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# Scientific analysis of the status of designated Natura 2000 areas and the protection of nitrogen-sensitive species and habitats

Dutch contribution

A.M. Schmidt and R.A. Smidt



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The designation of Natura 2000 sites in the Netherlands took longer than expected. At present, 159 of 160 identified sites have been designated as Natura 2000 sites, and their management plans are currently being developed. About 60% of the land area in the Netherlands is used for agriculture, which puts significant pressure on the Natura 2000 network, particularly in terms of nitrogen inputs. The Dutch Integrated Approach to Nitrogen (PAS) aims to meet conservation objectives while facilitating economic development around the Natura 2000 sites within strict environmental limits. Nitrogen-sensitive Natura 2000 sites (118 of the 160) were identified by the presence of the nitrogen-sensitive habitats of species or habitat types (Annex I of the Habitats Directive). The critical load of nitrogen input (combined NH<sub>4</sub> and NO<sub>x</sub>) was calculated for each area based on the abiotic nutrient requirements of these habitats. For the purpose of the PAS, a specific monitoring programme is being developed.

Keywords: Nitrogen regulation, Natura 2000, habitat types, nitrogen input, agriculture, conservation

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# Summary

The Natura 2000 network in the Netherlands consists of 160 protected sites. At present, 159 of these sites have been officially designated by the Dutch government; however, the designation process took longer than expected and the development of management plans for these Natura 2000 sites is still ongoing.

About 60% of the land area in the Netherlands is used for agriculture. The Natura 2000 network protects about 10% of the country's terrestrial areas, of which approximately 11% is agricultural land. A further 18% of the 1–2-km buffer zones surrounding the Natura 2000 sites comprises agricultural land, which puts significant pressure on the protected areas, particularly in terms of nitrogen input.

The Dutch Integrated Approach to Nitrogen (in Dutch: *Programma Aanpak Stikstof (PAS)*) is a national plan that combines measures to reduce the levels of nitrogen emission with ecological restoration measures in the Natura 2000 areas, leaving room for economic development. The aim of the PAS is to ensure that conservation objectives are achieved while facilitating further economic development around Natura 2000 areas, within strict environmental limits. In total, 118 of the 160 Natura 2000 areas have been identified as nitrogen-sensitive areas based on the presence of at least one nitrogen-sensitive habitat type (Annex I of the Habitats Directive) or the nitrogen-sensitive habitat for species. Measures have been identified to address both the sources of nitrogen deposition and restore the status (quality) of these nitrogen-sensitive areas.

The identification of habitats of nitrogen-sensitive species (not part of Annex I of the Habitats Directive) and habitat types (Annex I) is based on the abiotic requirements of these habitats. The combined critical loads of NH<sub>3</sub> and NO<sub>x</sub> were calculated for each region based on their nitrogen requirements. Nitrogen deposition in the Natura 2000 areas was calculated based on the nitrogen sources (different types of sources), meteorological conditions, surface roughness and land cover, utilizing a special tool, 'AERIUS' (see <https://www.aerius.nl/en>), developed for this purpose.

It is difficult to conclude the biological effects of the Natura 2000 management plans from monitoring data collected in the period 2004–2015, particularly in terms of determining how they may have led to the observed trends in, for example, the population sizes of species. During this period and over the last two years, standardised methods were developed to acquire the necessary data for the quantitative and qualitative assessment of these habitats.

A monitoring programme is being developed for the purposes of the PAS, which consists of:

1. Monitoring the presence, size and quality of nitrogen-sensitive habitat types.
2. Monitoring the habitats of nitrogen-sensitive species.
3. Monitoring using 'field visits'; spot checks of relevant aspects of all Natura 2000 areas within the PAS framework.
4. Monitoring the progress of restoration measures.
5. Monitoring process indicators; the systematic monitoring of the effects of restoration measures.





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# 1 Introduction

## 1.1 Background

The Department of Food and Economics (IFRO) at the University of Copenhagen asked Wageningen Environmental Research (WENR) to participate in a scientific analysis of the status of designated Natura 2000 areas and the protection of nitrogen-sensitive species and habitats.

## 1.2 Objectives

The objectives of this research were to provide insights into the Nature 2000 designation process, the state of the protected ecosystems, and the efforts being made to protect nitrogen-sensitive habitats (specifically for measures to reduce ammonia emissions from livestock) by different EU member states (in this case the Netherlands). Research questions were posed on these two topics by IFRO.

## 1.3 Approach

Geographic information system (GIS) analyses were performed and existing policy documents, scientific reports and articles were consulted to answer the research questions posed by IFRO.

## 1.4 Overview

In chapter 2, the research questions regarding the Nature 2000 designation process in the Netherlands are addressed. In chapter 3, the state of the protected ecosystems and the efforts being made to improve them in the Netherlands are described.

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## 2 The national designation of Natura 2000 areas

### 2.1 Special Areas of Conservation (land and sea), their sizes, and the number of habitat types they contain

The Netherlands has designated 137 Special Areas of Conservation (SACs) and 77 Special Protection Areas (SPAs; Table 1). One Site of Community Importance (SCI), 'Krammerak-Volkerak', has not yet been assigned. Due to large overlap of the SACs and SPAs, they comprise a total of 160 Natura 2000 areas (Appendix 1), including 20 sites in which the borders of the SACs and SPAs precisely overlap (site type C in the Standard Data Form; Table 1).

**Table 1** The number of Special Protection Areas (SPAs), Sites of Community Importance (SCIs) and/or Special Areas of Conservation (SACs) in the Netherlands (source: Standard Data Forms, version 10<sup>th</sup> October 2016).

Site Type	Protection status	Number of sites
A	SPA	57
B	SCI and/or SAC	118
C	Combined SPA and SAC	20

The SACs vary in size between 15 and 473,500 ha, with an average size of 11,052 ha; however, most Natura 2000 areas are relatively small (< 5000 ha; Appendix 2). The number of habitat types (Annex I) present at each site varies from 0 to 9 (Appendix 2).

### 2.2 Biogeographical distribution of Natura 2000 habitat types

There are two biogeographical regions in the Netherlands; the Atlantic region and the Marine Atlantic region. All marine habitat types (the 1100 series), which comprise a total of 1,128,285.6 ha within the Natura 2000 sites, are located in the Marine Atlantic region of the country. All terrestrial and aquatic (inland waters) habitat types are located in the Atlantic region, with a total of 110,113.91 ha contained within the Natura 2000 sites.

### 2.3 Percentage of land covered by Natura 2000 areas

A total of 10% of the land in the Netherlands is contained within Natura 2000 areas (345,457.3 ha). This percentage was calculated using a GIS analysis, in which the borders of the Natura 2000 network were overlaid onto the Land Use Database of the Netherlands. Only the coastal waters (sea), estuaries and closed sea inlets were excluded in this analysis (Figure 1); inland waters such as rivers and lakes were included.



**Figure 1** Land use in the Netherlands. Source: *The Land Use Database of the Netherlands: the land surface* (<http://www.wur.nl/en/Expertise-Services/Research-Institutes/Environmental-Research/Facilities-Products/Land-use-database-of-the-Netherlands.htm>).

## 2.4 Land area covered by SACs

SACs cover 8.2% (289,031.9 ha) of the total land area in the Netherlands.

## 2.5 Land area covered by SPAs

SPAs cover 7.5% (264,032.4 ha) of the total land area in the Netherlands, which is a little less than the area covered by the SACs (section 2.4).

## 2.6 Quantity of natural non-cultivated areas

Natural non-cultivated areas (forest and other natural areas) comprise 18% of the land surface in the Netherlands (Table 2), while most of the land surface in the country (60%) is used for agricultural purposes. This percentage was calculated using a GIS analysis of the agricultural land use classes listed in the Land Use Database of the Netherlands.

**Table 2** Land use in the Netherlands. Source: *The Land Use Database of the Netherlands: the land surface*.

Land cover category	Percentage of land
Agriculture	60%
Greenhouse cultivation	< 1%
Orchards	1%
Forest	10%
Inland waters	5%
Built-up area	14%
Infrastructure	2%
Nature	8%

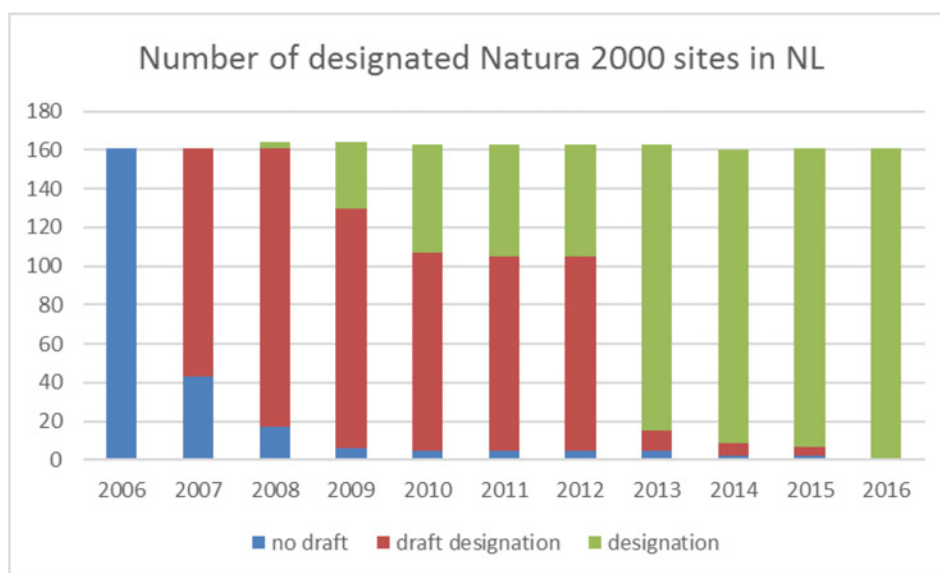
## 2.7 Annex I habitat types and Annex II species present in Natura 2000 designated sites

A total of 52 Annex I habitat types (Appendix 3) and 36 Annex II species (Appendix 4) were present in the designated Natura 2000 sites (SACs) in the Netherlands.

## 2.8 The Natura 2000 designation process

The Natura 2000 areas are designated by the Ministry for Economic Affairs, Agriculture and Innovation (previously the Ministry of Agriculture, Nature and Food Security). Before the Natura 2000 areas can be designated under the Dutch Nature Conservation Act, the draft designation decrees are deposited for public inspection under the Dutch General Administrative Law Act.

The EU Birds Directive came into force in 1980. Most of the SPAs were designated in 2000, following a 1989 European Court of Justice ruling that the Netherlands had not complied with their obligations to designate SPAs (described by Backes and Keessen, 2017). The EU Habitats Directive was enacted in 1994; however, the designation process of SACs was again delayed. In 2004, a list of SCIs was published, the vast majority of which (137 of 138) have now been designated as SACs. This designation process took about ten years (Figure 2).



**Figure 2** The designation process of Natura 2000 areas between 2006 and 2016. Before Natura 2000 areas are designated, draft designation decrees must be deposited for public inspection.

## 2.9 The involvement of NGOs in the designation process

Non-governmental organisations (NGOs) have been strongly involved in the Natura 2000 designation process, specifically in identifying the area's most important for the conservation of species. The designation of the Natura 2000 areas is, to a large extent, based on the information and expertise provided by NGOs, nature conservation organisations, and research institutes.

The designation process of both the SPAs and the SACs took a long time (section 2.8). Several changes have been made to the boundaries of the Natura 2000 areas, as well to the conservation objectives for these regions. The latter are often based on improved information and knowledge of the Natura 2000

areas, in terms of the occurrence of species and habitat types. Further changes were made to the conservation objectives following the redefinition of habitat types during the designation process.

## 2.10 Areas of intensive agricultural production within the Natura 2000 sites

A GIS analysis using an overlay of the borders of the Natura 2000 network onto the Land Use Database of the Netherlands (see Figure 1) indicated that 11% of the land surface within the Natura 2000 network is used for agricultural purposes (Table 3). Permanent grasslands were included as agricultural areas for this analysis, as they are often managed intensively (e.g. fertilised and frequently mown).

**Table 3** Land use in the Netherlands and the Natura 2000 network. Source: The Land Use Database of the Netherlands: the land surface.

Land cover category	Percentage of land in the Netherlands	Percentage of land covered by the Natura 2000 network
Agriculture	60%	11%
Greenhouse cultivation	< 1%	< 1%
Orchards	1%	0%
Forest	10%	32%
Inland waters	5%	12%
Built-up area	14%	1%
Infrastructure	2%	0%
Nature	8%	43%

A GIS analysis using the Land Parcel Identification System (in Dutch: *Basisregistratie Percelen* (BRP)) and the Geographic Information System for Agricultural Holdings (in Dutch: *Geografisch Informatiesysteem Agrarische Bedrijven* (GIAB)) demonstrated that 16% of the total land surface area of the Natura 2000 network is under intensive agricultural production (higher than the 11% estimate derived from the analysis using the Land Use Database). Again, the permanent grasslands were included in this analysis; however, if they were excluded, only 8% of the Natura 2000 network was considered to be under intensive agricultural production. The causes of the differences between the estimates generated using the Land Use Database and the BRP and GIAB have not been studied, but are likely related to differences in the definitions of land use categories and the information upon which the databases are built. The percentage of each Natura 2000 site (SACs and SPAs) under intensive agricultural production is listed in Appendix 5.

## 2.11 Intensive agricultural production within buffer zones surrounding the Natura 2000 sites

The total areas of land under intensive agricultural production in buffer zones of 100, 1000 or 2000 metres around the Natura 2000 sites were calculated using a GIS analysis of BRP and GIAB data (Table 4).

**Table 4** Intensive agricultural production (including and excluding permanent grasslands) in buffer zones of 100, 1000 or 2000 metres surrounding the Natura 2000 sites.

Buffer zone	Area (ha)	Including permanent grasslands	Excluding permanent grasslands
100 m	91,071	32%	16%
1000 m	700,439	18%	17%
2000 m	1,313,281	18%	17%

## 2.12 Arable, pastoral, or mixed agriculture within buffer zones surrounding the Natura 2000 sites

The number of hectares dedicated to arable, pastoral or mixed agriculture within 1000- or 2000-m buffer zones surrounding the Natura 2000 sites, calculated using a GIS analysis of BRP and GIAB data (Table 5).

**Table 5** The number of hectares dedicated to arable, pastoral, or mixed agriculture in the 1000- or 2000-m buffer zones surrounding the Natura 2000 sites.

Buffer zone	Unknown	Arable	Pastoral	Mixed	Total
1000 m	96,818 ha	63,054 ha	117,140 ha	11,171 ha	288,182 ha
2000 m	182,995 ha	121,416 ha	217,641 ha	19,877 ha	541,930 ha

# 3 The state of the Natura 2000 areas and efforts to improve them

## 3.1 Monitoring and assessment of the state of the Natura 2000 areas

Several national and regional monitoring programmes provide data and information on the status and trends of species and/or habitats in the Netherlands, and their organisation is quite complex.

### 3.1.1 Monitoring species and habitats at the national, regional and/or site level

Fundamental differences exist between the approaches used to monitor species and habitats in the Netherlands (Table 6). Whereas species monitoring is, to a large extent, executed by volunteers and experts from NGOs, habitat monitoring is mainly performed by experts from nature conservation organisations or private companies.

**Table 6** Differences between species and habitat monitoring approaches in the Netherlands.

	Species	Habitats
<b>Managing authority and funders</b>	National government, regional authorities and, to some extent, nature conservation organisations	Regional authorities, nature conservation organisations and, to some extent, national governments
<b>Executor (data collector)</b>	NGOs, volunteers and, to a lesser extent, scientific institutes	Nature conservation organisations, private companies and, to a lesser extent, scientific institutes
<b>Quality control</b>	The application of field protocols, validation by the Central Bureau of Statistics	The application of field protocols
<b>General approach / organisation</b>	National perspective (top down): from national scale to site scale	Site perspective (bottom up): from site scale to national scale
<b>Monitoring strategies</b>	National sampling schemes (statistically robust)	Sequential mapping of sites
<b>Type of observations</b>	Occurrence (presence or absence) of species, counting indicators of species (individuals, nests, eggs, etc.)	Vegetation (structure) mapping and species mapping

Species monitoring is organised from a national perspective (a top-down approach), partly because NGOs are organised at a national scale for each species group. The monitoring objectives and protocols are decided upon by national and regional governments in collaboration with the NGOs, within the context of the Network for Ecological Monitoring (in Dutch: *Netwerk Ecologische Monitoring* (NEM), see <http://www.netwerkecologischemonitoring.nl/>).

Habitat monitoring (in terms of vegetation, species composition and abiotic factors) is organised from a site perspective (a bottom-up approach), partly because nature conservation organisations are responsible for the management of a selection of sites (not necessarily Natura 2000 sites) distributed throughout the Netherlands. Most nature conservation organisations receive subsidies from the Dutch government to manage ecosystems (in Dutch: *Subsidiestelsel Natuur en Landschapsbeheer* (SNL), and within this context, agreements on monitoring objectives and protocols are made between the regional governments and the nature conservation organisations.

The techniques used for species and habitat monitoring are also different. Species are largely monitored with national sampling schemes, whereas habitat monitoring is based on the sequential mapping of the managed areas (organised at the site level). The Central Bureau of Statistics (CBS)

plays an important role in species monitoring by validating the collected data and its statistical analysis; however, the role of the CBS in validating habitat monitoring has been limited.

### 3.1.2 Monitoring for the purpose of the Natura 2000 management plans

Regional authorities and the national government (the Ministry of Economic Affairs, the ministry of Infrastructure and Environment and the Ministry of Defence) are responsible for the monitoring and assessment of the state of species and habitats in the Natura 2000 sites, as well as the development of management plans for each location. The monitoring and assessment protocols for the Natura 2000 sites are still being developed. Agreements have been made between the regional authorities and the nature conservation organisations regarding the data to be collected for the purpose of Natura 2000, as well as for the management of ecosystems in general (not only for Natura 2000 purposes). These approaches were developed for use in the monitoring and assessment of 'nature quality' (in Dutch: *natuurkwaliteit*); however, they also concern the monitoring and assessment of 'ecosystem quality' by addressing ecosystem characteristics such as species composition (flora and fauna), structure and function.

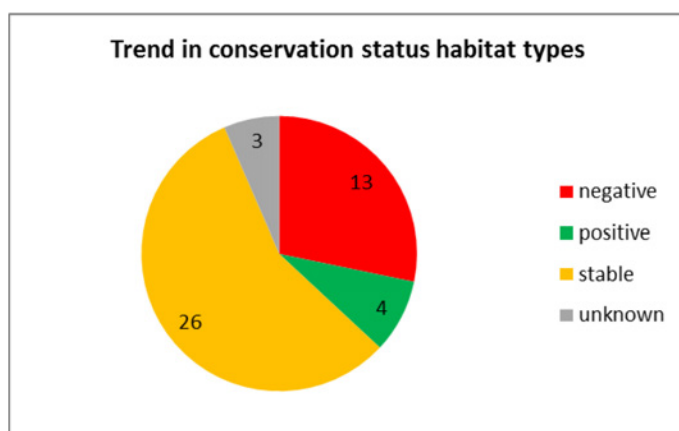
### 3.1.3 Monitoring for the purpose of the Dutch Integrated Approach to Nitrogen (PAS)

A specific monitoring programme is being developed for use in the PAS, which consists of:

1. Monitoring the presence, size and quality of nitrogen-sensitive habitat types.
2. Monitoring the habitats of nitrogen-sensitive species.
3. Monitoring using 'field visits'; spot checks of relevant aspects of all Natura 2000 areas within the PAS framework.
4. Monitoring the progress of restoration measures.
5. Monitoring process indicators; the systematic monitoring of the effects of restoration measures.

## 3.2 Trends in the conservation status of terrestrial habitat types

The overall trends in the conservation status of the terrestrial habitat types in the Netherlands (46 in total) are presented in Figure 3. Standardised methods for monitoring and assessing the structure and function of these habitat types are under development, which means there is currently a lack of quality data for these factors. This makes it difficult to provide scientific evidence of changes in the conservation status of the habitat types.

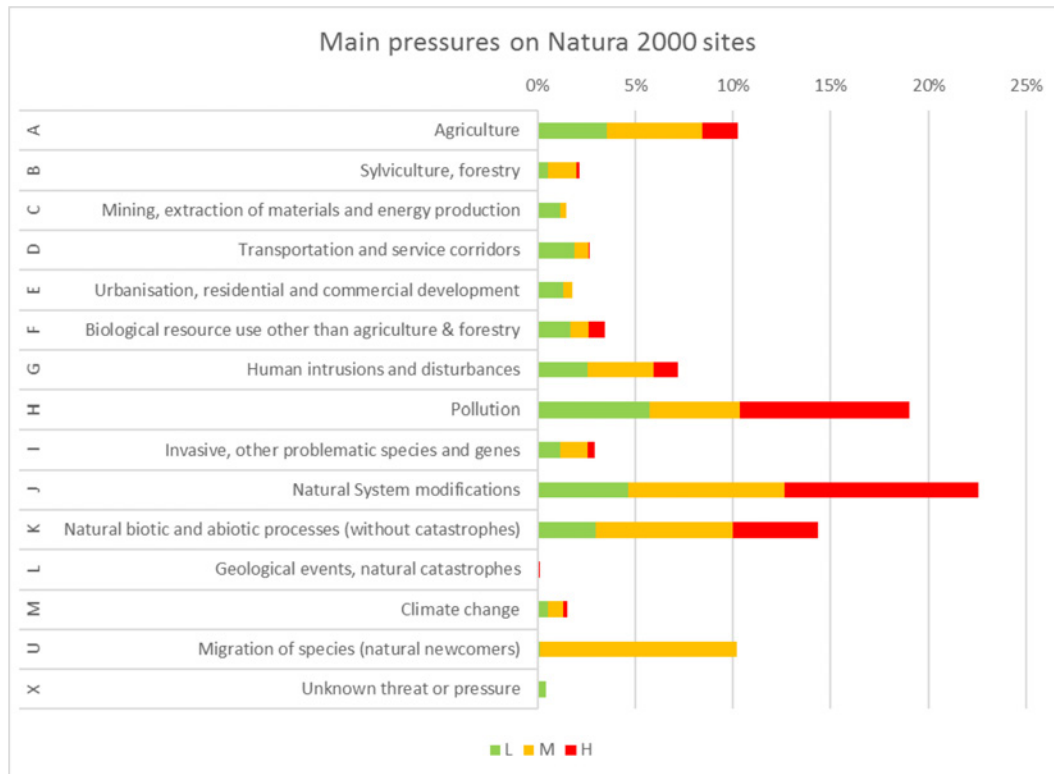


**Figure 3** Trends in the conservation status of terrestrial habitat types for Natura 2000 sites in the Netherlands. Source: Report for Article 17 of the Habitats Directive (period 2007–2012).



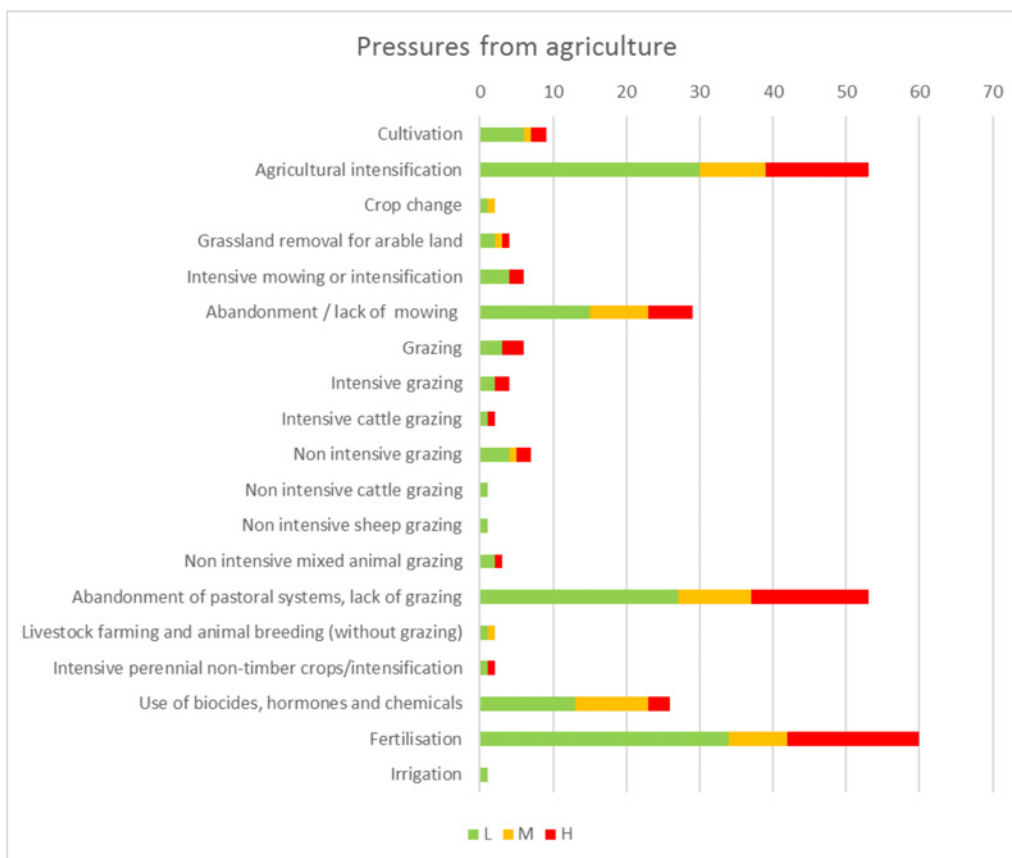
### 3.3 Pressures giving rise to the changes in (terrestrial) habitat types

Based on the information provided in the Standard Data Forms, it can be concluded that main pressures on Natura 2000 sites are agriculture, pollution, natural system modifications and abiotic and biotic processes (Figure 4).



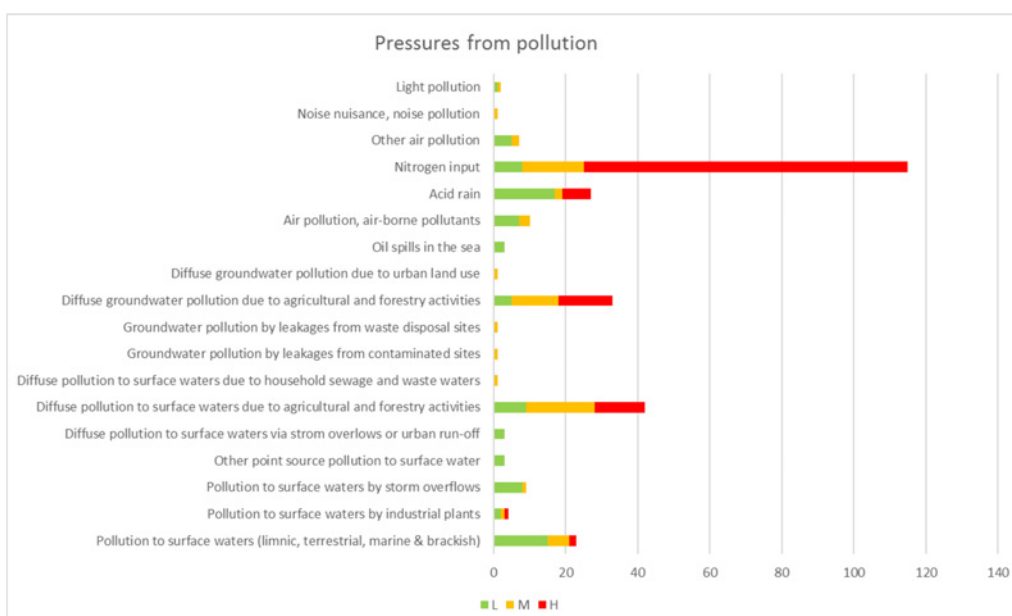
**Figure 4** Main pressures on the Natura 2000 sites in the Netherlands, with low (L), medium (M) and high (H) impacts (source: Standard Data Forms, version 10th October 2016). The percentages were calculated based on the relative number of sites with pressures belonging to a certain category (agriculture, forestry etc.).

By examining the agricultural pressures in more detail, the main issues are found to be agricultural intensification, the lack of properly performed land management measures (e.g. grazing, mowing etc.), and the use of biocides, hormones, chemicals and fertilisers (Figure 5).



**Figure 5** Pressure from agriculture on the Natura 2000 sites in the Netherlands. Number of sites under pressure from each subcategory (source: Standard Data Forms, version 10th October 2016). L, low impact; M, medium impact; H, high impact.

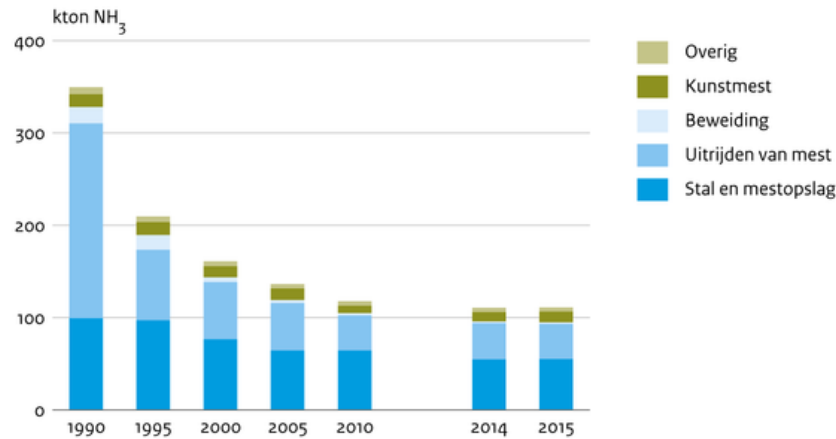
Nitrogen input, acid rain, ground water and surface water pollution are the most commonly occurring pressures under the main category 'Pollution' (Figure 6). Nitrogen input is mainly caused by the deposition of nitrogen-based fertilisers during agricultural activities.



**Figure 6** Pressures from the pollution of the Natura 2000 sites in the Netherlands. Number of sites under pressure for each subcategory (source: Standard Data Forms, version 10th October 2016). L, low impact; M, medium impact; H, high impact.

The Netherlands Environmental Assessment Agency (in Dutch: *Planbureau voor de Leefomgeving* (PBL)) concluded that ammonia emissions from agriculture and horticulture declined by 65% between 1990 and 2015 (Figure 7). The emissions were not measured directly, but were calculated based on available information about the number of animals, nitrogen excretion, emission factors and so on. The sources of ammonia emissions (fertilisers, pastoralism, storage of manure etc.) were distinguished from one another in this analysis. The National Emission Model for Agriculture (Vonk et al., 2016) was used for these calculations.

### Emissie ammoniak (NH<sub>3</sub>) door land- en tuinbouw



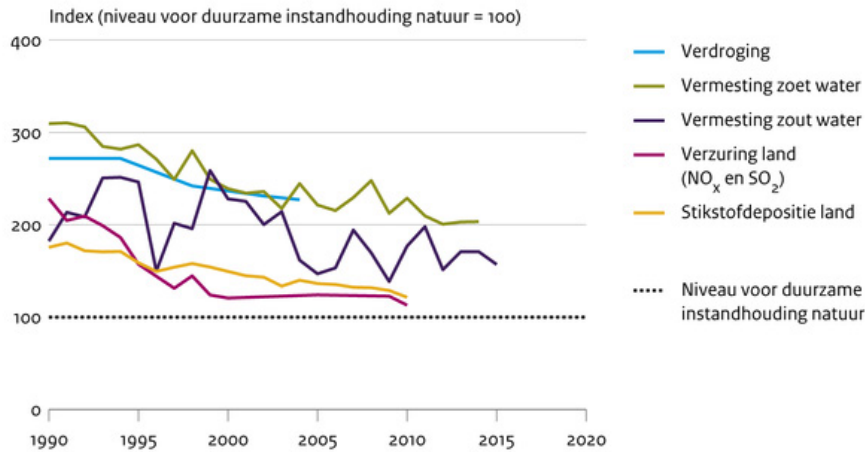
Bron: Emissieregistratie

PBL/jul17  
www.clo.nl/nl010114

**Figure 7** Ammonia emissions from agriculture and horticulture between 1990 and 2015. Source: [www.clo.nl](http://www.clo.nl). overig: other; kunstmest: chemical fertilizer; beweiding: grazing; uitrijden mest: manure treatment; stal en mestopslag: stable and manure storage.

Although the pressures on the state of the Natura 2000 sites are decreasing (Figure 8), the level of nitrogen deposition in many of the natural areas in the Netherlands is still exceeding the threshold critical load (see Figure 9).

## Milieudruk op water en natuurgebieden

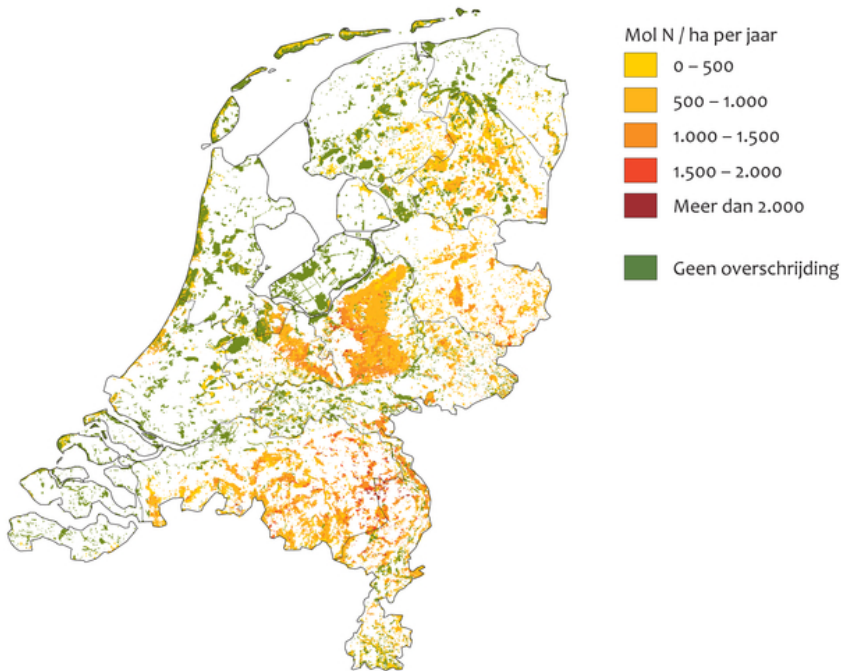


Bron: PBL

PBL/aug16  
www.clo.nl/nh152205

**Figure 8** Pressures of nitrogen pollution on aquatic systems and terrestrial habitats. *verdroging*: desiccation; *vermesting*: over-fertilisation; *verzuring*: acidification; *stikstofdepositie*: nitrogen deposition; *zoet water*: freshwater; *zout water*: saltwater. The dotted line (Index = 100) reflects the maximum level for a favourable conservation status. Source: [www.clo.nl](http://www.clo.nl).

## Overschrijding kritische stikstofdepositie op natuur, 2009



Bron: PBL, GCN.

PBL/apr10/1423  
www.compendiumvoordeleefomgeving.nl

**Figure 9** Natural areas in the Netherlands where the critical nitrogen deposition levels are either exceeded (yellow to red) or not exceeded (green). Source: [www.clo.nl](http://www.clo.nl).

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## 3.4 Monitoring and assessment methods for the identification of actions/measures to be included in Natura 2000 management plans

### 3.4.1 Identification of measures for the Natura 2000 management plans

The Ministry of Economic Affairs produced a guidance document and checklist for the national and regional authorities responsible for the Natura 2000 management plans (12 provinces and 3 ministries). The management plans should include a description of the main characteristics of the Natura 2000 area, an elaboration of the conservation objectives at the site level, and a description of the measures that are required to reach these objectives. There are specific sections on the measures needed to solve the pressures related to nitrogen (in Dutch: *stikstofparagraaf*) and water (in Dutch: *waterparagraaf*). The pressures related to nitrogen are addressed by the PAS (see next section). The pressures related to water are, to some extent, addressed within the context of the Water Framework Directive. Other types of nature conservation measures are addressed within the context of the SNL (see section 3.1). The Natura 2000 management plans therefore often refer to these programmes/instruments.

### 3.4.2 Identification of measures for the PAS

The PAS aims to reduce nitrogen deposition and restore nitrogen-sensitive habitats, while allowing economic development around Natura 2000 areas. The PAS began on 1<sup>st</sup> July 2015, and will run for a period of six years (until 2021). Two additional six-year programmes will run until 2033. In total, 118 of the 160 Natura 2000 areas have been identified as 'nitrogen-sensitive areas' (in Dutch: *PAS-gebieden*; see Appendix 2), based on the presence of at least one nitrogen-sensitive habitat type (Annex I) or the presence of the a nitrogen-sensitive habitat for species. Measures have been identified that address the causes of nitrogen deposition (sources) and restore the status (quality) of nitrogen-sensitive habitats. The identified restoration measures have been documented in three separate reports (Janssen et al., 2014; Smits & Bal, 2014a, 2014b), and were identified for each site and habitat based on an ecological assessment.

## 3.5 Nitrogen / ammonia sensitivity assessment

Different systems are used to identify nitrogen-sensitive habitats and species (as well critical loads) in the Netherlands, namely:

- the nature target types (in Dutch: *natuurdoeltypen*),
- the nature management types (in Dutch: *natuurbeheertypen*),
- the habitat types listed in Annex I of the Habitats Directive.

The nature target types were developed immediately after the establishment of the national ecological network in 1990 for the purpose of setting conservation objectives at a national and regional scale (Bal et al., 2001). This typology has been used for all types of assessments, including the PBL's estimation of the critical loads of nitrogen for habitats in the Netherlands (Figure 9). In around 2009, the nature target types were replaced by nature management types, also known as the 'Index Nature and Landscape' (see <https://www.bij12.nl/onderwerpen/natuur-en-landschap/index-natuur-en-landschap/de-index-natuur-en-landschap/>). The subsidies for nature conservation measures are based on this typology (e.g. the calculation of management costs per ha). The nature management types are used by (subsidised) nature conservation organisations to set conservation objectives at the site level. The PBL will update the calculations presented in Figure 9 based on this new typology. For the purposes of Natura 2000, such as the Natura 2000 management plans, the habitat types (Annex I) are used.

Nitrogen-sensitive habitat types were identified within the context of the PAS (see paragraph 3.4), including the habitats of nitrogen-sensitive species (not part of Annex I of the Habitats Directive). The

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latter are based on the original nature target types. The identification of nitrogen-sensitive habitats is based on the abiotic nutrient requirements of the habitat. The threshold critical loads of nitrogen are then calculated based on these requirements, as described by Dobben et al. (2012).

In the Netherlands, the critical load (of a combination of NH<sub>y</sub> and NO<sub>x</sub>) is used. Critical load calculations are based on a combination of model predictions and empirical data, which is the same approach used for all nature classification systems (see Dobben et al., 2012). The critical loads are calculated based on the assumption that the habitat types are under a regular management regime (e.g. mowing or grazing regime).

The Netherlands regulates nitrogen critical loads; if the nitrogen deposition on a Natura 2000 site is too high, restorative management approaches are often applied to lower (mitigate) the effect of this deposition, e.g. by mowing or sod cutting. These measures are often subsidised by the government, including within the context of the PAS (see paragraph 3.4). The further expansion of pollution sources is often blocked, or the polluting companies are required to compensate the damage; for example, by paying for additional restorative management, by creating new natural areas, or by investing in the protection of a species. For areas outside the Natura 2000 sites, the effects of nitrogen pollution are still mitigated by subsidised management, but the regulation of polluters is less strict.

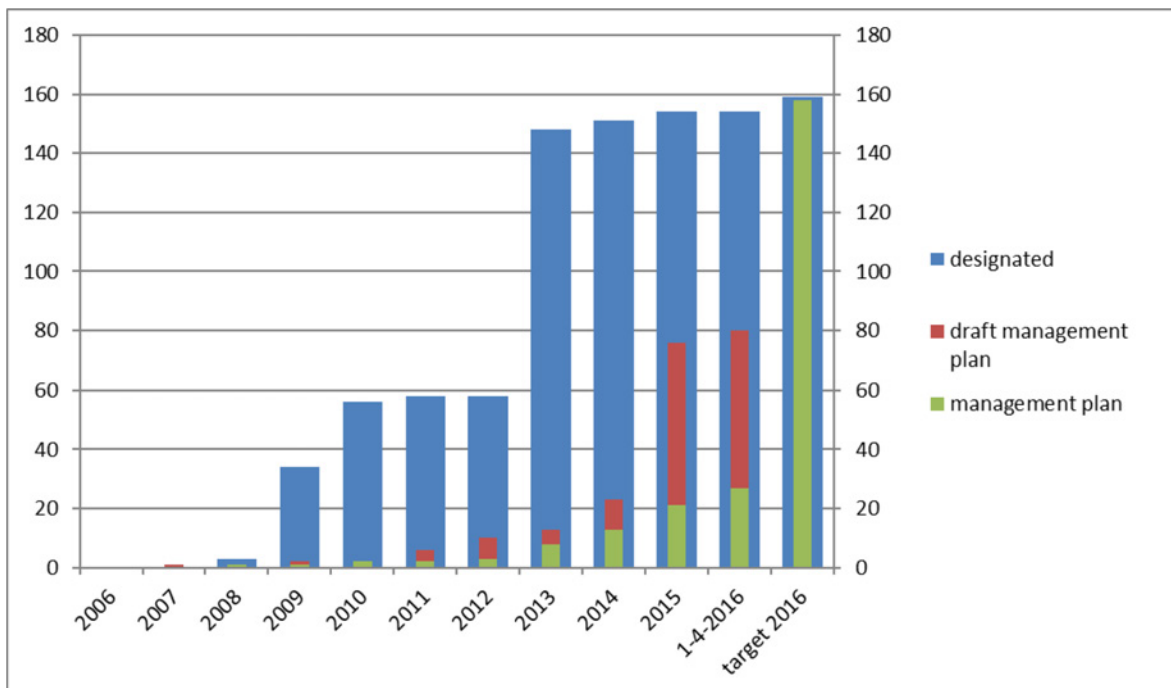
Nitrogen deposition in the Natura 2000 areas is calculated based on the different nitrogen sources, meteorological conditions, surface roughness and land cover. A specialised tool, 'AERIUS' (<https://www.aerius.nl/en>), was developed for this purpose. These calculations are performed on a site level, and are more accurate than the calculations of the PBL at a national scale (Figure 9).

### 3.6 Implementation of the national monitoring programmes

The national monitoring programmes were developed for different purposes at different times. The NEM programme began in 1999. The national monitoring of ecosystem quality, linked to the subsidies for nature conservation (SNL) and including the mapping and monitoring of the Natura 2000 habitat types, started in 2015.

### 3.7 Implementation of the Natura 2000 management plans

Dutch law states that management plans must be developed for Natura 2000 sites in the Netherlands within three years of their designation. Most SPAs were designated in 2000, with the first SACs being designated in 2007 (see section 2.8). Almost all proposed Natura 2000 areas were supposed to have been designated at this point (June 2017); however, the process of developing the management plans is still ongoing (Figure 10).



**Figure 10** Number of draft and final management plans for designated Natura 2000 areas from 2006 until 2016 (status as of July 2016). The number of management in 2017 are the expected amount (the target). This target has not been met.

### 3.8 Monitoring and assessing the (biological) effects of the Natura 2000 management plans (period 2004–2015)

It is difficult to determine the biological effects of the Natura 2000 management plans based on monitoring data collected during the period 2004–2015, particularly in terms of how the implementation of these plans may have led to the observed trends in, for example, the population size of species.

During this period and over the last two years, standardised methods have been developed to acquire the necessary data and assess the quantitative and qualitative aspects of these habitats. This process is still on going and the monitoring and assessments on site level are not fully operational yet.

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# Appendix 1 Natura 2000 areas in the Netherlands

Source: Standard Data Forms, version 10<sup>th</sup> October 2016

Code	Name	SAC	SPA
1	Waddenzee	yes	yes
2	Duinen en Lage Land Texel	yes	yes
3	Duinen Vlieland	yes	yes
4	Duinen Terschelling	yes	yes
5	Duinen Ameland	yes	yes
6	Duinen Schiermonnikoog	yes	yes
7	Noordzeekustzone	yes	yes
8	Lauwersmeer	no	yes
9	Groote Wielen	yes	yes
10	Oudegaasterbrekken, Fluessen en omgeving	yes	yes
11	Witte en Zwarte Brekken	no	yes
12	Sneekermeergebied	no	yes
13	Alde Feanen	yes	yes
14	Deelen	no	yes
15	Van Oordt's Mersken	yes	yes
16	Wijnjeterper Schar	yes	no
17	Bakkeveense Duinen	yes	no
18	Rottige Meenthe & Brandemeer	yes	no
19	Leekstermeergebied	no	yes
20	Zuidlaardermeergebied	no	yes
21	Lieftingsbroek	yes	no
22	Norgerholt	yes	no
23	Fochteloërveen	yes	yes
24	Witterveld	yes	no
25	Drentsche Aa-gebied	yes	no
26	Drouwenezand	yes	no
27	Drents-Friese Wold & Leggelderveld	yes	yes
28	Elperstroomgebied	yes	no
29	Holtingerveld	yes	no
30	Dwingelderveld	yes	yes
31	Mantingerbos	yes	no
32	Mantingerzand	yes	no
33	Bargerveen	yes	yes
34	Weerribben	yes	yes
35	De Wieden	yes	yes
36	Uiterwaarden Zwarte Water en Vecht	yes	yes
37	Olde Maten & Veerslootlanden	yes	no
38	Rijntakken	yes	yes
39	Vecht- en Beneden-Reggegebied	yes	no
40	Engbertsdijksvenen	yes	yes
41	Boetelerveld	yes	
42	Sallandse Heuvelrug	yes	yes
43	Wierdense Veld	yes	no
44	Borkeld	yes	no
45	Springendal & Dal van de Mosbeek	yes	no
46	Bergvennen & Brecklenkampse Veld	yes	no
47	Achter de Voort, Agelerbroek & Voltherbroek	yes	no
48	Lemselermaten	yes	no
49	Dinkelland	yes	no
50	Landgoederen Oldenzaal	yes	no
51	Lonnekermeer	yes	no

Code	Name	SAC	SPA
53	Buurserzand & Haaksbergerveen	yes	no
54	Witte Veen	yes	no
55	Aamsveen	yes	no
56	Arkemheen	no	yes
57	Veluwe	yes	yes
58	Landgoederen Brummen	yes	no
60	Stelkampsveld	yes	no
61	Korenburgerveen	yes	no
62	Willinks Weust	yes	no
63	Bekendelle	yes	no
64	Wooldse Veen	yes	no
65	Binnenveld	yes	no
69	De Bruuk	yes	no
70	Lingegebied & Diefdijk-Zuid	yes	no
71	Loevestein, Pompveld & Kornsche Boezem	yes	no
72	IJsselmeer	yes	yes
73	Markermeer & IJmeer	yes	yes
74	Zwarte Meer	yes	yes
75	Ketelmeer & Vossemeer	no	yes
76	Veluwerandmeren	yes	yes
77	Eemmeer & Gooimeer Zuidoever	no	yes
78	Oostvaardersplassen	no	yes
79	Lepelaarplassen	no	yes
81	Kolland & Overlangbroek	yes	no
82	Uiterwaarden Lek	yes	no
83	Botshol	yes	no
84	Duinen Den Helder - Callantsoog	yes	no
85	Zwanenwater & Pettemerduinen	yes	yes
86	Schoolse Duinen	yes	no
87	Noordhollands Duinreservaat	yes	no
88	Kennemerland-Zuid	yes	no
89	Eilandspolder	yes	yes
90	Wormer- en Jisperveld & Kalverpolder	yes	yes
91	Polder Westzaan	yes	no
92	Ilperveld, Varkensland, Oostzanerveld & Twiske	yes	yes
93	Polder Zeevang	no	yes
94	Naardermeer	yes	yes
95	Oostelijke Vechtplassen	yes	yes
96	Coepelduynen	yes	no
97	Meijendel & Berkheide	yes	no
98	Westduinpark & Wapendal	yes	no
99	Solleveld & Kapittelduinen	yes	no
100	Voornes Duin	yes	yes
101	Duinen Goeree & Kwade Hoek	yes	yes
102	De Wilck	no	yes
103	Nieuwkoopse Plassen & de Haeck	yes	yes
104	Broekvelden, Vettenbroek & Polder Stein	no	yes
105	Zouweboezem	yes	yes
106	Boezems Kinderdijk	no	yes
107	Donkse Laagten	no	yes
108	Oude Maas	yes	no
109	Haringvliet	yes	yes
110	Oudeland van Strijen	no	yes
111	Hollands Diep	yes	yes
112	Biesbosch	yes	yes
113	Voordelta	yes	yes
114	Krammer-Volkerak <sup>1</sup>	yes	yes
115	Grevelingen	yes	yes

Code	Name	SAC	SPA
116	Kop van Schouwen	yes	no
117	Manteling van Walcheren	yes	no
118	Oosterschelde	yes	yes
119	Veerse Meer	no	yes
120	Zoommeer	no	yes
121	Yerseke en Kapelse Moer	yes	yes
122	Westerschelde & Saeftinghe	yes	yes
123	Zwin & Kievittepolder	yes	yes
124	Groote Gat	yes	no
125	Canisvliet	yes	no
126	Vogelkreek	yes	no
127	Markiezaat	no	yes
128	Brabantse Wal	yes	yes
129	Ulvenhoutse Bos	yes	no
130	Langstraat	yes	no
131	Loonse en Drunense Duinen & Leemkuilen	yes	no
132	Vlijmens Ven, Moerputten & Bossche Broek	yes	no
133	Kampina & Oosterwijkse Vennen	yes	yes
134	Regte Heide & Riels Laag	yes	no
135	Kempenland-West	yes	no
136	Leenderbos, Groote Heide & De Plateaux	yes	yes
137	Strabrechtse Heide & Beuven	yes	yes
138	Weerter- en Budelerbergen & Ringselven	yes	yes
139	Deurnsche Peel & Mariapeel	yes	yes
140	Groote Peel	yes	yes
141	Oeffeltermoent	yes	no
142	Sint Jansberg	yes	no
143	Zeldersche Driessen	yes	no
144	Boschhuizerbergen	yes	no
145	Maasduinen	yes	yes
146	Sarsven en De Banen	yes	no
147	Leudal	yes	no
148	Swalmdal	yes	no
149	Meinweg	yes	yes
150	Roerdal	yes	no
151	Abdij Lilbosch & Voormalig Klooster Mariahoop	yes	no
152	Grensmaas	yes	no
153	Bunder- en Elsloërbos	yes	no
154	Geleenbeekdal	yes	no
155	Brunsummerheide	yes	no
156	Bemelerberg & Schiepersberg	yes	no
157	Geuldal	yes	no
158	Kunderberg	yes	no
159	Sint Pietersberg & Jekerdal	yes	no
160	Savelsbos	yes	no
161	Noorbeemden & Hoogbos	yes	no
162	Abtskolk & De Putten	no	yes
163	Vlakte van de Raan	yes	no
164	Doggersbank	yes	no
165	Klaverbank	yes	no
166	Friese Front	no	yes
	<b>total</b>	<b>138 yes</b>	<b>77 yes</b>

One SCI is not yet designated as a SAC

## Appendix 2 Nitrogen-sensitive Special Areas of Conservation in the Netherlands

Source: Standard Data Forms, version 10th October 2016 + PAS documents

PAS: 'Programma Aanpak Stikstof'. These Natura 2000 areas are considered nitrogen sensitive.

Code	Name	Area (ha)	Habitat types present (#)	Nitrogen-sensitive
1	Waddenzee	264858	11	yes
2	Duinen en Lage Land Texel	4083	13	yes
3	Duinen Vlieland	1484	10	yes
4	Duinen Terschelling	4040	14	yes
5	Duinen Ameland	2055	9	yes
6	Duinen Schiermonnikoog	833	9	yes
7	Noordzeekustzone	144475	6	no
9	Groote Wielen	604	0	no
10	Oudegaasterbrekken, Fluessen en omgeving	3054	2	no
13	Alde Feanen	2124	6	yes
15	Van Oordt's Mersken	536	3	yes
16	Wijnjeterper Schar	170	5	yes
17	Bakkeveense Duinen	258	5	yes
18	Rottige Meenthe & Brandemeer	1369	6	yes
21	Lieftinghsbroek	20	4	yes
22	Norgerholt	26	1	yes
23	Fochteloërveen	2596	5	yes
24	Witterveld	481	5	yes
25	Drentsche Aa-gebied	3902	19	yes
26	Drouwenezand	222	5	yes
27	Drents-Friese Wold & Leggelderveld	7466	14	yes
28	Elperstroomgebied	351	4	yes
29	Holtingerveld	1754	11	yes
30	Dwingelderveld	3768	14	yes
31	Mantingerbos	46	1	yes
32	Mantingerzand	780	10	yes
33	Bargerveen	2083	3	yes
34	Weerribben	3280	8	yes
35	De Wieden	7156	8	yes
36	Uiterwaarden Zwarte Water en Vecht	1080	6	yes
37	Olde Maten & Veerslootlanden	795	3	yes
38	Rijntakken	8364	8	yes
39	Vecht- en Beneden-Reggegebied	4105	16	yes
40	Engbertsdijksvenen	998	3	yes
41	Boetelerveld	171	6	yes
42	Sallandse Heuvelrug	2217	6	yes
43	Wierdense Veld	419	4	yes
44	Borkeld	493	7	yes
45	Springendal & Dal van de Mosbeek	1225	10	yes
46	Bergvennen & Brecklenkampse Veld	133	11	yes
47	Achter de Voort, Agelerbroek & Voltherbroek	323	4	yes
48	Lemselermaten	55	6	yes
49	Dinkelland	532	16	yes
50	Landgoederen Oldenzaal	578	3	yes
51	Lonnekermeer	105	7	yes
53	Buurserzand & Haaksbergerveen	1243	10	yes

Code	Name	Area (ha)	Habitat types present (#)	Nitrogen-sensitive
54	Witte Veen	290	6	yes
55	Aamsveen	144	10	yes
57	Veluwe	88378	18	yes
58	Landgoederen Brummen	677	7	yes
60	Stelkampsveld	102	8	yes
61	Korenburgerveen	459	9	yes
62	Willinks Weust	52	5	yes
63	Bekendelle	88	3	yes
64	Wooldse Veen	63	3	yes
65	Binnenveld	111	2	yes
69	De Bruuk	99	1	yes
70	Lingegebied & Diefdijk-Zuid	750	3	yes
71	Loevestein, Pompeveld & Kornsche Boezem	750	5	yes
72	IJsselmeer	2441	3	no
73	Markermeer & IJmeer	1109	1	no
74	Zwarte Meer	2162	3	no
76	Veluwerandmeren	6166	2	no
81	Kolland & Overlangbroek	107	1	yes
82	Uiterwaarden Lek	148	4	yes
83	Botshol	218	6	yes
84	Duinen Den Helder - Callantsoog	645	8	yes
85	Zwanenwater & Petteerderduinen	770	11	yes
86	Schoorlse Duinen	1737	10	yes
87	Noordhollands Duinreservaat	5242	10	yes
88	Kennemerland-Zuid	8171	8	yes
89	Eilandspolder	798	2	yes
90	Wormer- en Jisperveld & Kalverpolder	1453	4	yes
91	Polder Westzaan	1057	4	yes
92	Ilperveld, Varkensland, Oostzanerveld & Twiske	1910	5	yes
94	Naardermeer	1151	6	yes
95	Oostelijke Vechtplassen	4401	8	yes
96	Coepelduynen	188	4	yes
97	Meijndel & Berkheide	2878	5	yes
98	Westduinpark & Wapendal	246	5	yes
99	Solleveld & Kapittelduinen	827	6	yes
100	Voornes Duin	1432	6	yes
101	Duinen Goeree & Kwade Hoek	1624	10	yes
103	Nieuwkoopse Plassen & de Haack	2008	8	yes
105	Zouweboezem	257	3	yes
108	Oude Maas	474	3	no
109	Haringvliet	10988	3	no
111	Hollands Diep	591	3	no
112	Biesbosch	9640	6	yes
113	Voordelta	83534	6	
114	Krammer-Volkerak <sup>1</sup>	6081	3	yes
115	Grevelingen	13753	7	yes
116	Kop van Schouwen	2242	9	yes
117	Manteling van Walcheren	735	5	yes
118	Oosterschelde	36976	5	yes
121	Yerseke en Kapelse Moer	433	2	no
122	Westerschelde & Saeftinghe	44052	9	yes
123	Zwin & Kievittepolder	121	7	yes
124	Groote Gat	70	2	no
125	Canisvliet	141	0	no
126	Vogelkreek	97	0	no
128	Brabantse Wal	1775	6	yes
129	Ulvenhoutse Bos	112	3	yes
130	Langstraat	506	4	yes

Code	Name	Area (ha)	Habitat types present (#)	Nitrogen-sensitive
131	Loonse en Drunense Duinen & Leemkuilen	3975	7	yes
132	Vlijmens Ven, Moerputten & Bossche Broek	897	5	yes
133	Kampina & Oisterwijkse Vennen	2278	13	yes
134	Regte Heide & Riels Laag	538	7	yes
135	Kempenland-West	1882	9	yes
136	Leenderbos, Grootte Heide & De Plateaux	4390	16	yes
137	Strabrechtse Heide & Beuven	1843	8	yes
138	Weerter- en Budelerbergen & Ringselven	1139	3	yes
139	Deurnsche Peel & Mariapeel	2734	3	yes
140	Groote Peel	1348	2	yes
141	Oeffeltermoent	101	2	yes
142	Sint Jansberg	226	3	yes
143	Zeldersche Driessen	82	4	yes
144	Boschhuizerbergen	277	4	yes
145	Maasduinen	5274	11	yes
146	Sarsven en De Banen	154	3	yes
147	Leudal	340	3	yes
148	Swalmdal	123	3	yes
149	Meinweg	1822	8	yes
150	Roerdal	834	4	yes
151	Abdij Lilbosch & Voormalig Klooster Mariahoop	15	0	no
152	Grensmaas	314	4	no
153	Bunder- en Elsoërbos	190	4	yes
154	Geleenbeekdal	253	4	yes
155	Brunsummerheide	542	8	yes
156	Bemelerberg & Schiepersberg	191	5	yes
157	Geuldal	2593	13	yes
158	Kunderberg	95	2	yes
159	Sint Pietersberg & Jekerdal	256	5	yes
160	Savelsbos	357	5	yes
161	Noorbeemden & Hoogbos	55	3	yes
163	Vlakte van de Raan	17521	1	no
164	Doggersbank	473500	1	no
165	Klaverbank	153900	1	
<b>Total</b>		<b>1520179</b>	<b>817</b>	<b>118 yes</b>

One SCI is not yet designated as a SAC

# Appendix 3 Annex I of the Habitats Directive: Habitat types

Source: Standard Data Forms, version 10th October 2016

habitat code	habitat name	area (ha)	nr. of Natura 2000 areas
1110	Sandbanks which are slightly covered by sea water all the time	838171	6
1130	Estuaries	43664	2
1140	Mudflats and sandflats not covered by seawater at low tide	134817	6
1160	Large shallow inlets and bays	34700	1
1170	Reefs	76934	1
1310	Salicornia and other annuals colonizing mud and sand	2250	13
1320	Spartina swards ( <i>Spartinion maritimae</i> )	787	7
1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	10239	14
2110	Embryonic shifting dunes	579	11
2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes')	1903	21
2130	Fixed coastal dunes with herbaceous vegetation ('grey dunes')	15660	21
2140	Decalcified fixed dunes with <i>Empetrum nigrum</i>	2409	8
2150	Atlantic decalcified fixed dunes ( <i>Calluno-Ulicetea</i> )	379	11
2160	Dunes with <i>Hippophaë rhamnoides</i>	6411	21
2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> ( <i>Salicion arenariae</i> )	835	13
2180	Wooded dunes of the Atlantic, Continental and Boreal region	7123	16
2190	Humid dune slacks	2538	21
2310	Dry sand heaths with <i>Calluna</i> and <i>Genista</i>	2233	20
2320	Dry sand heaths with <i>Calluna</i> and <i>Empetrum nigrum</i>	579	10
2330	Inland dunes with open <i>Corynephorus</i> and <i>Agrostis</i> grasslands	3169	17
3110	Oligotrophic waters containing very few minerals of sandy plains ( <i>Littorelletalia uniflorae</i> )	24	5
3130	Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	316	26
3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	5685	13
3150	Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> — type vegetation	1612	17
3160	Natural dystrophic lakes and ponds	459	21
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	100	13
3270	Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p. vegetation	175	8
4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>	1946	46
4030	European dry heaths	16286	34
5130	<i>Juniperus communis</i> formations on heaths or calcareous grasslands	389	15
6110	Rupicolous calcareous or basophilic grasslands of the <i>Alyso-Sedion albi</i>	0	4
6120	Xeric sand calcareous grasslands	178	12
6130	Calaminarian grasslands of the <i>Violetalia calaminariae</i>	1	1
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites)	52	5
6230	Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	492	35
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils ( <i>Molinion caeruleae</i> )	231	42
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	1364	32
6510	Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )	555	13
7110	Active raised bogs	102	23
7120	Degraded raised bogs still capable of natural regeneration	5922	13
7140	Transition mires and quaking bogs	1360	24
7150	Depressions on peat substrates of the <i>Rhynchosporion</i>	204	26

habitat code	habitat name	area (ha)	nr. of Natura 2000 areas
7210	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	92	15
7220	Petrifying springs with tufa formation ( <i>Cratoneurion</i> )	2	3
7230	Alkaline fens	8	11
9110	Luzulo-Fagetum beech forests	492	1
9120	Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer ( <i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i> )	6969	20
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	826	17
9190	Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains	2301	10
91D0	Bog woodland	551	25
91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> )	4271	41
91F0	Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers ( <i>Ulmenion minoris</i> )	57	3



# Appendix 4 Species of Annex II of the Habitat Directive

Source: Standard Data Forms, version 10th October 2016

Species code	Species name	Code	Natura 2000 areas (#)
1014	<i>Vertigo angustior</i>	1014	12
1016	<i>Vertigo moulinsiana</i>	1016	12
1037	<i>Ophiogomphus cecilia</i>	1037	1
1042	<i>Leucorrhinia pectoralis</i>	1042	9
1060	<i>Lycaena dispar</i>	1060	3
1082	<i>Graphoderus bilineatus</i>	1082	7
1083	<i>Lucanus cervus</i>	1083	7
1095	<i>Petromyzon marinus</i>	1095	10
1096	<i>Lampetra planeri</i>	1096	6
1099	<i>Lampetra fluviatilis</i>	1099	12
1102	<i>Alosa alosa</i>	1102	5
1103	<i>Alosa fallax</i>	1103	8
1106	<i>Salmo salar</i>	1106	5
1145	<i>Misgurnus fossilis</i>	1145	17
1149	<i>Cobitis taenia</i>	1149	31
1163	<i>Cottus gobio</i>	1163	23
1166	<i>Triturus cristatus</i>	1166	34
1193	<i>Bombina variegata</i>	1193	2
1318	<i>Myotis dasycneme</i>	1318	26
1321	<i>Myotis emarginatus</i>	1321	5
1324	<i>Myotis myotis</i>	1324	4
1337	<i>Castor fiber</i>	1337	9
1340	<i>Microtus oeconomus arenicola</i>	1340	20
1351	<i>Phocoena phocoena</i>	1351	4
1364	<i>Halichoerus grypus</i>	1364	6
1365	<i>Phoca vitulina</i>	1365	8
1387	<i>Orthotrichum rogeri</i>	1387	1
1614	<i>Apium repens</i>	1614	3
1831	<i>Luronium natans</i>	1831	16
1903	<i>Liparis loeselii</i>	1903	17
4056	<i>Anisus vorticulus</i>	4056	8
5339	<i>Rhodeus amarus</i>	5339	23
6177	<i>Phengaris teleius</i>	6177	1
6179	<i>Phengaris nausithous</i>	6179	2
6199	<i>Euplagia quadripunctaria</i>	6199	4
6216	<i>Hamatocaulis vernicosus</i>	6216	2

# Appendix 5 Percentage of Natura 2000 areas subjected to intensive agriculture

The percentage of each Natura 2000 area comprising 'intensive agricultural production' (including or excluding permanent grasslands), based on the combined analysis of data from the Land Parcel Identification System (in Dutch: *Basisregistratie Percelen*, BRP) and the Geographic Information System for Agricultural Holdings (in Dutch: *Geografisch Informatiesysteem Agrarische Bedrijven*, GIAB).

Code	Name	SAC	SPA	PAS	Land area (ha)	Intensive agricultural production (including permanent grasslands)	Intensive agricultural production (excluding permanent grasslands)
1	Waddenzee	yes	yes	yes	12378	22%	13%
2	Duinen en Lage Land Texel	yes	yes	yes	4083	9%	4%
3	Duinen Vlieland	yes	yes	yes	1482	0%	0%
4	Duinen Terschelling	yes	yes	yes	4023	2%	0%
5	Duinen Ameland	yes	yes	yes	2055	5%	2%
6	Duinen Schiermonnikoog	yes	yes	yes	833	3%	3%
7	Noordzeekustzone	yes	yes	no			
8	Lauwersmeer	no	yes	no	5755	9%	6%
9	Groote Wielen	yes	yes	no	604	55%	32%
10	Oudegaasterbrekken, Fluessen en omgeving	yes	yes	no	3054	14%	7%
11	Witte en Zwarte Brekken	no	yes	no	433	24%	3%
12	Sneekermeergebied	no	yes	no	2279	34%	23%
13	Alde Feanen	yes	yes	yes	2124	25%	15%
14	Deelen	no	yes	no	514	14%	9%
15	Van Oordt's Mersken	yes	yes	yes	842	60%	33%
16	Wijnjeterper Schar	yes	no	yes	170	7%	5%
17	Bakkeveense Duinen	yes	no	yes	258	10%	10%
18	Rottige Meenthe & Brandemeer	yes	no	yes	1369	12%	5%
19	Leekstermeergebied	no	yes	no	1543	28%	10%
20	Zuidlaardermeergebied	no	yes	no	2087	19%	9%
21	Lieftingsbroek	yes	no	yes	20	10%	10%
22	Norgerholt	yes	no	yes	26	0%	0%
23	Fochteloërveen	yes	yes	yes	2596	1%	0%
24	Witterveld	yes	no	yes	481	5%	2%
25	Drentsche Aa-gebied	yes	no	yes	3902	42%	30%
26	Drouwenezand	yes	no	yes	222	1%	0%
27	Drents-Friese Wold & Leggelderveld	yes	yes	yes	7466	11%	7%
28	Elperstroomgebied	yes	no	yes	351	18%	11%
29	Holtingerveld	yes	no	yes	1754	15%	4%
30	Dwingelderveld	yes	yes	yes	3768	7%	6%
31	Mantingerbos	yes	no	yes	46	53%	42%
32	Mantingerzand	yes	no	yes	780	13%	9%
33	Bargerveen	yes	yes	yes	2083	8%	5%
34	Weerribben	yes	yes	yes	3329	7%	1%
35	De Wieden	yes	yes	yes	9018	28%	11%
36	Uiterwaarden Zwarte Water en Vecht	yes	yes	yes	1441	59%	18%

Code	Name	SAC	SPA	PAS	Land area (ha)	Intensive agricultural production (including permanent grasslands)	Intensive agricultural production (excluding permanent grasslands)
37	Olde Maten & Veerslootlanden	yes	no	yes	795	64%	40%
38	Rijntakken	yes	yes	yes	23002	53%	18%
39	Vecht- en Beneden-Reggegebied	yes	no	yes	4105	18%	9%
40	Engbertsdijksvenen	yes	yes	yes	998	10%	9%
41	Boetelerveld	yes	no	yes	171	3%	3%
42	Sallandse Heuvelrug	yes	yes	yes	2217	7%	5%
43	Wierdense Veld	yes	no	yes	419	4%	4%
44	Borkeld	yes	no	yes	493	4%	4%
45	Springendal & Dal van de Mosbeek	yes	no	yes	1225	29%	18%
46	Bergvennen & Brecklenkampse Veld	yes	no	yes	133	22%	13%
47	Achter de Voort, Agelerbroek & Voltherbroek	yes	no	yes	323	17%	9%
48	Lemselermaten	yes	no	yes	55	26%	9%
49	Dinkelland	yes	no	yes	532	37%	8%
50	Landgoederen Oldenzaal	yes	no	yes	578	33%	8%
51	Lonnekermeer	yes	no	yes	105	13%	2%
53	Buurserzand & Haaksbergerveen	yes	no	yes	1243	16%	9%
54	Witte Veen	yes	no	yes	290	32%	32%
55	Aamsveen	yes	no	yes	144	18%	18%
56	Arkemheen	no	yes	no	1422	87%	6%
57	Veluwe	yes	yes	yes	88436	2%	1%
58	Landgoederen Brummen	yes	no	yes	677	39%	25%
60	Stelkampsveld	yes	no	yes	102	28%	17%
61	Korenburgerveen	yes	no	yes	459	21%	18%
62	Willinks Weust	yes	no	yes	52	20%	19%
63	Bekendelle	yes	no	yes	88	4%	1%
64	Wooldse Veen	yes	no	yes	63	7%	7%
65	Binnenveld	yes	no	yes	111	39%	18%
69	De Bruuk	yes	no	yes	99	0%	0%
70	Lingegebied & Diefdijk-Zuid	yes	no	yes	750	19%	14%
71	Loevestein, Pompveld & Kornsche Boezem	yes	no	yes	750	22%	11%
72	IJsselmeer	yes	yes	no	1495	12%	9%
73	Markermeer & IJmeer	yes	yes	no	358	1%	1%
74	Zwarte Meer	yes	yes	no	355	22%	15%
75	Ketelmeer & Vossemeer	no	yes	no	257	13%	3%
76	Veluwerandmeren	yes	yes	no	275	1%	0%
77	Eemmeer & Gooimeer Zuidoever	no	yes	no	246	35%	21%
78	Oostvaardersplassen	no	yes	no	5477	0%	0%
79	Lepelaarplassen	no	yes	no			
81	Kolland & Overlangbroek	yes	no	yes	107	18%	0%
82	Uiterwaarden Lek	yes	no	yes	148	49%	31%
83	Botshol	yes	no	yes	218	0%	0%
84	Duinen Den Helder - Callantsoog	yes	no	yes	645	3%	2%
85	Zwanenwater & Pettemerduinen	yes	yes	yes	770	1%	1%
86	Schoorlse Duinen	yes	no	yes	1733	0%	0%
87	Noordhollands Duinreservaat	yes	no	yes	5242	1%	1%
88	Kennemerland-Zuid	yes	no	yes	8164	0%	0%
89	Eilandspolder	yes	yes	yes	1397	68%	22%
90	Wormer- en Jisperveld & Kalverpolder	yes	yes	yes	1839	59%	19%
91	Polder Westzaan	yes	no	yes	1057	54%	9%
92	Ilperveld, Varkensland, Oostzanerveld & Twiske	yes	yes	yes	2553	45%	11%
93	Polder Zeevang	no	yes	no	1813	80%	10%

Code	Name				Land area (ha)	Intensive agricultural production (including permanent grasslands)	Intensive agricultural production (excluding permanent grasslands)
		SAC	SPA	PAS			
94	Naardermeer	yes	yes	yes	1151	19%	16%
95	Oostelijke Vechtplassen	yes	yes	yes	6475	21%	7%
96	Coepelduynen	yes	no	yes	188	1%	0%
97	Meijendel & Berkheide	yes	no	yes	2878	0%	0%
98	Westduinpark & Wapendal	yes	no	yes	246	0%	0%
99	Solleveld & Kapittelduinen	yes	no	yes	771	2%	0%
100	Voornes Duin	yes	yes	yes	1432	1%	1%
101	Duinen Goeree & Kwade Hoek	yes	yes	yes	1164	0%	0%
102	De Wilck	no	yes	no	116	72%	43%
103	Nieuwkoopse Plassen & de Haeck	yes	yes	yes	2008	24%	5%
104	Broekvelden, Vettenbroek & Polder Stein	no	yes	no	696	53%	40%
105	Zouweboezem	yes	yes	yes	257	29%	29%
106	Boezems Kinderdijk	no	yes	no	331	25%	3%
107	Donkse Laagten	no	yes	no	190	78%	69%
108	Oude Maas	yes	no	no	474	9%	6%
109	Haringvliet	yes	yes	no	2832	27%	17%
110	Oudeland van Strijen	no	yes	no	1568	85%	41%
111	Hollands Diep	yes	yes	no	629	30%	16%
112	Biesbosch	yes	yes	yes	9640	6%	3%
113	Voordelta	yes	yes	no	567	0%	0%
114	Krammer-Volkerak	yes	yes	yes	1844	8%	6%
115	Grevelingen	yes	yes	yes	2598	7%	5%
116	Kop van Schouwen	yes	no	yes	2241	3%	2%
117	Manteling van Walcheren	yes	no	yes	735	3%	2%
118	Oosterschelde	yes	yes	yes	2982	14%	8%
119	Veerse Meer	no	yes	no	473	14%	13%
120	Zoommeer	no	yes	no	226	0%	0%
121	Yerseke en Kapelse Moer	yes	yes	no	433	52%	42%
122	Westerschelde & Saeftinghe	yes	yes	yes	3802	44%	38%
123	Zwin & Kievittepolder	yes	yes	yes	81	0%	0%
124	Groote Gat	yes	no	no	70	49%	46%
125	Canisvliet	yes	no	no	141	49%	24%
126	Vogelkreek	yes	no	no	97	33%	23%
127	Markiezaat	no	yes	no	1832	11%	7%
128	Brabantse Wal	yes	yes	yes	4874	5%	4%
129	Ulvenhoutse Bos	yes	no	yes	112	0%	0%
130	Langstraat	yes	no	yes	506	58%	39%
131	Loonse en Drunense Duinen & Leemkuilen	yes	no	yes	3975	15%	9%
132	Vlijmens Ven, Moerputten & Bossche Broek	yes	no	yes	897	28%	22%
133	Kampina & Oisterwijkse Vennen	yes	yes	yes	2278	7%	4%
134	Regte Heide & Riels Laag	yes	no	yes	538	17%	17%
135	Kempenland-West	yes	no	yes	1882	4%	3%
136	Leenderbos, Groote Heide & De Plateaux	yes	yes	yes	4390	8%	7%
137	Strabrechtse Heide & Beuven	yes	yes	yes	1843	8%	7%
138	Weerter- en Budelerbergen & Ringselven	yes	yes	yes	3164	7%	5%
139	Deurnsche Peel & Mariapeel	yes	yes	yes	2734	4%	3%
140	Groote Peel	yes	yes	yes	1348	12%	11%
141	Oeffeltermoent	yes	no	yes	101	61%	56%
142	Sint Jansberg	yes	no	yes	226	15%	13%
143	Zeldersche Driessen	yes	no	yes	82	23%	23%
144	Boschhuizerbergen	yes	no	yes	277	3%	3%

Code	Name	SAC	SPA	PAS	Land area (ha)	Intensive agricultural production (including permanent grasslands)	Intensive agricultural production (excluding permanent grasslands)
145	Maasduinen	yes	yes	yes	5274	9%	8%
146	Sarsven en De Banen	yes	no	yes	154	29%	28%
147	Leudal	yes	no	yes	340	6%	4%
148	Swalmdal	yes	no	yes	123	23%	17%
149	Meinweg	yes	yes	yes	1821	5%	5%
150	Roerdal	yes	no	yes	834	60%	38%
151	Abdij Lilbosch & Voormalig Klooster Mariahoop	yes	no	no	15	5%	0%
152	Grensmaas	yes	no	no	314	0%	0%
153	Bunder- en Elsoërbos	yes	no	yes	190	2%	1%
154	Geleenbeekdal	yes	no	yes	253	12%	4%
155	Brunssummerheide	yes	no	yes	542	1%	1%
156	Bemelerberg & Schiepersberg	yes	no	yes	196	20%	16%
157	Geuldal	yes	no	yes	2724	25%	15%
158	Kunderberg	yes	no	yes	95	60%	34%
159	Sint Pietersberg & Jekerdal	yes	no	yes	280	33%	26%
160	Savelsbos	yes	no	yes	360	18%	15%
161	Noorbeemden & Hoogbos	yes	no	yes	55	55%	8%
162	Abtskolk & De Putten	no	yes	no	500	75%	17%
163	Vlakte van de Raan	yes	no	no			
164	Doggersbank	yes	no	no			
165	Klaverbank	yes	no	no			
166	Friese Front	no	yes	no			
<b>Total</b>					<b>341616</b>	<b>16%</b>	<b>8%</b>
		<b>138 yes</b>	<b>77 yes</b>	<b>58 yes</b>			

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Wageningen Environmental Research  
P.O. Box 47  
6700 AA Wageningen  
The Netherlands  
T +31 (0)317 48 07 00  
[www.wur.nl/environmental-research](http://www.wur.nl/environmental-research)

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Wageningen Environmental Research  
P.O. Box 47  
6700 AB Wageningen  
The Netherlands  
T +31 (0) 317 48 07 00  
[www.wur.eu/environmental-research](http://www.wur.eu/environmental-research)

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