of which is prohibited (article 5). Exceptions to these last prohibitions can be made in the interests of public health and safety, in the interests of air safety, to prevent serious damage to crops, livestock, forests, fisheries and water, for the protection of flora and fauna, for the purposes of research and teaching, of re-population, of re-introduction and for the breeding necessary for these purposes, to permit, under strictly supervised conditions and on a selective basis, the capture, keeping or other judicious use of certain birds in small numbers (article 9). Species listed in Annex II of the Birds Directive may be hunted under national legislation (article 7), but member states shall ensure that the hunting of these species does not jeopardise conservation efforts in their distribution area. In this respect, species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies and species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.

The Black-tailed Godwit is listed on Annex II, part B allowing hunting in Denmark and France. However, the Black-tailed Godwit is a protected species in Denmark and France has adopted a five-year moratorium on the hunting of the Black-tailed Godwit (2008-2012) so that, at the writing of this paper, hunting is not allowed within the EU.

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention; came into force in 1983) is an intergovernmental treaty concluded under the aegis of the United Nations Environment Programme that aims to conserve terrestrial, aquatic and avian migratory species throughout their range. The Black-tailed Godwit is listed on Appendix II, which lists migratory species with an unfavourable conservation status and which require international agreements for their conservation and management, as well as species which have a conservation status which would significantly benefit from the

international co-operation that could be achieved by an international agreement. Parties that are range states of migratory species listed in Appendix II shall endeavour to conclude agreements where these would benefit the species and should give priority to those species in an unfavourable conservation status. Parties are encouraged to take action with a view to concluding agreements for any population or any geographically separate part of the population of any species or lower taxon of wild animals, members of which periodically cross one or more national jurisdictional boundaries.

The Bern Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention for short; came into force in 1982) is an international legal instrument in the field of Nature Conservation that covers the natural heritage in Europe, as well as in some African countries. It is particularly concerned about protecting natural habitats and endangered species, including migratory species. The Black-tailed Godwit is listed as an Appendix III species, which requires each contracting party to take appropriate and necessary legislative and administrative measures to ensure the protection of the species. It requires that any exploitation of wild fauna specified in Appendix III shall be regulated in order to keep the populations out of danger (article 7).

The Agreement on the Conservation of African-Eurasian migratory waterbirds (AEWA, entered into force in 1999) aims to safeguard key habitats of migratory waterbirds throughout their entire flyway. Countries that have signed the agreement commit themselves to take co-ordinated measures to maintain migratory waterbird species in a favourable conservation status or to restore them to such a status giving special attention to endangered species as well as to those with an unfavourable conservation status. Obligations most relevant to the Single Species Action Plan of the Black-tailed Godwit include that countries should:

(i) ensure that any use of migratory waterbirds is based on an assessment of the best available knowledge of their ecology and is sustainable for the species as well as for the ecological systems that support them;
(ii) identify sites and habitats for migratory waterbirds occurring within their territory and encourage the protection, management, rehabilitation and restoration of these sites;
(iii) coordinate their efforts to ensure that a network of suitable habitats is maintained or, where appropriate, re-established throughout the entire range of each migratory waterbird species concerned, in particular where wetlands extend over the area of more than one country;
(iv) investigate problems that are posed or are likely to be posed by human activities and endeavour to implement remedial measures, including habitat rehabilitation and restoration, and compensatory measures for loss of habitat;
(v) initiate or support research into the biology and ecology of migratory waterbirds including the harmonization of research and monitoring methods and, where appropriate, the establishment of joint or cooperative research and monitoring programmes;
(vi) analyse their training requirements for migratory waterbird surveys, monitoring, ringing and wetland management to identify priority topics and areas for training and cooperate in the development and provision of appropriate training programmes;
(vii) develop and maintain programmes to raise awareness and understanding of migratory waterbird conservation issues in general and of the particular objectives and provisions of this Agreement;
(viii) exchange information and results from research, monitoring, conservation and education programmes;
(ix) cooperate with a view to assisting each other to implement this Agreement, particularly in the areas of research and monitoring.

Apart from these measures, they shall apply the specific actions determined in the Action Plan.
In implementing these measures parties should take into account the precautionary principle.

2 Black-tailed Godwit conservation in Belgium

2.1 Distribution, population trends and conservation status

The Godwit breeding distribution in Belgium is almost entirely restricted to Flanders. The discussion in this Chapter therefore deals with Flemish regulations and conservation measures and does not consider Walloon regulations and conservation initiatives.

Breeding numbers of Black-tailed Godwits in Flanders increased from the 1980's from 750-780 pairs to 865-910 pairs in 1990, to 1,050-1,200 pairs in 2000-2002 (Vermeersch et al., 2004). In recent years, the Black-tailed Godwit population seems to be declining again with tentative estimates of 900 pairs in 2012 (G. Spanoghe, personal communication).

The main distribution range is the coastal polder areas and bordering valley of the IJzer river, the lower Schelde valley and adjoining polder areas. More to the east significant numbers breed in wet grasslands on the higher sandy soils in the Kempen district (Vermeersch et al., 2006). This last area used to be the stronghold of Black-tailed Godwits in Belgium. However, in this region godwit numbers declined from 600 breeding pairs in 1981 to 320-440 breeding pairs in 2000-2002 (Vermeersch et al., 2006). The growth of the population in the western parts of the country, that are more open and dominated by peat and clay soils, more than compensates for the decline in the Kempen district. However, Vermeersch et al. (2006) doubt whether the increase in godwit number is due to favourable conditions on the Belgium breeding grounds themselves and suggest it might be largely driven by immigration of birds from neighbouring countries. Although reliable studies are lacking, reproductive success, even in areas mostly dominated by nature reserves, seems to be too low to compensate for mortality of adult birds (Van Impe, 2010).

In Belgium Black-tailed Godwits are listed as 'not threatened'.

2.2 Legal conservation framework

In Flanders, the requirements of the EU Habitats Directive and Birds Directive with respect to protection of areas have been regulated in the so-called Nature Decree (Het Natuur Decreet: Decreet betreffende het natuurbehoud en het natuurlijk milieu (BS 10/01/1998), 21 oktober 1997). The Flemish authorities have designated Habitats Directive Areas (Habitatrichtlijngebieden; Besluit van de Vlaamse Regering van 24 mei 2002 tot vaststelling van de gebieden die in uitvoering van artikel 4, lid 1, van Richtlijn 92/43/EEG van de Raad van de Europese Gemeenschappen van 21 mei 1992 inzake de instandhouding van de natuurlijke habitats en de wilde flora en fauna aan de Europese Commissie zijn voorgesteld als speciale beschermings-zones (BS 17/8/2002); De Bruyn en Paelinckx, 2007). Additionally, the Flemish authorities have designated Special Protection Zones to comply with regulations of the Birds Directive. The combination of Habitats Directive Areas and Special Protection Zones make up the Flemish Natura 2000 Network (Van Reeth et al., 2007).

The protection of individual species was, until 1 September 2009, regulated by means of Royal Decree (Koninklijk besluit van 22 september 1980 houdende maatregelen, van toepassing in het Vlaamse Gewest, ter bescherming van bepaalde in het wild levende inheemse diersoorten, die niet onder de toepassing vallen van de wetten en besluiten op de jacht, de riviervisserij en de vogelbescherming (BS 31/10/1980)). Since this date, in Flanders, this Royal Decree has been replaced by the so-called Species Decree (Het Soortenbesluit: Besluit van de Vlaamse Regering met betrekking tot soortenbescherming en soortenbeheer), which is linked to the above-mentioned Nature Decree. The regulations in the Species Decree closely adhere to the requirements of the EU Birds Directive and Habitats Directive with respect to protection of species, as outlined in Section 1.2.

In Flanders, the Black-tailed Godwit is listed as a category 2 species of article 9 of the Species Decree. This means that the basic conservation requirements apply, including any exceptions to those requirements similar to those listed under article 9 of the Birds Directive (http://www.codex.vlaanderen.be/).

2.3 Conservation initiatives and impact

Black-tailed Godwit conservation in Flanders is implemented by means of two approaches: the establishment of protected areas and the implementation of agri-environment schemes targeted at meadow birds.

2.3.1 Protected areas

In Flanders, 38 Habitats Directive Areas have been designated with a total area of 101,891 ha. Furthermore, 24 Special Protection Zones have been designated under the Birds Directive with a total area of 98,423 ha (Natuurindicatoren, 2012). Six of these sites have been designated for Black-tailed Godwits under Natura 2000 (http://eunis.eea.europa.eu/species/1119/sites), however the Black-tailed Godwit is considered to be only relevant for Natura 2000 as a migratory bird. As a result, no favourable reference values have been formulated for breeding populations of Black-tailed Godwits in Habitats Directive Areas or Special Protection Zones.

In Flanders, nature reserves are sites that have been acknowledged by the Flemish government because of their importance for the conservation or development of nature or the environment. Management in these areas is targeted at the conservation or promotion of specific types of biodiversity. On 1 January 2007 Flanders had 948 nature reserves with a total area of 34,318 ha (http://www.inbo.be/content/page.asp?pid =BEL_VLA_GEB_Natuurreservaten). Acknowledged nature reserves overlap with Habitats Directive Areas and Special Protection Zones and make up a small proportion of the Natura 2000 Network in Flanders. Some nature reserves host Black-tailed Godwits (e.g. Uitkerkse Polder) and specifically target the conservation of this species. However, it is unknown how many reserves host Black-tailed Godwits or what proportion of the Flemish Black-tailed Godwit population breeds in nature reserves.

Steurbaut et al. (2004) compare breeding densities in nature reserves and conventionally farmed grasslands. Godwit settlement densities were significantly higher (by a factor 6) in nature reserves than on agricultural grasslands. The percentage of breeding pairs that was subsequently observed with at least one chick was higher in reserves compared to agricultural grasslands (77% versus 25%). This suggests that reproductive success was higher in reserves compared to farmland.

2.3.2 Agri-environment schemes

Agri-environment schemes in Flanders place restrictions on grassland management with the aim to enhance reproductive success of meadow birds (Vermeersch et al., 2006). Fields with meadow bird agreements can only be used as permanent grasslands. Agricultural activities are prohibited between 1 April and 15 June. Before 15 June grazing is allowed provided grazing densities never exceed two adult cattle or horses per hectare. Farmers may additionally choose to use nest protectors to enhance clutch survival during grazing or other agricultural activities. In the period 2000-2008, the total area with meadow bird agreements increased from 152 to 808 ha (Vermeersch et al., 2006; Danckaert et al., 2009). In 2008, approximately 3% of the area that is important for meadow birds (including Black-tailed Godwits) was covered by meadow bird schemes (Danckaert et al., 2009). In 2004, 56% of the area with meadow bird agreements were extensively grazed, on 49% of the area nests were protected in various ways, 22% of the area had delayed first seasonal mowing and on 1.5% of the area arable fields were transformed into grasslands (Vermeersch et al., 2006).
Hardly any information is available on the ecological effects of meadow bird agreements on the Black-tailed Godwit. Steurbaut et al. (2004) compared breeding densities on fields with and without meadow bird agreements and found no differences in hatching rates of clutches between fields with agreements and neighbouring conventionally managed fields. Based upon the limited uptake of meadow bird agreements in Flanders and the poor effectiveness of similar meadow bird agreements in the Netherlands the general consensus is that the Flemish agri-environment schemes are insufficient for sustainable protection of Black-tailed Godwits and other meadow birds (Steurbaut et al., 2004; Vermeersch et al., 2006).

Figure 2
Outside the breeding season, the Black-tailed Godwit often congregates in large groups. In North-western Europe these can often be observed just prior to the breeding season on flooded fields or, more rarely, after the breeding season.

Photo: Hugh Jansman.

3 Black-tailed Godwit conservation in Germany

3.1 Distribution, population trends and conservation status

The Black-tailed Godwit is considered to be one of the German priority species for bird conservation as about 3.9% of the European population breeds in Germany (Nipkow, 2010).

The majority of the German Black-tailed Godwit population can be found in four federal states: Mecklenburg-Western Pomerania, Schleswig-Holstein, Lower Saxony and North Rhein-Westphalia. Breeding populations of Black-tailed Godwits in Germany are distributed over the North Sea islands (between 2000 and 2004 approximately 6% of the total German population), North Sea mainland salt marshes (situated outside coastal defences, 3%), North Sea clay marshes (situated inside coastal defences, 62%), Baltic coast (mostly inland nature reserves within 5 km of the Baltic coast, 1%) and inland habitats (28%; Hötker et al., 2007). A tentative estimate puts the German population size of Black-tailed Godwit at approximately 14,000 breeding pairs around 1960, which declined to 12,000 around 1980 (Hötker et al., 2007). The national population showed a marked decline in the early 1980's but recovered in the remainder of that decade. Since 1990, the German godwit population is declining steadily. In 2004 an estimated 4,300 Black-tailed Godwit pairs were breeding in Germany, which was less than half of the population size of 1990 (Hötker et al., 2007), but the population size is currently believed to be around 3,500 breeding pairs (H. Hötker, personal communication).

The different regions show considerably different population trends. Statistically significant negative trends were observed in the North Sea clay marshes (-2.28%), Baltic coast (-6.61%) and the inland habitats (-8.62%). Godwit numbers on the North Sea mainland salt marshes were almost stable (-1.22%) and on the North Sea islands numbers increased (+5.87%), although this trend did not deviate significantly from zero (Hötker et al., 2007). The strong decline of this species in inland habitats is well illustrated in the Lower Rhine area. A recent paper showed that the Black-tailed Godwit population breeding mainly in wet grasslands in floodplains of the river Rhine declined between 1960 and 2011 from 500 breeding pairs to 50-100 breeding pairs (Wille et al., 2011). The decline was attributed to agricultural intensification, the desiccation of the landscape caused by the deepening of the river bed and plain habitat loss due to expansion of built-up areas and excavations (for gravel extraction).

Causes for the decline are insufficient habitat quality (low water table, intensive management, small size of protected areas, high predation rates) and a decrease in meadow area (transformation of meadow to maize) (Hötker et al., 2007; Sudfeldt et al., 2009).

In Germany, Black-tailed Godwits are a red list species in the category 'critically endangered' (Nipkow, 2010).

3.2 Legal conservation framework

The requirements of the EU Habitats Directive and Birds Directive with respect to protection of areas have been regulated in the Gesetz über Naturschutz und Landschaftspflege (Bundesnaturschutzgesetz-BNatSchg) of 29 July 2009. This act regulates the maintenance and establishment of protected areas and includes requirements for protected area management plans. The Black-tailed Godwit in Germany is considered to be

relevant for Natura 2000 as a breeding bird and as a migratory bird. The German authorities have designated Special Protection Areas to comply with regulations of the Birds Directive (Federal Agency for Nature Conservation; last update 19 May 2011). Together with the Habitats Directive Areas and Special Protection Zones they make up the German Natura 2000 Network (Sudfeldt et al., 2009).

Black-tailed Godwits are listed as strictly protected species (§ 1 Satz 2) in the Verordnung zum Schutz wild lebender Tier- und Pflanzenarten (Bundesartenschutzverordnung - BArtSchV) of 16 February 2005. The regulations closely adhere to the requirements of the EU Birds Directive and Habitats Directive with respect to protection of species.

3.3 Conservation initiatives and impact

Sites protected under the Habitats Directive are classed as sites of Community importance (SCIs) and as special areas of conservation (SACs). Sites protected under the Birds Directive are called Special Protection Areas or 'Vogelschutzgebieten'. In May 2011, 4,009,716 ha terrestrial SPA's (http://www.bfn.de/fileadmin/MDB/documents/themen/natura2000/meldestand_spa_englisch.pdf) had been designated in Germany. The federal states that are most relevant for Black-tailed Godwit conservation (Mecklenburg-West Pomerania, Lower Saxony, Schleswig-Holstein, NorthRhine-Westphalia) together host 1,178,390 ha of these Special Protection Areas. A total of 102 sites have been designated for breeding or staging Black-tailed Godwits under Natura 2000 (http://eunis.eea.europa.eu/species/1119/sites; Appendix 1). Sixty-seven of these sites hold favourable reference values for breeding birds. If we assume average values when ranges of breeding pairs have been listed, German Special Protection Areas as a whole have a favourable reference value of about 2,900 breeding pairs of Black-tailed Godwits.
In addition to SCI's, SACs and SPA's that make up the Natura 2000-network, Germany has Nature Conservation Areas, National Parks, Biosphere Reserves, Landscape Protection Areas and Nature Parks. These areas partly overlap. For example, the Waddensea of Schleswig-Holstein (Schleswig-Holsteinisches Wattenmeer und Halligen) is both a National Park and a Biosphere Reserve and Nature Parks consist mainly of landscape protection areas or nature conservation areas (http://www.bfn.de/). From the perspective of Black-tailed Godwit conservation, SPAs, Nature Conservation Areas in combination with agri-environment schemes seem to be the most relevant instruments.

Special initiatives targeted at meadow bird conservation have been implemented in a number of Federal states. For example, in 2008 in Schleswig-Holstein agri-environment schemes targeted at meadow birds had been implemented on about 14,000 ha and an additional 28,000 ha of mostly swamp, bog and grassland areas, potentially suitable habitat for meadow birds, was managed by the Nature Conservation Foundation Schleswig-Holstein (Sudfeldt et al., 2009). At the same time, in Lower Saxony, approximately 10,000 ha of state-owned land was targeted to meadow bird protection and on an additional 10,000 ha agri-environment schemes had been implemented (Sudfeldt et al., 2009). In 2006, agri-environment schemes targeting grassland habitats were implemented on 23,500 ha in North Rhine-Westphalia (Michels, 2007). However, these include a wide range of habitats that are not used by godwits (e.g. chalk grasslands) and it is unknown what area was implemented in areas with Black-tailed Godwits. Hötker et al. (2007) estimate that 59% of the German Black-tailed Godwit population breeds in areas with conservation management[1].

[1] Hötker et al. (2007) used the criterion that areas qualified as 'areas with conservation management (Schutzgebieten: e.g. National Parks, Nature reserves, Special Protection Zones)' if at least 25% of the area consisted of reserve fields and/or fields with agri-environment schemes.

In Germany, the distinction between nature reserves and agri-environment schemes is rarely made in studies or reports that examine uptake or ecological effects of conservation measures (Ikemeyer and Kruger, 1999; Weiss et al., 1999; Hötker et al., 2007; Michels, 2007). Most studies compare population trends in areas with conservation management (Schutzgebieten) and areas without such management. However, areas with conservation management may include state-owned reserve fields, fields with agri-environment schemes as well as conventionally managed fields. This makes it impossible to discuss the separate effects of the two instruments that policy makers have to reverse the decline in Black-tailed Godwits. In the following sections we therefore discuss the impact of the combined set of measures and refer to this as 'areas with conservation management' to make clear that we discuss something different from the protected areas discussed elsewhere in this report.

Conservation management in Germany generally consists of manipulating water levels or modifying agricultural management. Agri-environment schemes (Vertragsnaturschutz) have existed in various forms since the mid-1980's. In North Rhine-Westphalia, the decline of the Black-tailed Godwits was actually one of the reasons for the establishment of the first agri-environment scheme in 1985 (the Wet Meadow Protection Program or Feuchtwiesenschutzprogramm; Michels, 2007). Agri-environment schemes in North Rhine-Westphalia prohibit the use of pesticides, agricultural activities between 15 March and 15 June, prohibit or restrict fertilizer inputs (no mineral fertilizer or slurry) and restrict grazing rates. In a study of 90[2] areas with conservation management, Hötker et al. (2007) found that in 60% of the area's water levels were raised during the breeding season, in 50% of the areas parts of fields were inundated or shallow pools were established and 20% of the areas were allowed to be flooded in winter time. Agricultural management was often extensified, generally by reducing fertilizer applications or abandoning fertilizer use altogether, lowering of stocking rates and delaying the first seasonal mowing or grazing date. Manipulation of water levels was generally only possible after fields had been bought by state or nature conservation organisations. Compared to fields owned by farmers with just agri-environment scheme, measures that increased the wetness of areas or induced a complete cessation of fertilizer applications were significantly more frequently implemented on fields owned by state or nature conservation organisations. Measures that delayed the first seasonal mowing date or reduced fertilizer input were significantly more frequently implemented on fields with just agri-environment schemes compared to state owned fields (Hötker et al., 2007).

Hötker et al. (2007) compared areas with conservation management[1] with conventionally managed areas and found that population trends of Black-tailed Godwits declined significantly less rapidly in areas with conservation management. This is in agreement with findings from earlier studies (Ikemeyer and Krüger, 1999; Weiss et al., 1999, 2002) showing that population trends were more positive (increasing instead of declining or declining less rapidly than outside) in areas with conservation management. Furthermore, inland populations, but not populations breeding on North Sea clay marshes, had significantly higher settlement densities inside areas with conservation areas than outside such areas (Hötker et al., 2007).

A closer inspection of the response of Black-tailed Godwits to individual conservation measures showed that settlement densities increased during the first five years after implementation, after which they declined again to approximately the original levels (Hötker et al., 2007). No significant relationship was observed between the distance to the nearest population of Black-tailed Godwits and local population trend, suggesting that isolation is not a factor contributing to population decline of Black-tailed Godwits.

[2] Twenty of the protected areas studied by Hötker et al. (2007) were located outside Germany.

An analysis of the impact of conservation measures on the reproductive success of Black-tailed Godwits showed that hatching rate declined over the years with no significant difference between areas with conservation management and conventionally managed areas (Hötker et al., 2007). Losses caused by agricultural activities declined with time and were significantly lower inside areas with conservation measures compared to conventionally managed areas. Predation rates were, on the other hand, higher in areas with conservation management, albeit not significantly. Chick survival declined significantly over time and was not influenced by the conservation status of areas. Godwit reproductive success declined significantly until 1999. Since 2000, the reproductive rate increased significantly in areas with conservation management and was significantly higher than outside such areas where reproductive success remained constant. These analyses were based on data from a range of studies both in and outside Germany. The majority of data came from German sites but it is unknown how representative these results are for the German population.

4 Black-tailed Godwit conservation in the Netherlands

4.1 Distribution, population trends and conservation status

A recent estimate of the size of the Dutch Black-tailed Godwit population suggests that around 2008 between 40,000 and 60,000 pairs were breeding in the Netherlands (Van Paassen and Teunissen, 2010). The Dutch population represents approximately 40% of the European Black-tailed Godwit population (Verhulst, 2007). Few other species are so dependent on the Netherlands for their survival and the Netherlands therefore has a large international responsibility for maintaining a favourable conservation status for this species. As a result, a lot of information is available about status and trends of the species and about the impact of different conservation initiatives.

Before humans started large-scale modifications of the landscape, the species is thought to have nested in bogs and littoral grasslands that naturally occurred in the riverine delta of what now is the Netherlands (Blankers and Kleijn, 2011). As human population size increased, more and more bogs were drained and saltmarshes were reclaimed and turned into grasslands resulting in significant loss of primary breeding habitat. At the same time, Black-tailed Godwits were able to switch from natural habitats to anthropogenic grasslands which occupied smaller areas but could generally sustain higher breeding densities. Traditionally, the largest numbers and highest densities can be found on agricultural grasslands in polder areas with high water tables and clay or peat soils in the western and northern parts of the country. The species occurred in lower densities in the floodplains of streams on the higher sandy soils and along the major rivers especially when people had cleared all trees and shrubs. Until the 1970's, godwits were common breeding birds of wet agricultural grasslands throughout the country. Although exact numbers are not available, the population size is believed to have temporarily peaked in the 1960's. With the acceleration of agricultural intensification since the 1960's, and particularly the large scale drainage of agricultural grasslands in the 1970's and 80's, the population started to decline rapidly. In the period 1990-2008, the national godwit population declined with approximately 3% per year.

With the onset of population decline, Black-tailed Godwits disappeared most rapidly from the sandy soils in the East and South of the country and more slowly from what are presumably the most suitable breeding areas in the West and North of the country (Van Paassen and Teunissen, 2010). In many areas the decline of Black-tailed Godwits is associated with changes in breeding distribution. Where godwits used to breed scattered across entire polder areas they now increasingly congregate in one or a few clusters, usually in and around nature reserves. Some nature reserves now have the highest densities of breeding godwits ever recorded. For example, between 1972 and 2008 breeding densities in the 190 ha Westwouderpolder reserve increased from 68 to 114 breeding pairs per 100 ha (Van Dorp, 2009) and in the 247 ha Eempolder reserve, breeding pairs per 100 ha increased from 59 to a stunning 148 between 2004 and 2011 (Jonkers, 2011). Not all reserves show positive trends, however, although population densities and trends are generally higher than in the surrounding countryside (Van Egmond and De Koeijer, 2006). At the national scale, the impact of nature reserves is insufficient to halt the decline which seems to accelerate in recent years. In the period 2004-2008 the size of the population decreased with almost 7% per year.

Black-tailed Godwits are listed as 'vulnerable' in the Dutch Red List of threatened bird species.

4.2 Legal conservation framework

The requirements of the EU Birds Directive and Habitats Directive with respect to protection of areas have been implemented in the Netherlands by means of the Dutch Nature Conservation Act (Natuurbeschermingswet 1998, came into force on 1 October 2005). This act regulates the establishment of protected areas and includes requirements for creation of protected area management plans and for impacts assessments in case of any activities in or nearby the sites that could potentially have harmful effects. The Nature Conservation Act distinguishes between Nature Monuments, Natura 2000 sites and Wetlands of international importance. Nature Monuments are designated by the Ministry of Economic Affairs and include reference values with respect to biotopes of species insofar as they are required by the Birds Directive. Furthermore, they include reference values with respect to specific habitats or populations of wild plant and animal species as far as required by the Habitats Directive. The designation of Nature Monuments does not foresee in the formulation of favourable reference values for population sizes of Black-tailed Godwits. In the Netherlands, 166 sites have been designated as Natura 2000 sites. Designation of Natura 2000 sites requires the formulation of favourable reference values of individual species. For wintering and staging Black-tailed Godwits, favourable reference values at the national level have been set as 'expansion in the size and quality of the biotope to obtain a carrying capacity of 6,000 individuals' (seasonal average; LNV, 2006). For the much more numerous breeding population no Natura 2000 favourable reference values have been formulated despite the fact that some Natura 2000 sites hold large breeding populations of this species (e.g Wormer- and Jisperveld and Kalverpolder c. 500 breeding pairs or 1,000 individuals).

The requirements of the EU Birds Directive and Habitats Directive with respect to protection of species have been implemented in the Netherlands by means of the Dutch Flora and Fauna Act (Flora- en Faunawet, 1998). Killing, injuring or capturing, possession of or tracking down of Black-tailed Godwits, whether intentional or not, is prohibited. However in the Netherlands, maintenance of high-quality meadow bird habitat requires management activities (e.g. mowing, grazing) that could result in bird casualties. The Dutch Ministry of Economic Affairs allows for exemptions in certain cases where there is no other satisfactory solution and where favourable reference values for populations are guaranteed. These exemptions are only possible if they adhere to a Code of Good Practice that is approved by the Minister of Economic Affairs. An approved Code of Good Practice exists for the management of nature reserves, but so far (September, 2012) no Codes of Good Practice have been approved for management of agricultural land (http://www.hetlnvloket.nl/onderwerpen/vergunning-en-ontheffing/dossiers/dossier/flora-en-faunawet-ruimtelijke-ingrepen/overzicht-van-gedragscodes-en-besluiten-flora-en-faunawet/overzicht-gedragscodes). In effect, this means that Black-tailed Godwits breeding on agricultural land are well protected in theory, but not in practice. This is reflected by the high mortality rates of Black-tailed Godwit clutches and chicks on agricultural land (Schekkerman and Müskens, 2000; Teunissen et al., 2005).

4.3 Conservation initiatives and impact

Partly because of the importance of the Netherlands for a large proportion of the European breeding population, the effectiveness of conservation management targeted at Black-tailed Godwits has received a lot of scientific interest the last couple of decades. As indicated in the previous section, Black-tailed Godwit conservation in the Netherlands is implemented by means of two approaches: the establishment of nature reserves outside Natura 2000 areas and the implementation of agri-environment schemes targeted at meadow birds.

4.3.1 Protected areas

Protected areas, or nature reserves, targeted at meadow birds cover about 19,875 ha (Van Paassen and Teunissen, 2010). It is unknown in what proportion of these so-called meadow bird reserves, the Black-tailed Godwit is actually nesting (as opposed to other species of meadow birds such as Lapwing *Vanellus vanellus*, Redshank *Tringa totanus* or Oystercatcher *Haematopus ostralegus*). Wet grasslands do not occur naturally anymore in the Netherlands and the upkeep of high quality wet grasslands requires regular but low-input agricultural practices such as regular mowing or grazing, maintenance of surface-level drainage system, reed cutting which is time-consuming and therefore costly. A key factor determining the habitat quality for Black-tailed Godwits is the groundwater level in these reserves as high water levels slows vegetation development thereby making the habitat suitable for both nesting adult birds and foraging chicks (Kleijn et al., 2009b). Managers therefore strive to maintain groundwater levels throughout the breeding season and keep agricultural activities in this period to a minimum. Nevertheless environmental conditions in reserves are often suboptimal for Black-tailed Godwits due to neglected maintenance which may result in Rush *Juncus effuses* dominance or establishment of shrubs and trees. Most Dutch meadow bird reserves are relatively small (e.g. <300 ha) and located in polder areas in which the remaining fields are conventionally farmed. In such situations it is often impossible (legally prohibited) to raise groundwater to levels optimal for Black-tailed Godwits because this has negative impacts on agricultural production on the neighbouring fields. The structure of the landscape surrounding many meadow bird reserves is often suboptimal because of presence of trees and woodlots near which Black-tailed Godwits prefer not to breed (Figure 3) as they may be used as perches by birds preying on godwit chicks. Mortality rate of wader clutches have been found to be higher near upgoing stuctures (Berg, 1992).

Finally, nature conservation organisations are required to open up at least part of their reserves for the general public in order to qualify for financial support by the Dutch government (without which many of the reserves could not have been maintained). Consequently (the edges of) many reserves are being exposed to increasing levels of human recreation (walking, bird watching, cycling, canoeing, etc.) which has negative impacts on godwit breeding bird population trends (Holm and Laursen, 2009). Thus, Black-tailed Godwit populations are declining in many Dutch nature reserves with management that is specifically targeted to this species. Nevertheless, average population trends for meadow birds in general are more positive in meadow bird reserves than in conventional farmland (Van Egmond and De Koeijer, 2006).

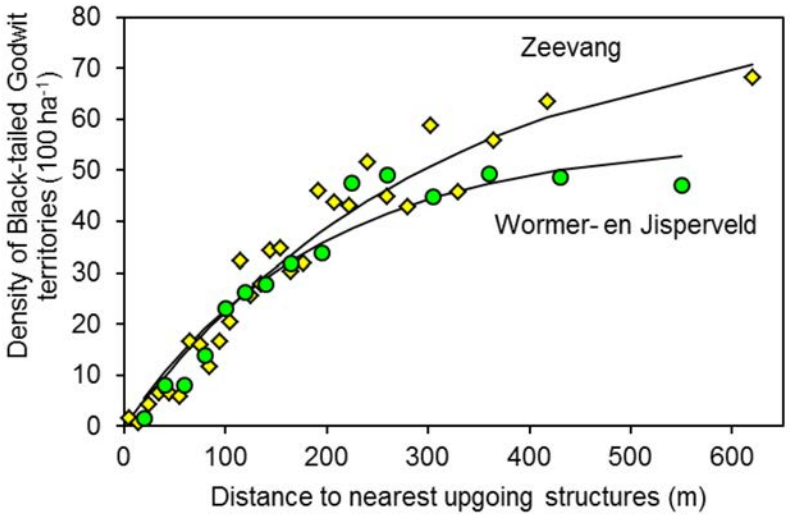


Figure 3

The settlement density of Black-tailed Godwits in relation to the distance to the nearest upgoing structure (e.g. buildings, trees) in 2006 in two different areas in the province of North-Holland, the Netherlands. With increasing distance to upgoing structures, the settlement density steadily increases to a maximum. The settlement density levels off at distances beyond 300 m suggesting that prime Black-tailed Godwit habitat needs a tree and building free buffer of at least 300 m.

Adapted from Kleijn et al., 2009c.

Kentie et al. (2011) compared reproductive success of Black-tailed Godwits in nature reserves with that on conventionally farmed agricultural grassland. Here, Black-tailed Godwit clutches were being protected during agricultural activities, at most. Clutch survival in reserves was higher than on farmland (54% and 32% respectively). More importantly, the chance of observing a chick in the years after ringing was about ten times as high in reserves as on farmland (4.3% versus 0.4%). Adult survival did not differ significantly between reserves and farmland. Using these data, Kentie et al. (2011) calculated that the chance of a godwit egg producing an adult godwit was almost 17 times higher in reserves than on farmland. Based on these findings they estimated that in reserves the reproductive success of Black-tailed Godwits was sufficient to maintain stable populations only in some of the years of study. On farmland, reproductive success was not nearly sufficient to result in stable populations in any of the years.

4.3.2 Agri-environment schemes

Agri-environment schemes in the Netherlands consist of two general strategies. First, volunteers mark the nests of meadow birds to protect them against mowing activities by farmers or place nest protectors on fields that are being grazed to protect nests from being trampled. In 2008, nest protection by volunteers was carried out on 357,000 ha, of which 118,000 ha was being subsidized by agri-environment schemes (Van Paassen and Teunissen, 2010). In general, measures protecting clutches against the impact of agricultural activities effectively reduce clutch mortality rates. However, if clutches are re-visited (as is often the case) after such measures have been taken, positive effects may by neutralized because of so-called visitor effects (increased loss rates in periods after nest have been visited; Goedhart et al., 2010). Visitor effects might largely counteract positive effects of nest protection particularly when it aims to reduce negative effects of cattle trampling or spreading of artificial fertilizer. Losses due to mowing or slurry application without nest protection are almost 100% so that in such cases nest protection has positive effects regardless of visitor effects (Goedhart et al., 2010).

The second Dutch agri-environmental strategy is carried out on 27,500 ha (in 2008) and prescribes delaying the first seasonal agricultural activities to 23 May or 1, 8, 15 or 22 June. In the Netherlands, agri-environment schemes delaying first agricultural activities are as old as the agri-environmental program itself. Initially, the objective of this type of measure was to enhance clutch survival (Beintema and Müskens, 1987). The expectation was that delayed mowing or grazing would result in higher breeding densities on fields with such schemes because successful hatching of clutches strengthens breeding site tenacity (Groen, 1993). Additionally, chicks return preferentially to the fields on which they were born (Groen, 1993; Thompson et al., 1994, but see Kentie et al., 2011). In theory, these mechanisms would result in increasing breeding densities with time, at least when compared to conventionally managed grasslands. The number of territories of Black-tailed Godwits were however not higher on fields with agri-environment schemes delaying the first agricultural activities (Kleijn et al., 2001).

During the 1990s it became clear that low chick survival was the main driver of Black-tailed Godwit decline (Schekkerman and Müskens, 2000). Godwit chicks are nidifugous and have to forage for themselves by gleaning insects from (un-cut or ungrazed) medium high vegetation (Beintema et al., 1991). Although scheme prescriptions changed very little, around the year 2000 the main objective of agri-environment schemes delaying first agricultural activities became raising chick survival through provisioning of chick foraging habitat (Schekkerman et al., 2008). The associated increase in clutch survival remains however an important (side-) effect of delayed mowing/grazing (Schekkerman et al., 2008). Subsequent research showed that foraging success of godwit chicks is generally higher in sites with tall vegetation than in recently cut or grazed sites (Schekkerman and Beintema, 2007). In particular, the abundance of large invertebrate prey in uncut swards is important because older chicks cannot efficiently use smaller invertebrates (Schekkerman and Boele, 2009). Furthermore, tall swards offer better cover against predators than grazed or mown swards and chicks foraging in tall swards are therefore less likely to be killed by predators (Schekkerman et al., 2009). Schekkerman et al. (2008) did indeed find a positive relationship between the area with tall sward (also called chick foraging habitat) and chick survival, but because the areas with tall swards did not differ between areas with agri-environment schemes and control areas no positive effects of the agri-environment scheme could be found. Furthermore, even in areas with the largest area tall swards chick survival in general insufficient to support stable godwit population level (Schekkerman et al., 2008). This was probably the results of a combination of insufficient quantity and quality of tall swards. A recent study showed that, due to climate change, vegetation growth in spring has advanced considerably in the last few decades (Kleijn et al., 2010). Throughout this period, farmers were observed to mow or graze the vegetation at approximately the same developmental stage. However, the date at which this stage was reached advanced by about two weeks compared to the early 1980's. Black-tailed Godwits did not advance the laying of their eggs in the same period. As a result, godwit chicks currently hatch on average about two days after the median mowing date of agricultural grasslands while in the mid 1980's they hatched eleven days before the median mowing date. This probably explains why chick mortality due to agricultural activities has strongly increased recently (Teunissen et al., 2005). Furthermore, less foraging habitat is available to hatched chicks nowadays and the remaining uncut swards are much taller and denser. This makes it more difficult for chicks to access the vegetation and results in lower density of invertebrate prey per volume vegetation, making the swards of lesser quality for godwit chicks (Kleijn et al., 2010).

5 Going against the tide

As the previous chapters indicate, in wet grassland areas in North-western Europe virtually all agricultural and socio-economic developments are having adverse effects on Black-tailed Godwits, and particularly on the reproductive success of this species. This largely explains why the species is currently declining at an unprecedented rate in most of its distributional range in North-western Europe. Nevertheless, there are some areas where Black-tailed Godwits seem to be faring well, with stable or even increasing populations. In this Chapter we describe two such areas, as case studies that can be used to get better insights into the type of measures that are required for sustainable conservation of Black-tailed Godwit breeding populations.

5.1 Case Study 1: De Ronde Hoep, the Netherlands

The Dutch Polder De Ronde Hoep has a total area of about 1,000 ha. The original pattern of parcelling of the area has been maintained, with the settlements, farms and other buildings situated on the edge of the polder and the centre being a large open wet grassland area (Figure 4). Since 1998, the implementation of agri-environment schemes in the area is being coordinated by the Agricultural Nature Cooperation De Amstel ('Agrarisch natuurvereniging De Amstel'). On approximately 50% of the agricultural fields in the polder, agri-environment schemes targeted at meadow birds (see Section 4.3.2), and particularly the Black-tailed Godwit, are being implemented. Most schemes, however, only prescribe nest protection. On a limited number of fields schemes delaying the first seasonal agricultural activities are being implemented (Natuurbeleven, 2009). In the centre of the area a meadow bird reserve is located. Prior to 2007 this reserve was approximately 40 ha in size and the management of the reserve was coordinated by the agricultural nature cooperation in close consultation with the nature conservation organization owning the reserve ('Noord-Hollands Landschap'). These reserve fields were either extensively grazed during the chick rearing period, mown after 8 June, grazed until 8 May and subsequently mown after 15 June or mown after 1 June but leaving uncut refuge strips of vegetation on the fields. In 2006 and 2007, the reserve was extended to approximately 180 ha, and in the winter of 2008-2009 the water level in the reserve was raised by installing dams that are used to prevent or limit drainage of rainwater during the breeding season of the Black-tailed Godwits. In winter time this results in parts of the reserves being inundated. Vegetation growth on these parts is strongly delayed, resulting in optimal habitat conditions in the chick rearing period in May and June. Management of fields in the reserves is switched to more uniformly mowing after 15 June, with differences in water level making sure that a mosaic of different types of vegetation persists in the reserve. Management of the reserve fields is still being coordinated by the agricultural nature cooperation and management of the fields is being carried out by the local farmers. Management of the water level is being done by the nature conservation organization.

The agricultural nature cooperation regularly organises meetings with farmers and volunteers to inform them of ongoing developments and results of last season's efforts. The contacts between the agricultural nature cooperation, farmers and volunteers run through a single contact person who plays a pivotal role in the coordination of conservation management in the entire area. This is key to the success of the conservation management because the coordinator collects and interprets all information on the location and requirements of the birds, whether availability of habitat meets the requirements of the Godwits, what farmers can alleviate shortfalls in habitat availability in parts of the area and has the means to enter management contracts on an ad-hoc basis.

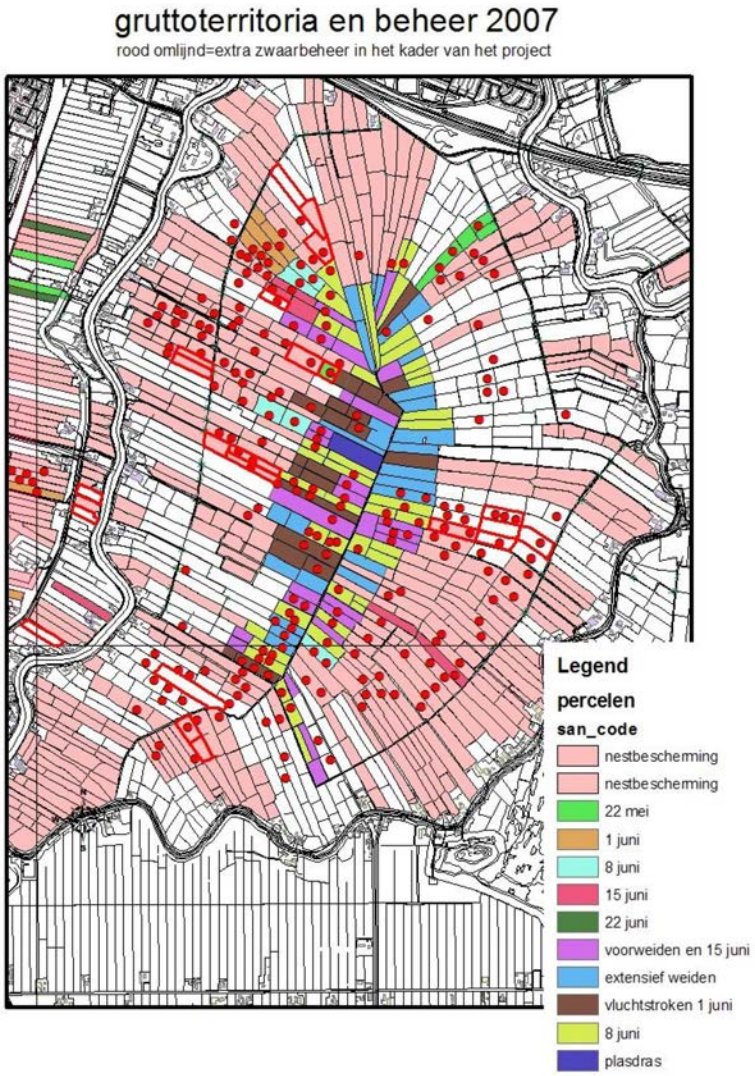


Figure 4

An example of the spatial distribution of different types of agri-environment schemes in the polder De Ronde Hoep in 2007. White fields have no agri-environment schemes, pink field have schemes prescribing nest protection only. Other colours indicate various forms of delayed first season agricultural activities, extensive grazing, refuge strips or temporarily inundating fields.

Source: Natuurbeleven, 2007.

The use of one key person in this role furthermore helps all parties to build up a relationship of trust, which makes it much easier to implement last minute changes in management when this is required for the conservation of the godwit. In return, it also allows for more flexibility in farm management because the coordinator knows when deviations from prior agreements can be allowed without harming the Black-tailed Godwit population.

Between 2005 and 2008, farmers documented grassland use during the Godwit breeding season. Furthermore, in the entire polder area, habitat use by Black-tailed Godwits is being monitored volunteers (e.g. Figure 4; Kuiper and Klein, 2005, Natuurbeleven 2007, 2008, 2009) who locate and map Godwit nests, map Godwit territories and perform counts of alarming Godwits (indicative of families with at least one chick) using standardised methods. All these activities are being coordinated by the agricultural nature cooperation who collect and analyse the data during and after the breeding season. If in a particular year, many Black-tailed

Godwit territories are located on fields without agri-environment schemes or with just nest-protection the agricultural nature cooperation asks farmers to enter last-moment contract for delayed mowing to enhance clutch survival and provide favourable foraging conditions for the chicks right after hatching (Natuurbeleven, 2007). Furthermore, on fields where Godwit families with chicks were observed during mowing, contracts for refuge strips can be entered on the spot to enhance chick survival. This way the spatio-temporal availability of high-quality habitat is optimised as much as possible to the needs of the Black-tailed Godwits. The analyses of the monitoring data furthermore help the agricultural nature cooperation to constantly improve conservation management. For example, data analyses revealed that perennial ryegrass monocultures, even with delayed mowing, offer poor chick rearing habitat because such swards are too tall and dense by the time the chick have hatched. This led to agricultural nature cooperation to promote the maintenance of less intensively managed, forb-rich grasslands and to preferentially locate delayed mowing agri-environment schemes on such fields (Natuurbeleven, 2007).

The presence of the meadow bird reserve with high-quality vegetation in the later stages of the chick rearing period is a key element determining the habitat quality for the entire area. Godwit families in De Ronde Hoep are observed on the entire range of grassland types (Figure 5a) but show a strong preference for unmown swards and tend to avoid mown or grazed grasslands (Figure 5b). During the chick rearing period, the availability of unmown swards outside the reserve declines rapidly. The presence of the reserves means that birds that have the possibility to establish territories on a wide variety of fields. Nest protection on most of these fields increases their survival rates and once the chicks have hatched families have the possibility to move to unmown swards (mostly located in the reserve) should the sward on their field be mown early.
The last decade the breeding population of Black-tailed Godwits has been stable at about 220 pairs, which is a number that corresponds closely to numbers observed in this area in a survey in the 1970's. This is exceptional considering the annual decline of about 7% for this species nationally. This success appears to be the results of the:

1. Large size, absence of upgoing structures and limited predator abundance in the area[3].
2. Integrated management of a nature reserve with raised water levels and optimal chick rearing habitat and agricultural land with a variety of agri-environmental measures.
3. Presence of an ornithologically as well as agriculturally skilled coordinator who oversees and coordinates all activities in the area and who has the facilities to optimize Black-tailed Godwit management by means of implementing last-minute management adjustments.

[3] Limited predator abundance is partly achieved by predator control (Dirk Tanger, personal communication).

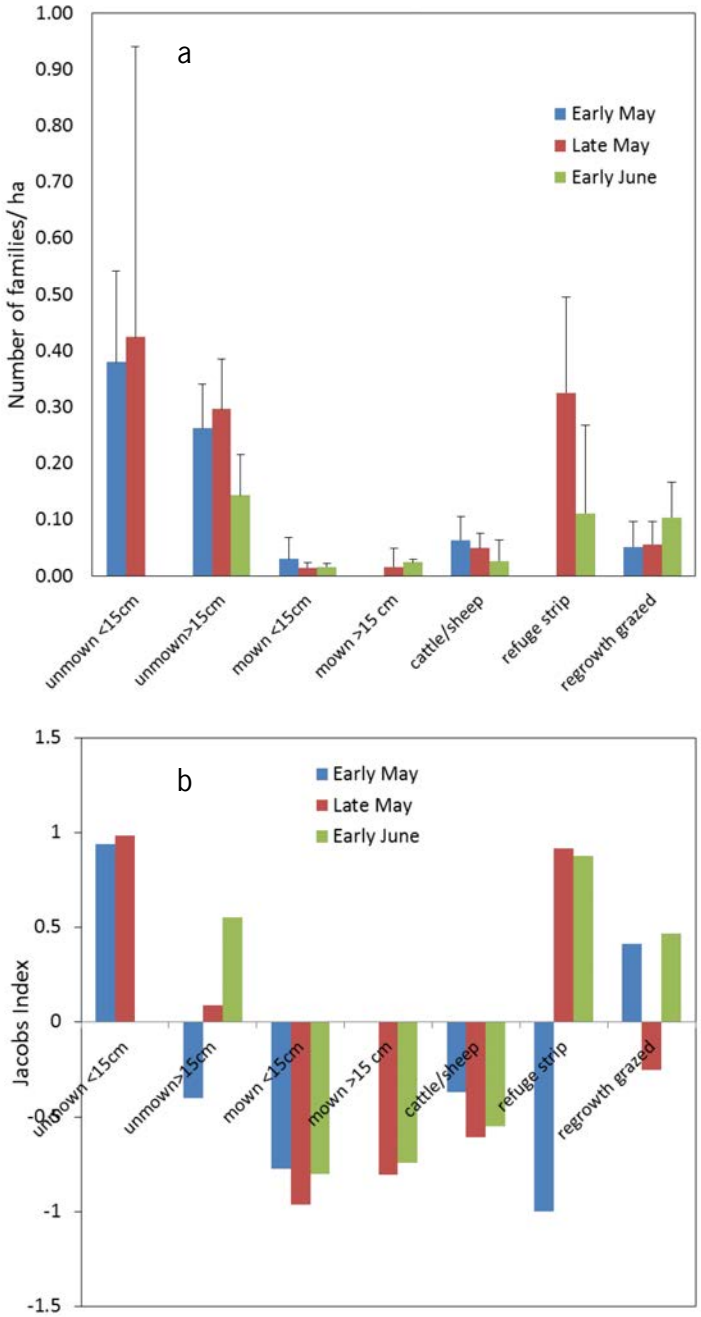


Figure 5

*Habitat preference of Black-tailed Godwit families in the polder De Ronde Hoep; (a) average density (± standard deviation) of Black-tailed Godwit families per grassland type and (b) preference of Black-tailed Godwit families as indicated by the Jacob's Index: (E=(Ui-Ai)/((Ui+Ai)-(2*Ui*Ai)) with Ui=relative number of families per habitat type i (%) and Ai=relative surface area per habitat type i; Jacobs, 1974). Availability of unmown swards declined from almost 600 ha in early May, to approximately 250 and 150 ha in late May and early June respectively. On average 69.6 % of the population favoured unmown vegetation taller than 15 cm (unmown>15cm) from early May until early June, with an 86% average in early May.*

Data from Kuiper and Klein, 2005; Natuurbeleven 2007, 2008, 2009.

5.2 Case Study 2: Dümmer, Germany

Situated between the German cities of Osnabrück, Damme and Diepholz, lake Dümmer and the surrounding fen grasslands are an important stronghold of the Black-tailed Godwit in Lower Saxony (Belting and Belting, 1999). An area of 4,560 ha has been designated as a Special Protection Area, with a favourable reference value of 124 breeding pairs of Black-tailed Godwits (Appendix 1). The aim of the conservation management in the area has been the regeneration of wet grasslands and the conservation of meadow birds. In 1987 a plan was adopted to establish a 42 km^2 nature reserve on the north, west and south side of the lake. Extensification of agricultural management and raising of the water levels was planned in the a central zone of 21 km^2 (Belting and Belting, 1999). Between the years 1987 and 2007, approximately 2,500 ha of land was purchased. In large parts of the area controlled flooding of fens during winter season was made possible by installing adjustable weirs. Using these weirs, a mosaic of areas with different flooding regimes has been created ranging from permanently flooded fields, via long-term flooded (2-6 months) and short-term flooded fields (app. one month) all the way to unflooded or even drained fields (on private lands) (Figure 6). Management of the grasslands after the end of the breeding season was carried out by no less than 140 local farmers. Management was targeted at the needs of the birds but allowed for flexibility (earlier mowing or grazing) when birds were no longer present on the fields (Belting et al., 1997).The flooding, in combination with lower-input agricultural management resulted in the development of flower-rich grasslands.

Extensive studies have been carried out in the area to get better insight into the needs of both adult and young birds (Belting et al., 1997; Belting and Belting, 1999). These studies showed that breeding success was negatively related to distance to upgoing structures, with lowered success at distances of less than 500 m. In the period 2001-2009, settlement of Black-tailed Godwits shifted from unflooded to flooded areas. While in the years 2001-2003, 60% of the godwits nested on fields that were not flooded, in the years 2007-2009 Black-tailed Godwits were no longer nesting on unflooded fields. In the last period about 50% of the godwits bred on short term flooded and 50% of the godwits nested on long-term flooded fields. Flooding had, however, a negative impact on invertebrate prey. Total invertebrate biomass decreased from unflooded to short term flooded to long-term flooded fields. Invertebrate biomass on unflooded fields was 2.5-4.5 times higher than that on long-term flooded fields. Furthermore, the size of invertebrates similarly declined from unflooded to long-term flooded. Size is important as it determines the efficiency of foraging by Black-tailed Godwit chicks (to secure their energy intake chicks need to eat less large prey than small prey. Prey size therefore determines the time required for foraging). Based on these findings it could be calculated that chicks needed to forage more than three times as long on long-term flooded fields than on unflooded fields. It would, in effect, be impossible for godwit chicks to survive on long-term flooded fields alone as they would have to forage around the clock to obtain enough food. The take-home message therefore is that a mosaic of areas with different flooding regimes is critical for the reproductive success of Black-tailed Godwits because birds nest survival is too low on unflooded fields but chicks survival is too low on flooded fields.

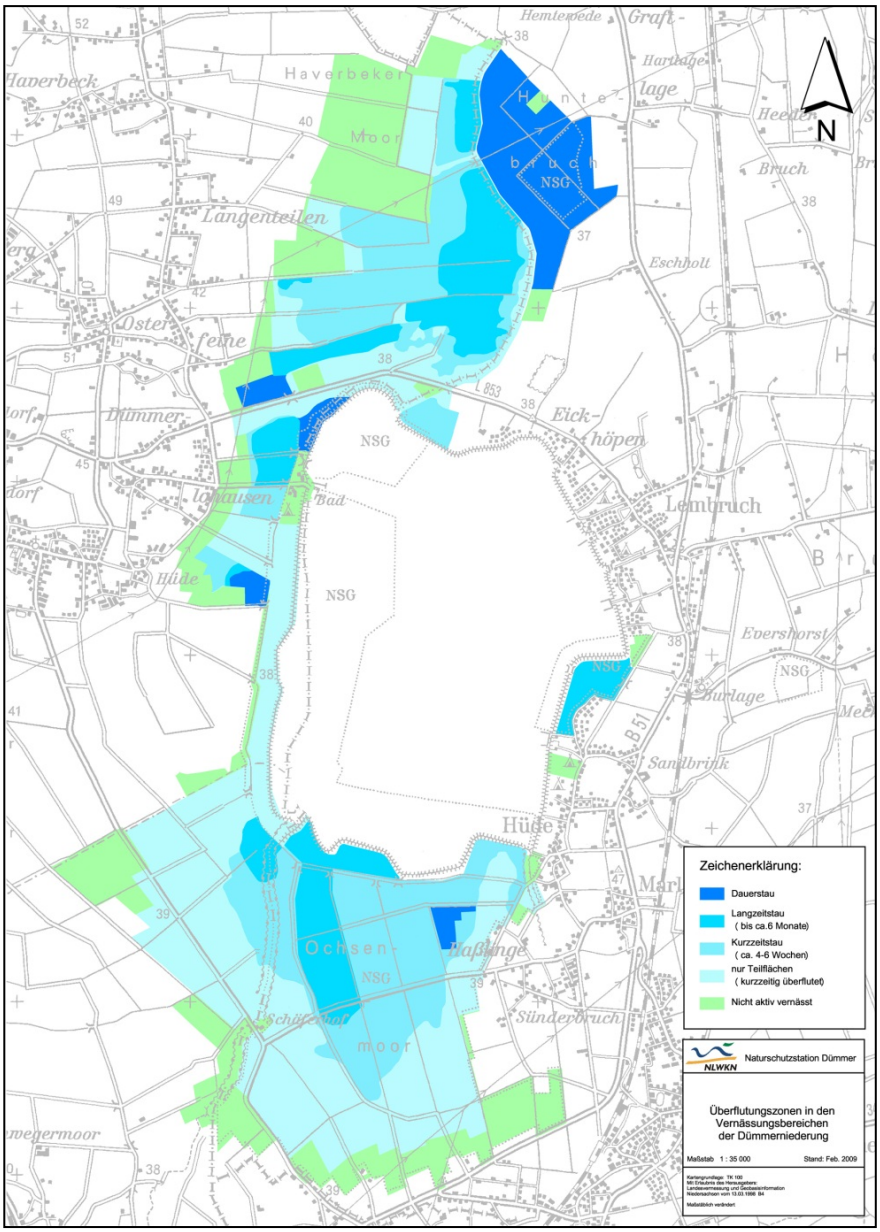


Figure 6

An illustration of the implementation of controlled flooding measures in the lake Dümmer areae. The white area in the centre is Lake Dümmer. The darkest shade of blue is continuously flooded. Successively lighter shades of blue indicate respectively long-term flooded (up to 6 months), short-term flooded (ca. 4-6 weeks) and partially short-term flooded. Areas in green are unflooded parts of the Special Protection Area (mostly private lands).

Source: H. Belting et al., in prep.

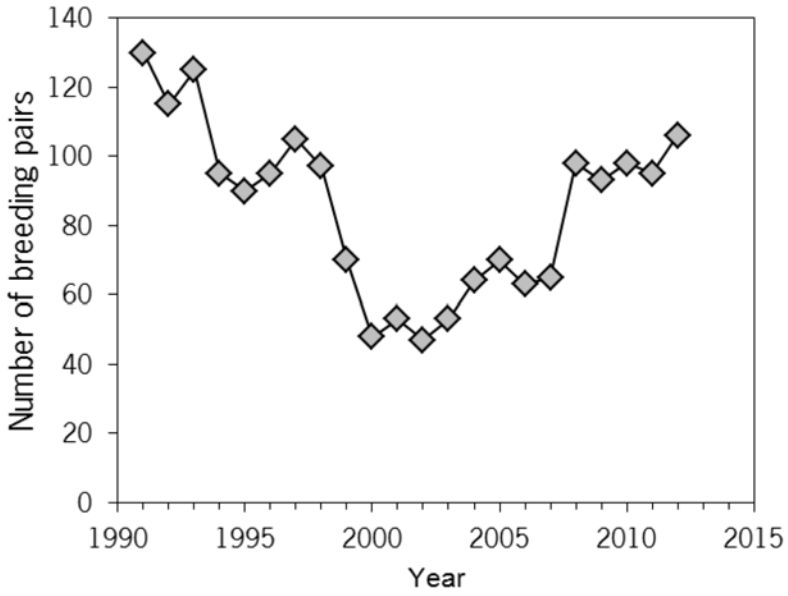


Figure 7

Population trend of the Black-tailed Godwit in the Lake Dümmer Special Protection Area.

Source: H. Belting et al., in prep.

Increasing the reproductive success of the local population proved to be difficult indeed in the Dümmer area. Between 1991 and 2003 reproductive success of Black-tailed Godwits ranged between 0.1 and 0.7 fledged chicks per breeding pair and was rarely higher than the 0.6-0.7 fledged chicks per breeding pair required to compensate adult mortality (Schekkerman and Müskens, 2000). After 2005 reproductive rate increased considerably and in the years 2006-2007 the number of fledged chicks per breeding pair was as high as 1.2, almost double the level required for stable populations. Breeding success in the period 2008-2012 fluctuated between 0.2-0.8 due to high predation rates (up to 94% nest predation of the first clutch, which was in some years partially compensated with a replacement clutch). This led, in 2010, to the implementation of predator control in the southern part of the area. Predator control resulted in low predator abundance in this part of the reserve (it is not yet known what the effects are on the reproductive success of the Black-tailed Godwit). The population trend reflected the pattern in reproductive success (Figure 7). Between 1991 and 2000 the number of breeding pairs declined from 130 to 50. The population size was more or less stable between 2000 and 2003 and subsequently showed a pronounced increase up to about 100 breeding pairs in 2008 after which it remained more or less stable at 100 pairs.

6 Conclusions and discussion

From the perspective of Black-tailed Godwits, the environmental conditions on farmland in most parts of North-western Europe are deteriorating rapidly. This is caused by habitat destruction, climate change, increased recreational use, but most importantly by the ongoing technological developments in the agricultural sector such as shifts from grassland to maize cultivation, the increasing proportion of work carried out by contract workers (who do not know where birds nest are), the increasing speed with which agricultural activities are being carried out, novel slurry application methods, increased drainage, etc. By and large, the scientific evidence is available that can be used to effectively protect and promote Black-tailed Godwits. In a nut shell, high-quality breeding sites for Black-tailed Godwits are characterised by large size, openness, wetness, spatial heterogeneity, good contacts with the farming community maintaining the sites and tight coordination by a single person that puts birds first but bears the needs of the farmers in mind. Furthermore, because in contemporary landscapes the natural processes are lacking that used to keep breeding sites largely free of predators (e.g. periods of extensive flooding) predator control might be needed. The exact way in which the key environmental factors are maintained in optimal condition differs between sites because sites are bound to differ in for example landscape structure, soil type, hydrology, human population pressure, farming systems or predator pressure. A one-size-fits-all approach will therefore be ineffective. The case-studies described in Chapter 5 show that it is possible in practice to maintain and promote Black-tailed Godwits sustainably even in densely populated and intensively farmed areas in North-western Europe.

For more than a decade, all three countries reviewed in this report have had the obligation as well as the instruments to conserve Black-tailed Godwits. Nevertheless the Black-tailed Godwit population is declining faster than ever. None of the three countries have formulated clear objectives on the minimum population size that is considered to be a favourable conservation status. None of the countries have a clear strategy on how they want to restore the favourable conservation status of the Black-tailed Godwit.

For Belgium, this is not really surprising. Published population trends indicate that the national population size of the Black-tailed Godwit has been increasing the last two decades. One could therefore argue that the species has a favourable conservation status in Belgium and that no measures or coherent plan for its conservation are required. However, the population increase seems to be largely due to import from neighbouring areas in the Netherlands. Furthermore, the reproductive rate of the population seems to be insufficient to maintain itself and in neighbouring areas in the Netherlands the population of the species shows a pronounced decline. It would therefore be prudent for the Belgian authorities to anticipate the expected decline that some experts' state has already begun.

Germany is the only country in which favourable reference values have been formulated for Black-tailed Godwits. In Germany as a whole, a minimum of 2,900 breeding pairs should be maintained inside Natura 2000 sites. This particular number is the sum of the number of breeding pairs that have been listed in individual Natura 2000 sites and it is unlikely that it is the result of deliberate thought or discussions. Moreover, surveys suggest that designation of Natura 2000 areas has, if anything, a negative impact on population trend of Black-tailed Godwits, possibly because in many Natura 2000 areas management has become too extensive for this particular species. It is unknown what proportion of the population breeds outside Natura 2000 areas. However, Hötker et al. (2007) estimated that 41% of the Black-tailed Godwit population bred outside areas with conservation measures so the number of breeding pairs outside Natura 2000 areas must be substantial. It is unknown what part of this population the German or state governments aim to conserve and by what tools. Barring exceptions, the effects of conservation measures (combinations of nature reserves and agri-

environment schemes) in their current form seem insufficient to halt the population decline. In sum, the German authorities do not have a clear view on what they consider to be a favourable conservation status for the Black-tailed Godwit and do not have a coherent plan or strategy for how they aim to achieve this. However, Germany does have favourable reference values for Natura 2000 sites that can be used as a conservation target and to assess progress.

The situation is more problematic in the Netherlands, the country hosting by far the largest breeding population of Black-tailed Godwits in North-western Europe. The Birds Directive requires that the Netherlands takes all requisite measures necessary to preserve, maintain or re-establish a sufficient diversity and area of habitats for the Black-tailed Godwit thereby restoring the Dutch Black-tailed Godwit population at a favourable conservation status. Yet, it is currently unclear how and by means of what measures this will be achieved in the Netherlands. It is unknown what the Dutch government considers to be a favourable conservation status. No favourable reference values have been formulated at national, regional or site levels in terms of numbers of breeding pairs or amount of high quality breeding habitat (VBN, 2009). Because in the Netherlands the majority of the population breeds outside Natura 2000 areas, restoration needs to be achieved through improvement of areas outside Natura 2000 areas. The Dutch national government is responsible for maintaining the favourable conservation status of any species (predominantly) occurring outside Natura 2000 species.

As detailed in Chapter 4, the conservation instruments that are currently implemented in the Netherlands are insufficient to halt the decline of Black-tailed Godwits. Agri-environment schemes are largely ineffective. Furthermore, they are implemented on a voluntary basis and farmers are free to end agri-environment schemes at the end of a contract period. Reserve management is sufficient to maintain stable populations only in some years and areas. Additionally, the upkeep of many Black-tailed Godwit reserves is under pressure. The maintenance of optimal Black-tailed Godwit habitat requires year-round intensive management and is therefore costly. Management of Dutch nature reserves is largely subsidized by the national government (through provincial authorities). In 2011, the budget for nature conservation was significantly reduced and conservation organizations are now forced to work more efficiently (manage the same area with less money). An attractive approach to become more efficient is to replace management-intensive and therefore expensive types of nature (such as meadow bird habitat) with less management-intensive, and therefore cheaper forms of nature (such as swamps or forests). At the moment, the Dutch government does not have any means to guarantee that Dutch nature conservation organizations maintain a minimum area of high-quality Black-tailed Godwit habitat.

In sum, the Dutch government is responsible for maintaining a favourable conservation status of the Black-tailed Godwit but currently does not have any control over and does not coordinate in any way the conservation of this species. The Black-tailed Godwit is declining at an unprecedented rate and there are few indications that the Netherlands is fulfilling the obligations imposed by the Birds Directive to maintain a favourable conservation status for this species. In the past, lawsuits against countries have been successful in similar cases (e.g. Case C-418/04; http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:051:0003:0004:EN:PDF).

The lack of national-level favourable reference values seriously hampers effective conservation of Black-tailed Godwits. First of all, it makes it impossible to formulate an effective conservation strategy. If it is unknown how many Black-tailed Godwits should be preserved in an area it is impossible to make meaningful decisions on how much of the key breeding sites should be protected and by what measures. Furthermore, the lack of clear population goals makes it impossible to evaluate whether conservation efforts are effective (e.g. Kleijn et al., 2006). The most pressing issues that need to be addressed in each of the three countries are therefore:

– The establishment of clear goals for the (minimum) national population size of the Black-tailed Godwit that needs to be sustainably conserved (i.e. the population is considered to be a favourable conservation status).

– The establishment of a national species action plan that describes in which sites, by what measures, in what time frame and by whom the sustainable conservation of the Black-tailed Godwit at the agreed level of the national population size will be achieved. Inclusion of a rigorous monitoring and evaluation process in the national action plan is essential.

During their first meeting (15-16 October 2012 in Abcoude, the Netherlands), the AEWA Black-tailed Godwit International Working Group, including representatives of the national governments of the three countries, therefore recommended that these issues should be addressed with high priority and before the end of the year 2013.

Acknowledgements

Thanks are due to Harm Dotinga for his help with parts of this report and to Diedert Spijkerboer for data collection. This project was funded by the Dutch Ministry of Economy Affairs (project BO-10-001-161).

References

Beintema, A.J. and G.J.D.M. Müskens, 1987. Nesting success of birds breeding in Dutch agricultural grasslands Journal of Applied Ecology 24: 743-758.

Belting, S. and H. Belting, 1999. Zur Nahrungsökologie von Kiebitz- (Vanellus vanellus) und Uferschnepfen- *(Limosa limosa)* Küken im wiedervernässten Niedermoor-Grünland am Dümmer. Vogelkundliche Berichte aus Niedersachsen 31: 11-25.

Belting, H., F. Körner, U. Marxmeier and C. Möller, 1997. Wiesenvogelschutz am Dümmer und die Entwicklung der Brutbestände sowie der Bruterfolg von wiesenbrütenden Limikolen. Vogelkundliche Berichte aus Niedersachsen 29: 37-50.

Berg, A., 1992. Factors affecting nest-site choice and reproductive success of Curlews *Numenius arquata* on farmland. Ibis, 134, 44-51.

Blankers, P. and D. Kleijn, 2011. Weidevogels natuurlijk: nieuwe inzichten in het Nederlandse weidevogelbeheer. In: Gewapende vrede - Beschouwingen over plant-dierrelaties in de natuur (Eds. J. Schaminee, J. Jansen and E. Weeda), pp.130-149. KNNV Uitgeverij, Zeist.European Community, 2007. Management plan for Black-tailed Godwit *(Limosa limosa)* 2007-2009 (http://ec.europa.eu) [in Dutch].

Danckaert, S., K. Carels, D. van Gijseghem and M. Hens, 2009. Indicatoren voor het opvolgen van de hoge natuurwaarden op landbouwgrond in het kader van de PDPO-monitoring. Een verkennende analyse, Beleidsdomein Landbouw en Visserij, afdeling Monitoring en Studie, Brussel [in Dutch].

De Bruyn, L. and D. Paelinckx, 2007. Soorten van de Habitatrichtlijn. In: Dumortier, M., De Bruyn, L., Hens, M., Peymen, J., Schneiders, A., Van Daele, T. & Van Reeth, W. (red.) 2007. Natuurrapport 2007. Toestand van de natuur in Vlaanderen: cijfers voor het beleid. Mededelingen van het Instituut voor Natuur- en Bosonderzoek nr. 4, Brussel. pp. 38-55.

Gill, J.A., R.H.W. Langston, J.A. Alves, JP.W. Atkinson, P. Bocher, N. Cidraes Vieira, N.J. Crockford, G. Gélinaud, N. Groen, T.G. Gunnarsson, B. Hayhow, J. Hooijmeijer, R. Kentie, D. Kleijn, P.M. Lourenço, J.A. Masero, F. Meunier, P.M. Potts, M. Roodbergen, H. Schekkerman, J. Schröder, E. Wymenga and T. Piersma, 2007. Contrasting trends in two Black-tailed Godwit populations: a review of causes and recommendations. Wader Study Group Bulletin, 114, 43-50.

Goedhart, P.W., W.A. Teunissen and H. Schekkerman, 2010. Effect van nestbezoek en onderzoek op weidevogels. Sovon-onderzoeksrapport 2010/01. SOVON Vogelonderzoek Nederland, Nijmegen.

Groen, N.M., 1993. Breeding site tenacity and natal philopatry in the Black-tailed Godwit *Limosa l. limosa*. Ardea 81: 107-113.

Holm, T.E. and K. Laursen, 2009. Experimental disturbance by walkers affects behaviour and territory density of nesting Black-tailed Godwit *Limosa limosa*. Ibis: 151, 77-87.

Hötker, H., H. Jeromin and J. Melter, 2007: Development of populations of meadow waders breeding in Germany - results of a new monitoring approach for scarce bird species. Vogelwelt 128: 49-65.

Ikemeyer, D. and B. Krüger, 1999. Bestandsmonitoring bei 'Wiesenvögeln' in Feuchtwiesenschutz-gebieten. LÖBFMitteilungen 3: 42-46.

Jacobs J., 1974. Quantitative measurement of food selection. A modification of the forage ratio and Ivlev's electivity index. Oecologia 14: 413-417.

Jensen, F.P., A. Béchet and E. Wymenga (Compilers), 2008. International Single Species Action Plan for the Conservation of Black-tailed Godwit *Limosa l. limosa* & *L. l. islandica*. AEWA Technical Series No. 37. Bonn, Germany.

Jonkers, D.A., 2011. Resultaten van weidevogelinventarisaties in delen van de Noordpolder te Veld, Maatpolder (Eemnes), De Kampen (Blaricum) en object De Slaag (Hoogland) in 2011. Vogelwerkgroep het Gooi en Omstreken, Hilversum [in Dutch].

Kentie, R., J.C.E.W. Hooijmeijer, C. Both and T. Piersma, 2011. Grutto's in ruimte en tijd 2007-2010. Rapport, Universiteit Groningen.

Kleijn, D., R.A. Baquero, Y. Clough, M. Díaz, J. De Esteban, F. Fernández, D. Gabriel, F. Herzog, A. Holzschuh, R. Jöhl, E. Knop, A. Kruess, E.J.P. Marshall, I. Steffan-Dewenter,T. Tscharntke, J. Verhulst, T.M. West and J.L. Yela, 2006. Mixed biodiversity benefits of agri-environment schemes in five European countries. Ecology Letters 9: 243-254.

Kleijn, D., F. Berendse, R. Smit and N. Gilissen, 2001. Agri-environment schemes do not effectively protect biodiversity in Dutch agricultural landscapes. Nature 413: 723-725.

Kleijn, D., W.J. Dimmers, R.J.M. van Kats and T.C.P. Melman, 2009a. Het belang van hoog waterpeil en bemesting voor de Grutto: I. de vestigingsfase. De Levende Natuur 110: 180-183 [in Dutch with English summary].

Kleijn, D., W.J. Dimmers, R.J.M. van Kats and T.C.P. Melman, 2009b. Het belang van hoog waterpeil en bemesting voor de Grutto: II. de kuikenfase. De Levende Natuur 110: 184-187 [in Dutch with English summary].

Kleijn, D., L. Lamers, R. van Kats, J. Roelofs and R. van 't Veer, 2009c. Ecologische randvoorwaarden voor weidevogelsoorten in het broedseizoen - Resultaten van een pilotstudie in het Wormer- en Jisperveld. Rapport DK nr. 2009/dk103, Ministerie van LNV - Directie Kennis, Ede/Alterra rapport 1613, Alterra, Wageningen [in Dutch].

Kleijn, D., D. Lammertsma and G. Müskens, 2011b. Het belang van waterpeil en bemesting voor de voedselbeschikbaarheid van weidevogels. pp. 41-60. In: Teunissen, W.A. & Wymenga, E. (Eds.) 2011. Factoren die van invloed zijn op de ontwikkeling van weidevogelpopulaties. Belangrijke factoren tijdens de trek, de invloed van waterpeil op voedselbeschikbaarheid en graslandstructuur op kuikenoverleving. SOVON onderzoeksrapport 2011/10. SOVON Vogelonderzoek Nederland, Nijmegen. A&W-rapport 1532. Bureau Altenburg & Wymenga, Veenwouden. Alterra-rapport 2187, Alterra, Wageningen [in Dutch].

Kleijn, D., H. Schekkerman, W.J. Dimmers, R.J.M. van Kats, T.C.P. Melman and W.A. Teunissen, 2010. Adverse effects of agricultural intensification and climate change on breeding habitat quality of Black-tailed Godwits *Limosa l. limosa* in the Netherlands. Ibis 152: 475-486.

LNV - Ministerie van Landbouw, Natuurbeheer en Voedselkwaliteit. 2006. Natura 2000 doelendocument. Ministerie van Landbouw, Natuur en Voedselkwaliteit, Den Haag.

Melman, T.C.P, A.G.M. Schotman S. Hunink and G.R. de Snoo, 2008. Evaluation of meadow bird management, especially Black-tailed Godwit *(Limosa limosa L.)*, in the Netherlands. Journal for Nature Conservation 16: 88-95.

Michels, C., 2007. Landesweite Erfolgskontrollen des Vertragsnaturschutzes Ergebnisse aus über 15-jährigen Untersuchungen in Nordrhein-Westfalen. Naturschutz-Mitteilungen 1/07: 29-35.

Natuurindicatoren, 2012. Internationaal beleid: Oppervlakte Natura 2000. Instituut voor Natuur- en Bosonderzoek, Brussel. www.natuurindicatoren.be (versie van 11-05-2012).

Kuiper, M. and R. Klein, 2005. Afstemming Instrumenten Weidevogelbeheer/Opschaling Mozaïekbeheer De Ronde Hoep 2005. Natuurbeleven/Natuurlijk Platteland West, Unpublished report [in Dutch].

Natuurbeleven, 2007. Ronde Hoep - Rapportage Nederland Weidevogelrijk 2007. Unpublished report [in Dutch].

Natuurbeleven ,2008. Ronde Hoep - Rapportage Nederland Weidevogelrijk 2008. Unpublished report [in Dutch].

Natuurbeleven 2009. Ronde Hoep - Rapportage Nederland Weidevogelrijk 2009. Unpublished report [in Dutch].

Nipkow, M., 2010. Vogelschutz in Deutschland - Das NABU-Grundsatzprogramm Vogelschutz. NABU-Bundesverband, Berlin. URL: http://www.nabu-daun.de/download/nabu_88.pdf (accessed 2-10-2012).

Schekkerman, H. and A.J. Beintema, 2007. Abundance of invertebrates and foraging success of Black-tailed Godwit *Limosa limosa* chicks in relation to agricultural grassland management. Ardea 95: 39-54.

Schekkerman, H. and A. Boele, 2009. Foraging in precocial chicks of the Black-tailed Godwit *Limosa limosa:* vulnerability to weather and prey size Journal of Avian Biology 40: 369-379.

Schekkerman, H. and G. Müskens, 2000. Do Black-tailed Godwits *Limosa limosa* produce sufficient young to sustain populations in agricultural grasslands? Limosa 73: 121-134 [in Dutch with English summary].

Schekkerman, H., W. Teunissen and E. Oosterveld, 2008. The effect of 'Mosaic management' on the demography of Black-tailed Godwit *Limosa limosa* on farmland. Journal of Applied Ecology 45: 1067-1075.

Schekkerman, H., W. Teunissen and E. Oosterveld, 2009. Mortality of shorebird chicks in lowland wet grasslands: interactions between predation and agricultural practice. Journal of Ornithology 150: 133-145.

Schlüter, R., M. Kaiser, C. Michels, A. Neitzke, U. Thiele and J. Weiss, 2008. Bedeutung des Vertragsnaturschutzes für die Biologische Vielfalt in NRW. Natur in NRW 2: 34-38.

Sudfeldt, C., R. Dröschmeister, M. Flade, C. Grüneberg, A. Mitschke, J. Schwarz and J. Wahl (2009): Vögel in Deutschland - 2009. DDA, BfN, LAG VSW, Münster [in German].

Teunissen W.A., H. Schekkerman and F. Willems, 2005. Predatie bij weidevogels. Op zoek naar de mogelijke effecten van predatie op de weidevogelstand. Sovon-onderzoeksrapport 2005/11, Sovon Vogelonderzoek Nederland, Beek-Ubbergen [in Dutch].

Thompson, P.S., D. Baines, J.C. Coulson and G. Longrigg, 1994. Age at first breeding, philopatry and breeding site-fidelity in the Lapwing Vanellus vanellus. Ibis 136: 474-484.

Van Dorp, A. 2009. Westwouderpolder - monitoring rapport. Staatsbosbeheer Directie West.

Van Egmond, P. and T. De Koeijer, 2006. Weidevogelbeheer bij agrariers en terreinbeheerders. De Levende Natuur 107: 118-120 [in Dutch with English summary].

Van Impe, J., 2011. Weidevogels te Antwerpen-Linkeroever, 1977-2010. Trends van broedvogelaantallen en evaluatie van nestsucces en voortplantingssucces 'op afstand'. Ongepubliceerd rapport. URL: http://www.doel2020.org/Afbeeldingen/447_WEIDEVOGELS_TE_ANTWERPEN_LO.pdf [in Dutch].

Van Paassen, A. and W. Teunissen, 2010. Weidevogelbalans 2010.Landschapsbeheer Nederland, Utrecht/SOVON Vogelonderzoek Nederland, Beek-Ubbergen.

Van Reeth, W., C. Wils, A. Schneiders and L. De Bruyn, 2007. Habitatrichtlijn. In: Dumortier, M, L. de Bruyn, M. Hens, J. Peymen, A. Schneiders, T. van Daele en W. van Reeth (red.), 2007. Natuurrapport 2007. Toestand van de natuur in Vlaanderen: cijfers voor het beleid. Mededelingen van het Instituut voor Natuur- en Bosonderzoek nr. 4, Brussel. pp. 169-184.

VBN 2009. Natura 2000 en weidevogels. Vogelbescherming Nederland, Zeist.

Verhulst, J., 2007. Meadow bird ecology at different spatial scales. PhD Thesis, Wageningen University, Wageningen.

Vermeersch, G., A. Anselin, K. Devos, M. Herremans, J. Stevens, J. Gabriëls and B. and der Krieken, 2004. Atlas van de Vlaamse broedvogels : 2000-2002. Mededeling van het Instituut voor Natuurbehoud, 23. Instituut voor Natuurbehoud: Brussel. 496 pp.

Vermeersch, G., K. Devos and A. Anselin, 2006. Weidevogels in Vlaanderen. De Levende Natuur 107: 75-80 [in Dutch with English summary].

Weiss, J., C. Michels, M. Jöbges and M. Kettrup, 1999. Zum Erfolg im Feuchtwiesenschutzprogramm NRW - das Beispiel Wiesenvögel. LÖBF-Mitteilungen 3: 14-26.

Wille, V., A. Barkow, J. Linke and N. Feige, 2011. Langfristige Entwicklung des Brutbestandes de Uferschnepfe *Limosa limosa* am Unteren Niederrhein. Charadrius 47: 122-140.

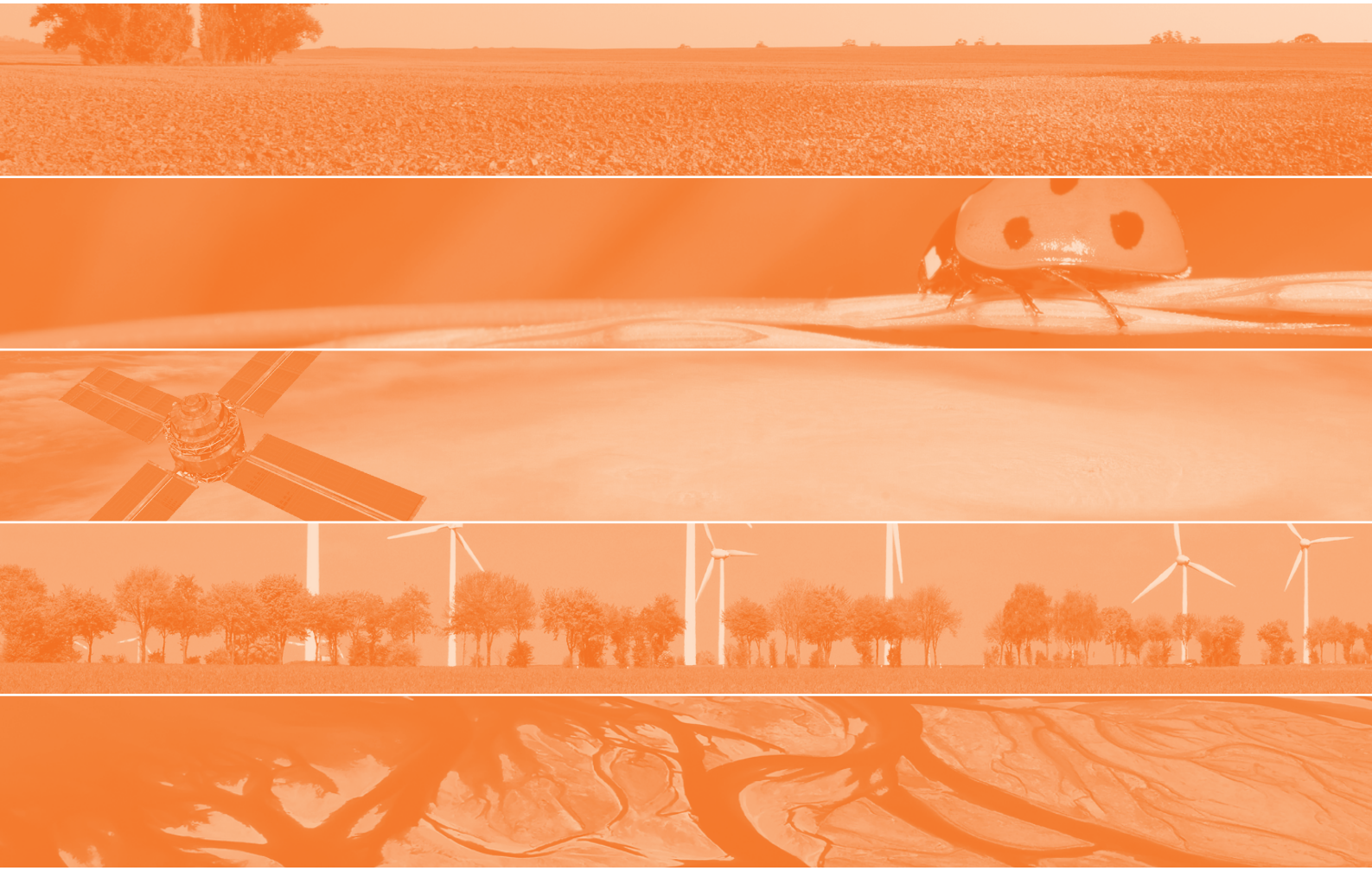
Appendix 1 Black-tailed Godwits in Natura 2000 sites

An overview of the number of Black-tailed Godwits listed in Natura 2000 as favourable reference values for number of breeding pairs or number of wintering or staging birds.
Source: http://eunis.eea.europa.eu/

Site code	Country	Site name	Breeding (pairs)	Winter (ind)	Staging (ind)
BE2100323	Belgium	De Kalmthouse Heide			900
BE2101437	Belgium	De Maatjes, Wuustwezelheide en Groot Schietveld			200
BE2301235	Belgium	Durme en Middenloop van de Schelde			150
BE2301336	Belgium	Schorren en Polders van de Beneden-Schelde			1400
BE2500831	Belgium	IJzervallei			3300
BE2501033	Belgium	Het Zwin			40
DE1119401	Germany	Gotteskoog-Gebiet	3		
DE1326301	Germany	NSG Schwansener See	1		
DE2021401	Germany	NSG Kudensee	50		
DE2121401	Germany	Unterelbe	716		2503
DE2210401	Germany	Niedersächsisches Wattenmeer und angrenzendes Küstenmeer	460		2200
DE2213401	Germany	Wangerland	2		100
DE2508401	Germany	Krummhörn	75		273
DE2509401	Germany	Ostfriesische Meere	113		40
DE2524401	Germany	Moore bei Buxtehude	2		
DE2526402	Germany	Untere Seeve- und Untere Luhe-Ilmenau-Niederung	3		2
DE2609401	Germany	Emsmarsch von Leer bis Emden	101-250		859
DE2611401	Germany	Fehntjer Tief	114		
DE2617401	Germany	Unterweser	35		3
DE2709401	Germany	Rheiderland	320		1063
DE2719401	Germany	Hammeniederung	58		42
DE2816401	Germany	Hunteniederung	19		180
DE2818401	Germany	Blockland	11-50		101-250
DE2819402	Germany	Borgfelder Wümmewiesen	6-10		
DE2820402	Germany	Wümmewiesen bei Fischerhude	28		
DE2832401	Germany	Niedersächsische Mittelelbe	8		29
DE2909401	Germany	Emstal von Lathen bis Papenburg	30		295
DE2911401	Germany	Esterweger Dose	64		
DE2918401	Germany	Niedervieland	6-10		
DE2935301	Germany	Aland-Elbe-Niederung nördlich Seehausen	1-5		6-10
DE2935401	Germany	Aland-Elbe-Niederung	1-5		11-50
DE2948401	Germany	Schorfheide-Chorin			<2
DE2951401	Germany	Unteres Odertal	<1		<30
DE3036301	Germany	Elbaue Beuster-Wahrenberg	1-5		6-10
DE3036401	Germany	Unteres Elbtal			<2
DE3138302	Germany	Havel nördlich Havelberg	1-5		

Site code	Country	Site name	Breeding (pairs)	Winter (ind)	Staging (ind)
DE3239301	Germany	Untere Havel und Schollener See	6-10		51-100
DE3239401	Germany	Untere Havel/Sachsen-Anhalt und Schollener See	6-10		51-100
DE3334301	Germany	Secantsgraben, Milde und Biese	1-5		
DE3334401	Germany	Milde-Niederung/Altmark	6-10		11-50
DE3339402	Germany	Niederung der Unteren Havel	<25		<120
DE3341401	Germany	U. Rhinluch/Dreetzer See, Havell. Luch und Belziger Landschaftsw.	<8		<20
DE3408401	Germany	Dalum-Wietmarscher Moor und Georgsdorfer Moor	9		
DE3415401	Germany	Dümmer	124		219
DE3418401	Germany	Diepholzer Moorniederung	31		
DE3437302	Germany	Elbaue zwischen Derben und Schönhausen	1-5		51-100
DE3437401	Germany	Elbaue Jerichow	1-5		51-100
DE3521401	Germany	Steinhuder Meer	3		8
DE3530401	Germany	Barnbruch	3		
DE3612301	Germany	Mettinger und Recker Moor	5		
DE3612401	Germany	Vogelschutzgebiet 'Düsterdieker Niederung'	6-10		
DE3637301	Germany	Elbaue bei Bertingen	1-5		
DE3642401	Germany	Rietzer See	<1		<2
DE3709301	Germany	Harskamp	1-5		
DE3806301	Germany	Lüntener Fischteich u. Ammeloer Venn	1-5		
DE3807301	Germany	Amtsvenn u. Hündfelder Moor	11-50		
DE3807401	Germany	Vogelschutzgebiet 'Moore und Heiden des westlichen Münsterlandes'	11-50		>100
DE3808301	Germany	Eper-Graeser Venn/ Lasterfeld	1-5		
DE3810301	Germany	Emsdettener Venn und Wiesen am Max-Clemens-Kanal	11-50		
DE3906301	Germany	Zwillbrocker Venn u. Ellewicker Feld	11-50		
DE3911401	Germany	Vogelschutzgebiet 'Rieselfelder Münster'			101-250
DE4102302	Germany	NSG Salmorth, nur Teilfläche	1-5		
DE4103301	Germany	Dornicksche Ward	1-5		
DE4103302	Germany	NSG Emmericher Ward	1-5		
DE4104301	Germany	NSG Hetter-Millinger Bruch, mit Erweiterung	~30		
DE4104302	Germany	NSG Bienener Altrhein, Millinger u. Hurler Meer u. NSG Empeler M.	1-5		
DE4108301	Germany	Schwarzes Venn	1-5		
DE4108401	Germany	VSG 'Heubachniederung, Lavesumer Bruch und Borkenberge'	6-10		
DE4116401	Germany	Vogelschutzgebiet 'Rietberger Emsnied. mit Steinhorster Becken'	11-50		
DE4139401	Germany	Mittlere Elbe einschließlich Steckby-Lödderitzer Forst			11-50
DE4140304	Germany	Dessau-Wörlitzer Elbauen			11-50
DE4142301	Germany	Elbaue zwischen Griebo und Prettin	1-5		11-50
DE4142401	Germany	Mündungsgebiet der Schwarzen Elster	1-5		11-50
DE4143301	Germany	Untere Schwarze Elster	1-5		6-10
DE4152302	Germany	Peitzer Teiche	pP		
DE4203401	Germany	Vogelschutzgebiet 'Unterer Niederrhein'	51-100		
DE4204301	Germany	NSG Reeser Schanz			iP
DE4204302	Germany	NSG Lohwardt/Reckerfeld, Hübsche Grändort, nur Teilfl., mit Erw.	1-5		
DE4204306	Germany	NSG Gut Grindt u. NSG Rheinaue zw. Km 830,7 - 833,2, nur Teilfl.	1-5		
DE4225401	Germany	Leinetal bei Salzderhelden	1		

Site code	Country	Site name	Breeding (pairs)	Winter (ind)	Staging (ind)
DE4239302	Germany	Untere Muldeaue			6-10
DE4304302	Germany	NSG Rheinaue Bislich-Vahnum, nur Teilfläche			iP
DE4305301	Germany	NSG Bislicher Insel, nur Teilfläche	1-5		
DE4305303	Germany	NSG Rheinvorland bei Perrich			iP
DE4314301	Germany	Ahsewiesen			iP
DE4405303	Germany	NSG Rheinvorland im Orsoyer Rheinbogen, mit Erweiterung	1-5		
DE4406301	Germany	NSG Rheinaue Walsum	1-5		
DE4531401	Germany	Helmestausee Berga-Kelbra (Anteil Sachsen-Anhalt)			11-50
DE4531403	Germany	Kyffhäuser - Badraer Schweiz - Helmestausee			6
DE4724304	Germany	Lichtenauer Hochland	pP		
DE5021301	Germany	Leistwiesen bei Rommershausen	~1		
DE5314303	Germany	NSG Krombachtalsperre			<1
DE5412401	Germany	Westerwälder Seenplatte			1
DE5417301	Germany	Lahnaue zwischen Atzbach und Gießen			~3
DE5419301	Germany	Wetterniederung bei Lich			3
DE5511301	Germany	NSG Urmitzer Werth			<10
DE5511401	Germany	Engerser Feld			1
DE5519304	Germany	Horloffaue zwischen Hungen und Grund-Schwalheim			10
DE5707401	Germany	Jungferweiher			<5
DE5807401	Germany	NSG Sangweiher und Erweiterung			<1
DE5820302	Germany	Weideswiesen-Oberwald bei Erlensee	pP		
DE5905401	Germany	Orsfeld (Bitburger Gutland)			<10
DE5914303	Germany	Rheinniederung Mainz-Bingen	-	-	-
DE6013301	Germany	Rheinwiesen von Oestrich-Winkel und Geisenheim	pP		
DE6116301	Germany	Riedwiesen von Wächterstadt			iP
DE6315401	Germany	Klärteiche Offstein			<5
DE6316401	Germany	Lampertheimer Altrhein			<3
DE6716402	Germany	Berghausener und Lingenfelder Altrhein mit Insel Flotzgrün			<5
NL1000021	Netherlands	Krammer-Volkerak		25	840
NL2000007	Netherlands	Lepelaarsplassen		5	
NL2000011	Netherlands	Waal		13	670
NL2003020	Netherlands	Groote Wielen		670	
NL3009001	Netherlands	Alde Feanen			1100
NL3009002	Netherlands	Biesbosch		34	480
NL3009013	Netherlands	Ketelmeer en Vossemeer		20	400
NL4000056	Netherlands	Eilandspolder	-	-	-
NL9801001	Netherlands	Waddenzee			1100
NL9802012	Netherlands	Lauwersmeer		260	
NL9802018	Netherlands	Haringvliet		1	1600
L9802031	Netherlands	Zwarte Meer		700	
NL9802036	Netherlands	IJssel		270	4000
NL9802038	Netherlands	Neder-Rijn		19	560
NL9802047	Netherlands	Sneekermeer/Goëngarijpsterpoelen/Terkaplesterpoelen		110	970
NL9802048	Netherlands	Witte en Zwarte Brekken en Oudhof		940	
NL9802054	Netherlands	Oostvaardersplassen		90	
NL9802058	Netherlands	Wormer- en Jisperveld			1500
NL9803028	Netherlands	IJsselmeer		290	2200
NL9902003	Netherlands	Zwarte Water en Overijsselse Vecht		17	700
NL9902004	Netherlands	Gelderse Poort		4	450



Alterra is part of the international expertise organisation Wageningen UR (University & Research centre). Our mission is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine research institutes – both specialised and applied – have joined forces with Wageningen University and Van Hall Larenstein University of Applied Sciences to help answer the most important questions in the domain of healthy food and living environment. With approximately 40 locations (in the Netherlands, Brazil and China), 6,500 members of staff and 10,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the exact sciences and the technological and social disciplines are at the heart of the Wageningen Approach.

Alterra is the research institute for our green living environment. We offer a combination of practical and scientific research in a multitude of disciplines related to the green world around us and the sustainable use of our living environment, such as flora and fauna, soil, water, the environment, geo-information and remote sensing, landscape and spatial planning, man and society.

More information: www.wageningenUR.nl/en/alterra